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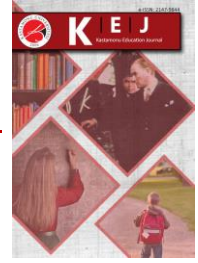
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Pre-Service Social Studies Teachers' Cognitive Structures on the Concepts of Effective Teaching and Effective Learning

Sosyal Bilgiler Öğretmen Adaylarının Etkili Öğretim ve Etkili Öğrenme Kavramlarına İlişkin Bilişsel Yapıları

Vural Tünkler¹

Keywords

1. Effective teaching
2. Effective learning
3. Word association test
4. Pre-service social studies teachers

Anahtar Kelimeler

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Abstract

Purpose: The purpose of this research is to reveal the cognitive structures of pre-service social studies teachers regarding effective teaching and effective learning.

Design/Methodology/Approach: The research was designed according to the survey model. Word association test was used as a data collection tool. The research was carried out with 122 pre-service teachers.

Findings: According to the research result, it has been observed that pre-service teachers mostly associate the concept of effective teaching with teacher, material, student, active student, and the concept of effective learning with student, active student, material, motivation. In the study, it was determined that 12 connections were established between the concept of effective teaching and the concept of effective learning. It was seen that the connection between these concepts is structured with the common components of teaching and learning such as student, material, and motivation.

Highlights: In order to understand the teaching and learning process, it would be useful to emphasize the descriptive and distinctive features of the concepts in teacher professional courses.

Öz

Çalışmanın amacı: Bu araştırmanın amacı, sosyal bilgiler öğretmen adaylarının etkili öğretim ve etkili öğrenme kavramlarına ilişkin bilişsel yapılarını ortaya koymaktır.

Materyal ve Yöntem: Tarama modeline göre yürütülen araştırmada veriler kelime ilişkilendirme testi ile toplanmıştır. Araştırmaya Türkiye’de bir devlet üniversitesinde öğrenim gören 122 öğretmen adayı katılmıştır.

Bulgular: Araştırma sonucunda öğretmen adaylarının etkili öğretim kavramını en çok öğretmen, materyal, öğrenci, aktif öğrenci; etkili öğrenme kavramını öğrenci, aktif öğrenci, materyal, motivasyon gibi kelimelerle ilişkilendirdikleri belirlenmiştir. Çalışmada etkili öğretim kavramıyla etkili öğrenme kavramı arasında 12 bağlantının kurulduğu saptanmıştır. Bu kavramlar arasındaki bağlantının öğrenci, materyal, motivasyon gibi öğretim ve öğrenmenin ortak bileşenleri ile yapılandırıldığı görülmüştür.

Önemli Vurgular: Öğretim-öğrenme sürecinin anlaşılması için öğretmenlik meslek derslerinde kavramların tanımlayıcı ve ayırt edici özelliklerinin vurgulanması faydalı olacaktır.

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INTRODUCTION

Schools are functional institutions in education (Cafoğlu, 1995). Studies aimed at increasing the quality of education in schools revealed the concept of effective school (Ada & Akan, 2007; Helvacı & Aydoğan, 2011). The main determining criterion in these studies was success (Ada & Akan, 2007). With the term effective school, which is based on the understanding that all students can learn (Balci, 1988), it is emphasized that not only a few elite classes but all classes within the school perform quite well in raising the school average (Ralph & Fennessey, 1983). Edmonds (1979), who defines an effective school as a school that enables weak students to acquire basic school skills, stated that these schools have "strong administrative leadership, high expectations for children's success, school climate conducive to learning, emphasis on acquisition of basic skills, and frequent monitoring of student progress". The role of effective teachers in effective schools is to teach all students to achieve high success (Brookover, 1985). Frequent monitoring of student progress in the teaching process, the existence of a positive learning environment, and emphasis on students' achievement of basic skills play a critical role in the development of an instructionally effective school (Bamburg & Andrews, 1990). According to Balci (2014), effective school and the effectiveness of teaching interact and a culture that supports effective teaching should be created at school. According to him, this culture should emphasize teaching and point to the order and discipline that is the source of effective learning of students.

Although learning at school is tried to be realized with planned activities, the concepts of failure, deficient or inadequate learning are still mentioned for many students for various reasons, including effective teaching (Oral, 2015). Learning is defined as the process of perceiving, recording, remembering and using knowledge, most of which is the result of an individual's active effort (Yıldırım, Doğanay, & Türkoğlu, 2009, p. 19). Today, it is argued that in an environment where the knowledge base in society is rapidly increasing and the learning environment is quite comprehensive and rich, learning objectives should focus less on acquiring knowledge but more on producing knowledge with others (Watkins, Carnell, Lodge, Wagner, & Whalley, 2002). In this process, which is known as effective learning, the active role of learners in the learning process is widely accepted, and it is known that meaningful and retention learning is possible with the learner's own effort and contribution (Yıldırım et al., 2009, p. 3). According to Mortimore (1993), effective learning is active, hidden and complex, and is influenced by various contexts and individual differences among learners. Effective learning in school and in the classroom is promoted through (a) activity, reflection and making sense, b) collaboration for learning, (c) responsibility to learn, and (d) learning to learn (Watkins et al., 2002).

Studies in education basically aim to increase learning, and the high level of learning indicates the need for effective teaching (Bellibaş & Gedik, 2016). Teaching is an intentional activity and an interactive process involving teachers, students, and tasks (Brown, 1993). Since teaching is about providing learning opportunities to students in general (Brown, 1993), the realization of education depends on the planning, implementation and assessment of teaching to create learning for certain goals (Senemoğlu, 2018, p. 395). There is no single definition of effective teaching acceptable to everyone (Cashin, 2003, p. 537). According to Senemoğlu (2018, p. 395), effective teaching requires understanding the nature of the learning event and the characteristics of students in different developmental stages. Effective teaching is at the center of effective schools (Dunne & Wragg, 1994). Teachers, who are primarily responsible for teaching, have to create effective teaching environments in order to facilitate learning and make it retain (ie, appropriating learning experiences to students) (Oral, 2015). Feldman (2007, p. 115) defined the factors of "being prepared/organizing the course and, clarity, pursued course objectives, stimulation of interest in the course or the subject matter, and motivating the students to do their best" among the most important teacher behaviors that contribute to effective teaching. If the concept of effective teaching is explained based on the qualities of effective teachers, it can be said that effective teaching includes the following features (Rosenshine & Stevens, 1986, p. 377):

- Begin a lesson with a short review of previous, prerequisite learning
- Begin a lesson with a short statement of goals
- Present new material in small steps, with student practice after each step
- Give clear and detailed instructions and explanations
- Provide a high level of active practice for all students
- Ask a large number of questions, check for student understanding, and obtain responses from all students
- Guide students during initial practice
- Provide systematic feedback and corrections
- Provide explicit instruction and practice for seatwork exercises and, where necessary, monitor students during seatwork

Cognitive structure, which plays an important role in learning and remembering, determines the general framework in which new knowledge is fused and how the connection between knowledge is (Özenci Uçar & Olşen Güzeldere, 2006, p. 10). It is known that cognitive structures guide perceptions and perceptions guide actions (Girgin, 2019, p. 464). It is necessary to reveal how teachers and pre-service teacher's structure knowledge, with the thought that their knowledge structures about professional concepts will guide their teaching actions (Gürkan, 2019, p. 635). Cognitive structure is a hypothetical structure that refers to the relationships of concepts in memory and is measured by word association test (WAT) (Shavelson, 1972, p. 226-227). The WAT is

the the most common and oldest test used among the few methods in the literature to determine cognitive structures and elicit the relationships between concepts (Bahar, 1999; Bahar, Johnstone, & Sutcliffe, 1999). The basic logic of the word association test is that the order of the response given to the concept reflects an important part of the structure between the concepts (Shavelson, 1972, p. 227). According to the order of writing, the words written previously are associated with the key concept at a higher level (Başol, 2016). In this method, which can provide evidence about the frequency and infrequency of the individual's responses to the words (Gough, 1976), the words that come to mind about any key concept within a certain period of time (usually 30 seconds) are given as an response (Bahar, Nartgün, Durmuş, & Bıçak, 2015, p. 68). The WAT is a powerful tool that helps to see the cognitive structures, the connections between concepts, the relationships that the individual establishes between the concepts, and the errors (Başol, 2016, p. 87). In addition, it is effective in revealing the types and numbers of concepts in the cognitive structures of individuals (Bahar et al., 1999; Derman & Eilks, 2016) and determining misconceptions (Çelikkaya, 2018; Ercan, Taşdere, & Ercan, 2010; Gödek, Polat, & Kaya, 2019; Gürkan, 2019; Hastürk, 2017; Özatlı, 2006). When the literature is examined, it can be seen that the WAT is frequently used to determine the cognitive structures of students (Ay & Tokcan, 2019; Bahar et al., 1999; Bahar & Özatlı, 2003; Deveci, Çengelci Köse, & Gürdoğan Bayır, 2014; Ekici, Gökmen, & Kurt, 2014; Gürkan, 2019; Işıklı, Taşdere, & Göz, 2011; Karakuş, 2019; Karatekin & Elvan, 2016; Kostova & Radoynovska, 2008; Özatlı & Bahar, 2010; Polat, 2013; Ünal & Er, 2017).

In the literature, studies examining the perceptions of teachers and pre-service teachers about the concepts of teaching (Alger, 2009; Bullough, 1991; Hamilton, 2016; Işık, 2014; Leavy, McSorleya, & Boté, 2007; Shaw & Mahlios, 2008; Stylianou, Hodges Kulinna, Cothran, & Kwon, 2013; Szukala, 2011), learning (Alger, 2009; Işık, 2014; Leavy et al., 2007; Saban, Koçbeker-Eid ve Saban, 2014; Stylianou et al., 2013; Szukala, 2011), effective learning (Kasapoğlu, 2014; Özgün Koca, Yaman, & Şen, 2005) and effective teaching have been found (Carnell, 2007; Hativa, Barak, & Simhi, 2001; Özgün Koca et al., 2005; Ünver, 2013). Unlike these studies, there is also a study in which the cognitive structures of primary school pre-service teachers regarding the concept of instruction were determined by WAT (Gürkan, 2019). However, no study has been encountered on effective teaching and effective learning, especially on social studies pre-service teachers. Examining pre-service teachers' prior knowledge and perceptions about teaching and learning is an effective way to help them build meaningful knowledge and understanding (Bullough & Gitlin, 1995, as cited in Leavy et al., 2007, p. 1218). Likewise, investigating how pre-service teachers cognitively construct teaching and learning concepts, which are of professional importance, is considered important in terms of creating meaningful knowledge and understanding. As a matter of fact, it is thought that the way social studies pre-service teachers' structuring of these concepts may affect their teaching practices in the future, as teachers are not only in the position of teaching, but also would take the role of providing learning (Şentürk & Oral, 2008). Effective teaching and effective learning concepts were investigated together in the study, since learning is the basis of the teaching concept (Karlı, 2012, p. 15) and all teaching is based on learning (Brown, 1993, p. 213). The aim of the study is to reveal the cognitive structures of social studies pre-service teachers regarding the concepts of effective teaching and effective learning.

METHOD

Research Design

The main aim of this study is to determine the cognitive structures of pre-service social studies teachers regarding the concepts of effective teaching and effective learning. The study has been conducted using the survey model. Survey models are research approaches aiming to describe a past or current situation as it exists (Karasar, 2009). Since the cognitive structures of pre-service social studies teachers regarding these concepts were tried to be determined, the survey model was used in the research.

Study Group

The study group consists of 122 students studying in the program of the Social Studies Teaching of a state university in Turkey in the spring semester of 2019-2020 academic years. Criteria sampling method was used in the selection of participants. Since assessment is referred to as an important component of effective teaching, the research was conducted with pre-service teachers who had taken the measurement and evaluation course. 55 of the pre-service teachers are juniors and 67 are seniors. 76 of the participants were female and 46 were male.

Data Collection Tool and Process

Data for the study were collected with the word association test (WAT). An application guide and an example are presented on the first page of the WAT. A page layout was created with each key concept located on one page. Before the application, necessary explanations were made about the WAT, and a pilot application was carried out by examining the sample in the test. In the test, students were asked to write six words about the concepts of effective teaching and effective learning. During administration of the test, pre-service teachers wrote down the words that came to their minds about the concept within the 30-second period allowed for each concept. It took about eight minutes to distribute the test, to make the necessary explanations and to implement it. An example application is as follows.

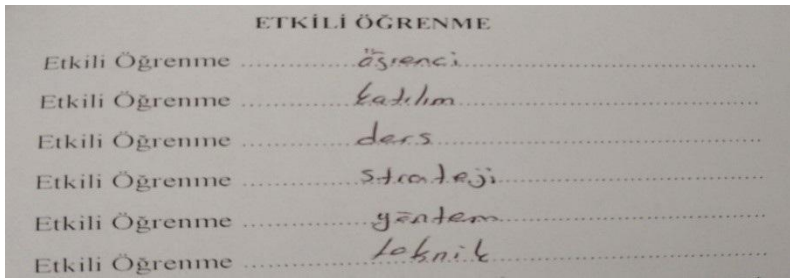


Figure 1. Response Sheet of One of the Participants

Data Analysis

In order to evaluate the results of the WAT for the study, responses given to the key concepts were examined in detail and then a frequency table was prepared showing how frequently those words were used for each key concept. A concept map was created in line with the cut-off points determined by considering the frequency table. According to Bahar et al. (1999), for any key concept in the WAT, fewer than 3-5 words from the most frequent words are determined as the cut-off point. The number of responses over this range is written in the first part of the concept map. Afterwards, the cut-off is pulled down at regular ranges and this process continues until all keywords appear in the concept map. Concepts emerging in each cut-off point range are repeated as many times as the number of students in that range. For example, the concepts with the cut-off point in the range of 6-15 were shown as response words created between the numbers of 6-15 participants. The data of the study were analyzed by looking at the relations between the concepts in the concept maps.

FINDINGS

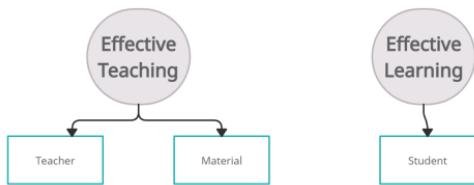
The frequencies of the words produced by the pre-service teachers regarding the concepts of effective teaching and effective learning are given in Table 1.

Table 1. Frequencies of Produced Words Related to Key Concepts

Key Concepts	Produced Words
Effective Teaching	<p>Teacher (41), Material (36), Student (26), Active student (15), Motivation (12), Course (12), Classroom environment (11), Technique (10), Learning (10), Student-centered (10), Communication (9), Method (9), Discovery teaching (9), Discipline (9), Constructivist education (9), Planned-programmed (9), Making student active (8), Knowledge (8), Retention learning (8), Activity (8), Study (7), Plan (7), Time (6), School (6), Lecture (6), Counseling teacher (6), Content (6), Skills (5), Efficient use of time (5), Appropriate learning environment (5), Knowledgeable (5), Education (5), Presentation (5), Learning by doing (5), Smart board (5), Concept map (5), Diction (5), Participation (5), Effective lecturing (5), Readiness (4), Application (4), Qualified teacher (4), Understanding (4), Systematic (4), Achievement (4), Relativity to the student (4), Question-answer (4), Sense-making (4), Process (4), Environment (4), Person (3), Brainstorm (3), Questioning (3), Expert (3), Examples (3), Permanent behavior change (3), Experienced (3), Knowledge transfer (3), Individual (3), Democratic classroom environment (3), Goal-directed (3), Transfer (3), Gesture and facial expression (3), Responsible student (3), Feedback (3), Effective course (2), Suitability for instructional level (2), Homework (2), Book (2), Preparedness (2), Ability (2), Entertainment (2), Instilling knowledge (2), Openness (2), Attention (2), Interactivity (2), Useful (2), Confidence (2), Drama (2), Gamification (2), Contemporary (2), Different method (2), Giving responsibility (2), Regular (2), Cooperation (2), Strategy (2), Relationship (2), Concrete experience (2), Classroom management (2), Attracting attention (2), Individual difference (2), Visual (2), Concretization (2), Educational game (2), Diagonal (2), Assessment (2), Individual learning (2), Willingness to teach (2), Effort (2), Effective teaching (2), Active learning (2), Comprehension (2), Face to face teaching (2), Goal (2), Conscious (2), Attitude (2), Subject mastery (2), Reinforcement (2), Development (2), Cognitive (1), Teaching qualification (1), Concept cartoon (1), Instructional comics (1), Expository instruction (1), Learning by discussion (1), Decision making (1), Self-development (1), Practical thinking (1), Parent (1), Ability to understand the student (1), Acquisition (1), Test (1), Rote avoidance (1), Physical difference (1), Valuing the student (1), Individual lecturing (1), Education-instruction system (1), Team work (1), Common learning (1), Peer education (1), Productive (1), Product (1), Dignity (1), Valuing (1), Lesson plan (1), Obeying class rules (1), Foresighted (1), Merciful (1), Field knowledge (1), Using Turkish correctly (1), Add something (1), Helper (1), Interest (1), Transfer (1), Schema (1), Discovery (1), Layered curriculum (1), Project-based teaching (1), Free thought (1), Figure (1), Thinking (1), Intelligence (1), Continual (1), Effectice result (1), Mastery learning (1), Opinion development (1), Aquarium (1), Social (1), Independent (1), Word (1), Slide (1), Demonstration (1), Quick thinking (1), Influencing the other (1), Change the opinion (1), Equipped (1), Active teaching (1), Flued teaching (1), Information exchange (1), Learning together (1), Scientific knowledge (1), Teaching model (1), Range of knowledge (1), Filter (1), Pragmatist (1), Concept (1), Achievement level (1), Family-school (1), Family (1), Groups (1), Formal education (1), Demonstration (1), Station (1), Mind map (1), Snowball (1), Research-examination (1), Directly (1), Lesson duratin (1), Question solving (1), Material design (1), Harmony (1), Teacher-student relationship (1), Usability (1), Change (1), Progress (1), Purpose of education (1), Instruction (1), Teacher-student</p>

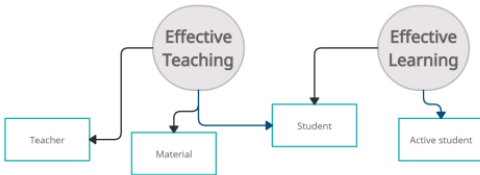
	<p>communication (1), Listening (1), Respect for opinion (1), Teacher-student (1), Lifelong (1), Psychomotor (1), Empathy (1), Effective learning (1), Rehearsal (1), Model (1), Rules (1), Consciousness (1), Teaching (1)</p>
Effective Learning	<p>Student (36), Active student (29), Material (17), Motivation (16), Effective listening (13), Rehearsal (12), Environment (12), Knowledge (11), Understanding (10), Readiness (10), Teacher (10), Attention (10), Achievement (10), Retention learning (10), Comprehension (10), Person (9), Application (9), Feedback (9), Reinforcement (8), Study (8), Effort (7), Classroom environment (7), Course (7), Research (7), Meaningful learning (6), Activity (6), Curiosity (6), Planned study (6), Time (6), Team work (5), Concretization (5), Thinking (5), Note taking (5), Skill (5), Technical (5), Cooperative learning (5), Examples (5), Method (5), Communication (4), Goal (4), Creative thinking (4), Interest (4), Individual speed (4), Implementation (4), Productive time (4), Learning by doing (4), Learning (4), Active learning (4), Assessment (4), Imagination (3), Suitability for student level (3), Course preparation (3), Permanent behavior change (3), Interaction (3), Student-centered (3), Counseling teacher (3), Need (3), Desire to know (3), Questioning (3), Acquisition (3), Grit (3), Lifelong (3), Adaptation (3), Strategy (3), Plan (3), School (3), Education (3), Productive (3), Product (3), Openness (3), Aid (3), Lecture (3), Homework (2), Visual (2), Process (2), Question solving (2), Difference (2), Regular (2), Inquiry (2), Ability to criticize (2), Positive result (2), Harmony (2), Expression (2), Lifelong learning (2), Small steps (2), Sharing (2), Brainstorm (2), Willing (2), Association (2), Logical (2), Content (2), Synthesis (2), Ability (2), Freedom (2), Technology (2), Gamification (2), Test (2), Dynamism (2), Rest (2), Behavior (2), Family (2), Performance (2), Responsible student (2), Regular attendance to class (2), Theory (2), Required knowledge (1), Optional (1), Test-retest (1), Mastery learning (1), Collegium (1), Order (1), Knowledgeable teacher (1), Speaking (1), Guidance (1), Noticing (1), Definition (1), Quick decision making (1), Gesture and facial expression (1), Direct lecturing (1), 3D thinking (1), Demonstration (1), Active class (1), Parent (1), Adequacy of resource (1), In-class behaviors (1), Not being abstracted (1), Confidence (1), Satisfaction with knowledge (1), Patience (1), Venturous (1), Teaching by understanding (1), Cumulative learning (1), Qualified teacher (1), Intermittent study (1), Concept map (1), Perception (1), Studying by coding (1), Adaptation for environmental (1), Systematic thinking (1), Print out (1), Functionality (1), Transfer (1), Usability (1), Respect (1), Learning style (1), Having the skill (1), Analyzing knowledge (1), Learning to Learn (1), Knowing what you don't know (1), Attract attention (1), Educational game (1), Do together (1), Social participation (1), Discovery learning (1), Learning by understanding (1), Progressive teaching (1), From simple to complex (1), Current (1), Constructivist education (1), Fishbone (1), Instruction (1), Abstract (1), Association (1), Planned-programmed (1), Exam (1), Trip-observation (1), Self-regulated (1), Build of schema (1), Hardworking (1), Suitable conditions (1), Receiver (1), Love-respect (1), Objective (1), Classroom climate (1), Devoted (1), Values (1), Mind (1), Finding solution (1), Learning level (1), Conclusion (1), Value system (1), Systematic (1), Cognitive (1), Psychomotor (1), Affective (1), Creating (1), Practicality (1), Physiological environment (1), One-to-one (1), Six thinking hats (1), Report preparation (1), Presentation preparation (1), Material design (1), Activity preparation (1), Test analysis (1), Student feature (1), Advance (1), Experience (1), Attracting attention (1), Cognitive preparation (1), Intelligence type (1), Establishing a cause-effect relationship (1), Knowledge transfer (1), Level and capacity (1), Interpreting what has been learned (1), Preliminary (1), Teacher-student relationship (1), Friend relationship (1), Scope (1), Induction (1), Interaction with the group (1), Teaching (1), Sensitive (1), Generating new ideas (1), Transferring knowledge (1), Teacher knowledge (1), Passive student (1), Ability to express (1), Transfer to the across (1), Not rote (1), Hard to forget (1), Meeting the need (1), Rules (1), Teacher-student (1), Transfer (1)</p>

When Table 1 is examined, it is observed that a total of 345 words related to the concepts of effective teaching and effective learning were produced. Looking at the response words most associated with each key concept, the words teacher (f=41) for the concept of effective teaching and student (f=36) for the concept of effective learning were repeated. In the research, the data in Table 1 were taken into account in revealing the cognitive structure between the concepts. In this framework, four ranges were determined as the cut-off point and the cut-off point were shown in different colors. Arrows in the concept map created according to cut-off point 36 and above are black; arrows on the concept map created according to cut-off point 26-35 are blue; arrows in the concept map created according to cut-off point 16-25 are orange; arrows in the concept map created according to the cut-off point 6-15 are green. Below are the concept maps created according to the cut-off points 36 and above, 26-35, 16-25 and 6-15, respectively.



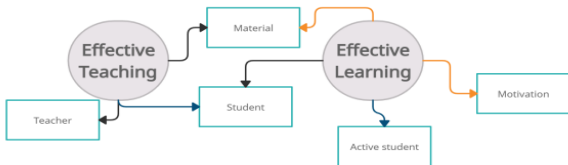
Cut-off point 36 and above

Figure 2. Concept Map Structured According to Cut-off Point 36 and Above



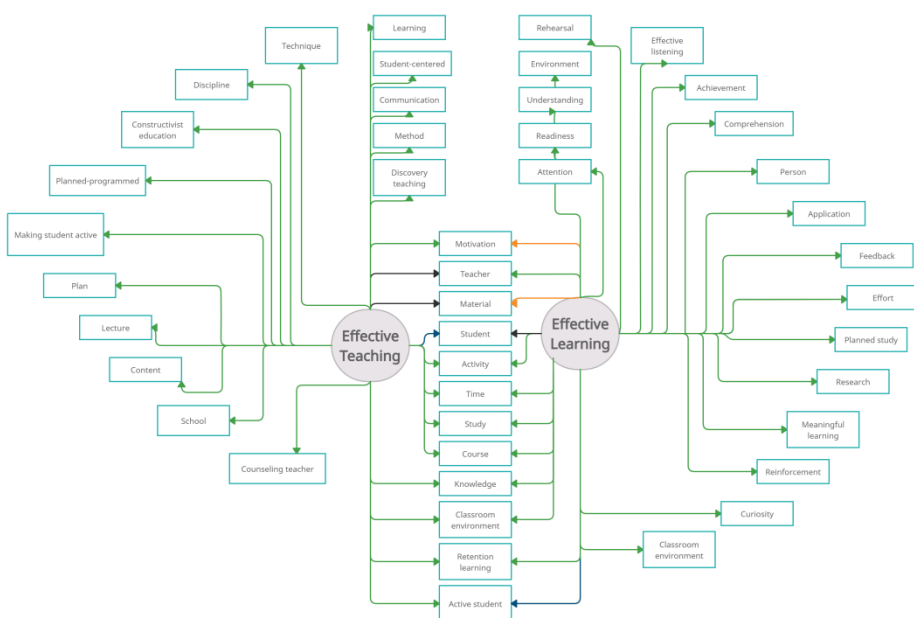
Cut-off point 26 and 35 range

Figure 3. Concept Map Structured According to Cut-off Point 26 and 35 Range



Cut-off point 16 and 25 range

Figure 4. Concept Map Structured According to Cut-off Point 16 and 25 Range



Cut-off point 6 and 15 range

Figure 5. Concept Map Structured According to Cut-off Point 6 and 15 Range

Cut-off Point 36 and Above: In this range, the concept of effective teaching was associated with the response words "teacher" and "material", and the concept of effective learning was associated with the response word "student". The concepts emerging in this range are still unassociated with each other.

Cut-off Point 26 and 35 Range: In this range, it is seen that the concept of effective learning is associated with the response word "active student", and as a result of associating the concept of effective teaching with the response word "student" that appeared before, a relationship is established between the concepts of effective teaching and effective learning. Thus, the associations between concepts started in this range.

Cut-off Point 16 and 25 Range: In this range, the concept of effective learning was associated with the response word "motivation". In addition, as a result of associating the concept of effective learning with the response word "material" that appeared before, a second relationship was established between the concepts of effective teaching and effective learning.

Cut-off Point 6 and 15 Range: In this range, the concepts of *effective teaching* are "technique", "learning", "student-centered", "communication", "method", "discovery teaching", "discipline", "constructivist education", "planned-programmed", "making student active", "knowledge", "retention learning", "activity", "study", "plan", "time", "school", "lecture", "counselin teacher" and "content" were associated with the response words. On the other hand, the concept of *effective learning* is "effective listening", "rehearsal", "environment", "knowledge", "understanding", "readiness", "teacher", "attention", "achievement", "retention learning", "comprehension", "person", "application", "feedback", "reinforcement", "study", "effort", "classroom environment", "course", "research", "effort", "research", "meaningful learning", "activity", "curiosity", "planned study" and "time" were associated with the response words.

DISCUSSION, CONCLUSION, AND RECOMMENDATIONS

The purpose of this research is to reveal the cognitive structures of pre-service social studies teachers regarding effective teaching and effective learning. As a result of the research, when the cognitive structures of pre-service teachers related to the concept of effective teaching were examined, it was determined that effective teaching was mostly associated with words such as teacher, material, student, active student, motivation, course, classroom environment. It was determined that the pre-service teachers often repeated the method-technique, material, active participation, planning in the sentences they formed with the words they produced, and only four participants referred to the concept of assessment. The findings of this study are compatible with those of other studies (Gürkan, 2019; Gürses, 2011; Ünver, 2013). In the study conducted by Ünver (2013), it was determined that doctoral students conceptualized effective teaching as active learning, learner-centered learning, student diversity, and learning materials. On the other hand, in Gürkan's (2019) research, it was revealed that primary school pre-service teachers mostly associate the concept of teaching with words such as student, teacher, school, knowledge, education, and class.

Pre-service teachers' explanations of the concept of effective teaching with words related to student learning are in line with the findings of Carnell (2007), Hativa et al. (2001) and Gürses (2011). In his study, Carnell (2007) asked teachers to give examples of effective teaching and found that teachers focused on student learning by establishing a link between effective teaching and student learning in their examples. Hativa et al. (2001) in their study, teachers accepted the importance of providing learning motivation, making the course interesting and maintaining attention, making students active in the course, and creating an enjoyable classroom environment suitable to learning in effective teaching. Gürses (2011), on the other hand, held the view that effective teaching is student-centered, contributes to the social and academic development of students by increasing their willingness to the course, and they argued that feedback is necessary for effective teaching. In the study, it was observed that almost all pre-service teachers could not associate the concept of effective teaching with assessment. Based on this finding, it can be thought that pre-service teachers do not have enough knowledge on this subject. As a matter of fact, it is useful to provide feedback to students frequently (Westwood, 1996) and to assess teaching (Güven, 2004) for effective teaching, which is the result of qualified planning (Tok, 2015). In this study, it was determined that 12 connections were established between the concepts of effective teaching and effective learning. It can be seen that the connection between these concepts is structured with the common components of teaching and learning such as student, material, and motivation.

When the cognitive structures of the pre-service teachers regarding the concept of effective learning were analyzed, it was determined that the pre-service teachers mostly associated this concept with words such as student, active student, material, motivation, effective listening, rehearsal, knowledge, and readiness. Considering the results of the study conducted by Aydede Yalçın and Öztürk (2016) on teachers, it can be said that teachers' perceptions of the concept of active learning as student activity, active participation, and readiness indirectly support the findings of this study. In the study of Aydın and Yılmaz (2015), pre-service

teachers' associating effective learning with features such as arousing curiosity in students, consideration of disparity between students, being student-centered, providing active participation and learning with fun, and increasing the retention of knowledge is similar to the findings. In addition, the pre-service teachers' association of effective learning with rehearsal and knowledge in this study is in line with the results of the study conducted by Işık (2014). Effective learning actively involves learners in the planning, monitoring and reflection processes (Biggs & Moore, 1993, as cited in Watkins, Carnell, Lodge, Wagner, & Whalley, 2000, p. 37). In effective learning, it is emphasized that for meaningful learning, students need to be active in the learning process, and to use learning strategies that will help students retain learning (İlhan Beyaztaş, 2014). In the literature, effective learning is treated together with terms like student-centered learning, learning to learn (Watkins, Carnell, & Lodge, 2007), active learning, cooperative learning (Carnell & Lodge, 2002; Watkins et al., 2007) and learning responsibility (Carnell & Lodge, 2002). Based on the literature, when the words that pre-service teachers often associate with the concept of effective learning are evaluated, it can be said that their cognitive structures on this subject are not at an adequate level. In terms of the effectiveness of teaching and learning processes in the realization of school learning, it can be thought that it is important for pre-service teachers to acquire and make sense of these concepts correctly in teacher education. In this context, it would be useful to emphasize the basic and distinctive features of the concepts in teacher professional courses. In future research, the cognitive structures of pre-service teachers and teachers regarding the concepts of effective teaching and effective learning can be examined through the WAT.

Declaration of Conflicting Interests

The author declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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Statements of publication ethics

I hereby declare that the study has no unethical issues and that research and publication ethics have been observed carefully.

Researchers' contribution rate

This research was conducted with a single author. I declare that all actions taken during the research process belong to me.

Ethics Committee Approval Information

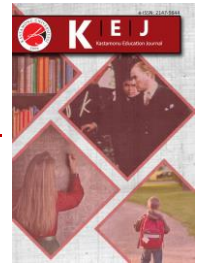
The research was carried out as of 2020. The research is not an experimental study. Therefore, ethics committee approval was not required.

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| Research Article / Araştırma Makalesi |

Examination of Teachers' Educational Information Network (EBA) Awareness In Terms of Some Variables

Öğretmenlerin Eğitim Bilişim Ağı (EBA) Farkındalıklarının Bazı Değişkenler Açısından İncelenmesi

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Keywords

1. EBA
2. Educational Informatics Network
3. Awareness
4. FATİH Project

Anahtar Kelimeler

1. EBA
2. Eğitim Bilişim Ağı
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4. FATİH Projesi

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Abstract

Purpose: In Turkey, in order to ensure equal opportunities in education and to ensure the integration of technology into education, the Action to Increase Opportunities and Improve Technology Project (FATİH) is carried out by the Ministry of National Education (MEB). One of the five basic pillars of this project is an online social education platform "The Educational Informatics Network (EBA) which is presented free to students, teachers and parents and provides access to tens of thousands of educational contents. Although there are many opportunities and benefits that EBA provides to all its stakeholders, it is not known whether teachers who are the planners and practitioners of the teaching process are aware of what they can do with this platform. With this research, it is aimed to reveal the EBA awareness of the teachers working in MEB schools and to examine these awareness in terms of many variables such as the province they work, branch, school type, the professional experience, the education level, the situation of receiving EBA education or not.

Design/Methodology/Approach: 244 teachers participated in the study. In order to collect data, a survey model was used., The data was collected through the Personal Data Form and the "Teacher EBA Awareness Scale " developed by the researchers.

Findings: As a result of descriptive analysis and comparisons, teachers' awareness of EBA was found to be "medium" and it was determined that this awareness differed from significantly according to the variables of branch, school type, number of technological tools owned, the ability of using technology, the status of training related to EBA, the status of being aware of the update made in EBA, number of EBA modules used and frequency of EBA use. However, it was determined that the status of having BTR teachers in schools were found to be unaffected by the variables.

Highlights: Since it is important to be informed about the platform in the use of the EBA, it is thought that new applications and features published on the platform should be announced to the teachers, measures should be taken to share them and more effective methods should be used for promotion.

Öz

Çalışmanın amacı: Türkiye'de eğitimde fırsat eşitliğinin sağlanması ve teknolojinin eğitime entegrasyonunun sağlanması amacıyla Milli Eğitim Bakanlığı (MEB) tarafından Fırsatları Artırma ve Teknolojiyi İyileştirme Hareketi (FATİH) projesi yürütülmektedir. Bu projenin 5 temel ayağından biri olan "eğitsel e-çeriğin sağlanması ve yönetilmesi" ayağını; öğrenci, öğretmen ve velilerin ücretsiz erişimine sunulan ve on binlerce eğitim içeriğine ulaşılmasını sağlayan bir çevrimiçi sosyal eğitim platformu olan Eğitim Bilişim Ağı (EBA) oluşturmaktadır. EBA'nın tüm paydaşlarına sağladığı birçok imkan ve yarar bulunmasına rağmen öğretim süreçlerinin planlayıcı ve uygulayıcıları olan öğretmenlerin bu platform ile yapabileceklerinin farkında olup olmadığı bilinmemektedir. Bu araştırma ile; MEB'e bağlı okullarda görev yapan öğretmenlerin, EBA farkındalıklarının ortaya çıkarılması ve bu farkındalıklarının görev yaptıkları il, branş, okul türü, mesleki deneyim, öğrenim düzeyi, EBA eğitimi alıp almama durumu gibi birçok değişken açısından irdelenmesi amaçlanmıştır.

Materyal ve Yöntem: İki yüz kırk dört öğretmenin katıldığı ve nicel araştırma yöntemlerinden tarama modelinin kullanıldığı çalışmada veriler Kişisel Bilgi Formu ve araştırmacılar tarafından geliştirilen "Öğretmen EBA Farkındalık Ölçeği" ile toplanmıştır.

Bulgular: Yapılan betimsel analizler ve karşılaştırmalar sonucunda Öğretmenlerin EBA'ya ilişkin farkındalıkları ""orta" düzeyde bulunmuş ve bu farkındalıkların branş, okul türü, sahip olunan teknolojik araç sayısı, teknoloji kullanma becerisi, EBA ile ilgili eğitim alma durumu, EBA'da yapılan güncellemeden haberdar olma durumu, kullanılan EBA modül sayısı ve EBA kullanım sıklığı değişkenlerine göre anlamlı farklılık gösterdiği ancak okullarda BTR öğretmenini bulunma durumu değişkeninden etkilenmediği tespit edilmiştir.

Önemli Vurgular: EBA kullanımında platform hakkında haberdar olmanın önemli olması nedeniyle platformda yayına alınan yeni uygulamaların ve özelliklerin öğretmenlere duyurulması, paylaşılması için tedbirler alınması ve tanıtım konusunda daha etkili yöntemler kullanılması gerektiği düşünülmektedir.

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INTRODUCTION

With the use of technology in education as in all areas of life, many concepts such as e-learning, blended learning, computer assisted learning and distance education emerged (Gökdaş & Kayri, 2005; İşman, 2008; Yurdakul, 2016). These activities, the use and importance of which are increasing with each passing year, have gained even more importance after the Covid-19 cases (WHO, 2020), which emerged in December 2019 and caused millions of people to become ill and hundreds of thousands to die in the world (Telli & Altun, 2020). As part of the measures taken in many countries in order to reduce deaths, reduce the rate of progression of the epidemic and gain time for treatment studies, face-to-face education in educational institutions was suspended for a while or schools were suspended (Dikmen & Bahçeci, 2020). With this epidemic also seen in Turkey as of March 2020 (Ministry of Health, 2020), the Ministry of National Education (MEB) announced that face-to-face education will be suspended as of March 16, 2020, and distance education will be started as of March 23, 2020 (MEB, 2020a). The distance education process, on the other hand, is carried out through the Education Information Network (EBA), which was initiated with the FATİH Project which has the highest user number and most active distance education environment in Turkey as of today (MEB, 2020d).

The Movement to Increase Opportunities in Education and Improve Technology (FATİH) Project was initiated by the Ministry of National Education for the effective use of information technology tools in lessons, in a way to appeal to more sense organs in the learning-teaching process, in order to ensure equality of opportunity in education and training and to improve technology in schools (MEB, 2020c). It is stated that thanks to this project, it will be easier and faster for students to access the information they need (Kayaduman, Sırakaya, & Seferoğlu, 2011). This project, which is based on a constructivist education approach, is based on five basic principles: "Accessibility", "Efficiency", "Equality", "Measurability" and "Quality" factors. Of the project:

It has five main components,

- In-service training of teachers
- Providing hardware and software infrastructure
- Effective use of Information Technologies (IT) in curricula
- Ensuring conscious, secure, manageable and measurable IT use, and
- Provision and management of educational e-content

The component of "Providing and managing educational e-content" is the EBA platform.

EBA, which was established by the Ministry of National Education and carried out by the General Directorate of Innovation and Education Technologies (YEĞİTEK), affiliated to the ministry; is an online social education platform that enables students, teachers and parents to access tens of thousands of educational content (EBA, 2020a). Many learning / teaching materials such as lectures, presentations, e-books, videos, simulations, animations, questions, exams, experiments are included in EBA. Through this platform, users can access the content at home, at school or wherever needed by using information technology tools. The potential to provide equal opportunities to students with different social and economic opportunities is also frequently expressed by the Ministry of National Education.

EBA, which has some deficiencies and flaws in some aspects previously from the eyes of teachers and students such as useless (Ekici, Arslan & Tüzün, 2016), lack of functional help support (Erensayın & Güler, 2017), lack of some content in the mobile version and slow loading (Kapıdere & Çetinkaya, 2017), insufficient content and unsorted content (Alabay, 2015; Karaçorlu & Aıcı, 2019), was introduced a new term on February 18, 2020, and a radical change was implemented in the platform.

In the promotion organized by the Ministry of National Education (2020b), the principle of "Justice of Opportunity in Education" was emphasized and it was stated that the content of the EBA (interactive school books, lecture videos, exams, applications, etc.) was updated, the user interface was renewed, giving it a modern and simple look and smart features. It is stated that by adding a content recommendation system according to the student's performance, it offers its users a personalized learning environment and personalized interface options. With the renewed EBA, students can make up for their shortcomings with the follow-up of their studies and personalized directions on the system, see their upcoming exams and events on their calendars, establish a social sharing area with their friends and make learning more fun by earning points and badges with the gamification system in the platform.

In terms of teachers, there are many activities-applications that can be made using EBA. The table below summarizes what teachers can do by using the modules in EBA.

Table 1. What teachers can do using EBA modules (EBA, 2020b).

Module Name	Teachers Can
My Page	<ul style="list-style-type: none"> · view the events in their personalised calendar · make sharings (messaging, discussion, voting, activity) with the people in the school · give feedback (comments, likes, etc.) on the shared message and · follow the activity status of the students by following the works sent to the students
Lessons	<ul style="list-style-type: none"> · access to all learning materials related to all grade levels and courses in EBA · use the educational materials with the smart board mode and send these materials to the students as a study when necessary
Exams	<ul style="list-style-type: none"> · access exercises and tests related to all classes, lessons and subject areas and send them to the students
Library	<ul style="list-style-type: none"> · access thousands of educational and general cultural contents (e-books, e-journals, movies, videos, audio files, etc.) belonging to different categories.
Lists	<ul style="list-style-type: none"> · make personalized content arrangements according to teaching plans,
Studies	<ul style="list-style-type: none"> · see the work they sent to the students · analyze past or ongoing works
Reports	<ul style="list-style-type: none"> · monitor the reports of the studies they've sent both on a student-based and study-based basis
Groups	<ul style="list-style-type: none"> · create several groups with students and teachers · join existing groups · add branches.
EBA Portfolio	<ul style="list-style-type: none"> · follow students' academic achievements, social activities, projects, etc. they participate in and EBA actions
Files	<ul style="list-style-type: none"> · file and share as they wish to their personal 2 GB cloud storage
Calendar	<ul style="list-style-type: none"> · follow the activities and important days and weeks · monitor the exam dates processed in the e-school
Content Production	<ul style="list-style-type: none"> · produce original content · design learning steps and course flows using the content
Question and Exam System	<ul style="list-style-type: none"> · can access the questions and exams in EBA · add new questions and exams · send the exams as work · take printouts of the exams when needed
Professional Development	<ul style="list-style-type: none"> · participate in in-service training such as various courses, seminars, etc. · join groups (21st Century Education World, Education Technologies, Classroom Management and Guidance etc.) where they can share information and opinions with all their EBA using colleagues

Along with all the above-mentioned opportunities that EBA provides to students and teachers, there are findings in many studies on the use of this platform, indicating that it provides various benefits to students and teachers (Kılıç Koçak, 2019; Tüysüz & Çümen, 2016). To students; Reinforcing, visualizing and concretizing the lesson for teachers with reinforcing the subjects, preparing for the exams, conducting interactive experiments, repeating the lessons and increasing academic success (Aydınözü, Sözcü, & Akbaş, 2016; Ertem Akbaş, 2019; Tüysüz & Çümen, 2016). , 2016), focusing students on the lesson (Karaçorlu & Aıcı, 2019), facilitating classroom management (Kılıç Koçak, 2019), increasing motivation (Kuyubaşoğlu & Kılıç, 2019). Achieving these benefits depends primarily on the willingness of teachers, who are practitioners of the curriculum, to use technology in order to integrate technology in education (Fryer & Bovee, 2016). In his research, Öz (2016) determined that cognitive awareness increases motivation and motivation increases success, so it is deduced that "awareness" is the basis of being motivated to a job. In a different study by Abdelrahman (2020); It has been revealed that there is a significant relationship between students' academic achievement and academic motivation, and that metacognitive awareness contributes to success in learning.

In a study investigating the effects of metacognitive awareness on students' participation in online classes (Tsai, Lin, Hong, & Tai, 2018), it was concluded that increased metacognitive awareness was positively related to online learning participation. Accordingly, it can be said that being able to do a job effectively depends on motivation and therefore awareness. It can be argued that this situation is also valid for teachers who are planners and implementers of teaching processes.

In the workshop on "EBA usage" held on February 24, 2016 with teachers participating from all schools in Gürsu District of Bursa Province, the problem that EBA is not used frequently by teachers, even not recognized, was expressed as a result of the workshop (Özgümüş, 2018). Again, in many studies conducted in the literature, it is stated that teachers do not know EBA sufficiently (Aksoy, 2017; Kurtdede Fidan, Erbasan, & Kolsuz, 2016; Saklan, 2017; Tutar, 2015) or do not use it at the expected level (Alabay, 2015; Güvendi, 2014; Karaçorlu & Aıcı, 2019; Nakiboğlu and Gacanoğlu, 2019). Teachers' awareness of EBA can be discussed as one of the reasons why EBA is not used enough by teachers. Teachers' awareness of using the EBA platform will affect the efficiency and quality elements of the FATİH project, which are the two principles mentioned above. For this, it has been

evaluated that it is important to determine the awareness of teachers about EBA, which was renewed and finalized in February 2020. In addition, Karaçorlu and Aıcı (2019) stated that examining teachers' awareness on the EBA platform will reveal the functioning of the FATİH Project.

When the literature is examined, many studies related to Fatih Project and EBA (Erensayın and Güler, 2019; Kalemkuş, 2016; Özgümüş, 2018; Saklan and Ünal, 2019; Yılmaz, 2013) etc. appears to be in some of these studies students (Bahçeci & Burak, 2018; Coşkunserçe & Becit İştürk, 2019; Tüysüz & Çümen, 2016), teachers (Elçiçek, 2019; Kayaduman et al., 2011; Kurtdede Fidan, 2016; Şahin & Erman, 2019) and the platform contents (Bertiz, 2017; Erensayın, 2018; Maden and Önal, 2018) are the focus. In studies focusing on teachers, variables such as attitude (Bayyığıt Teker, 2019), opinion (Saklan & Ünal, 2018), competence (Kayaduman et al., 2011) and usage situations-frequency (Elçiçek, 2019; Nakiboğlu & Gacanoğlu, 2019) have been discussed. Coşkunserçe and Becit İncitürk (2019) carried out a study to increase students' awareness in their study. In this literature review, no study was found that addresses teacher EBA awareness. Determining the awareness of teachers, whose importance is emphasized above, may be important in terms of filling this gap.

Determining the EBA awareness of teachers and revealing how these awarenesses are affected by variables such as teachers' professional experience, education level, school type, branch, whether there is an Information Technologies Counselor in schools; it is anticipated that it will be important in terms of contributing to the authorities related to FATİH Project-EBA and the General Directorate of Teacher Training and Development of the Ministry and being a source for further research.

With this research; It is aimed to reveal the EBA awareness of the teachers working in the schools affiliated to the Ministry of National Education and to examine this awareness in terms of many variables such as the province, branch, school type, professional experience, education level, whether or not they have received EBA education. For this purpose, the problem sentence of the research was expressed as "What is the level of EBA awareness of the teachers" and the sub-problems of the study were determined as follows.

- 1- Does EBA awareness of teachers differ according to branches?
- 2- Does EBA awareness of teachers differ according to the type of school they work in?
- 3- Does the number of technological tools owned by the teachers have a significant effect on their EBA awareness?
- 4- Do teachers' technology use skills affect their EBA awareness?
- 5- Does the presence of Information Technologies Counselor (ITC) Teacher in schools change the EBA awareness of teachers?
- 6- Do teachers' awareness of EBA change according to their EBA education?
- 7- Does teachers' awareness of the latest updates in EBA significantly affect their awareness of EBA?
- 8- Does EBA awareness of teachers vary according to the number of EBA modules they use?
- 9- What is the relationship between teachers' EBA usage frequency and their awareness?
- 10- Which modules do teachers with EBA experience use mostly?

METHOD/MATERIALS

A descriptive survey model was used in this study, which aimed to reveal the awareness of teachers about EBA.

Working Group

A total of 244 teachers, 111 women (46%) and 133 men (54%), working in public/private schools affiliated to the Ministry of National Education in the 2019-2020 academic year from 22 different provinces, mostly from Van, participated in the working group.

The distribution of the participants according to some demographic information such as branch, school type, education level is presented in the table below.

Table 2. Distribution of the participants according to some demographic information

Demographic Characteristics		N	%
School Type	Primary and Preschool	77	32
	Secondary School	112	46
	High School and Special Education	55	22
	TOTAL	244	100
Branch	Classroom Teaching	56	23
	Technology Branches (Information Technology, Technology Design)	35	14
	Verbal Branches (Geography, History, Social Science, Turkish Language and Literature etc.)	38	16
	Numerical Branches (Primary School Mathematics, Mathematics, Science, Physics, etc.)	35	14

	Language Branches (English, Turkish)	28	12
	Branches Requiring Special Talent (Physical education, music, visual arts, etc.)	22	9
	Developmental Branches (Guidance, special education, etc.)	30	12
	TOTAL	244	100
Professional Experience	0-5 Years	97	40
	6-10 Years	100	41
	11 Years and Over	47	19
	TOTAL	244	100
Education Level	Undergraduate	214	88
	Postgraduate	30	12
	TOTAL	244	100

As can be seen in Table 2, secondary school teachers (46%) participated in the research the most among the school types collected in three groups. This was followed by primary and pre-school (32%) teachers, and high school and special education (22%) teachers, respectively. Since there were participation from 22 different branches in total, the branches within the same field were grouped in order to carry out the analysis processes more efficiently, and it was seen that the class teachers who were not included in any group (23%) had the highest participation. This is followed respectively by verbal branches consisting of geography, history, etc., teachers (16%), technology branches consisting of information technologies and technology design teachers (14%), numeric branches consisting of mathematics, physics, biology, etc. teachers (14%), developmental branches consisting of guidance, special education teachers (12%), language branches consisting of English and Turkish teachers (12%), and the branches that require special talents consisting of physical education, music, visual arts etc. teachers. When the professional experience of the teachers is examined, it is seen that the highest participation is from the teachers with 6-10 years (41%) experience. This is followed by teachers with 0-5 years of experience (40%) and teachers with 11 years or more (19%) experience. While the majority of the participants consist of undergraduate (88%) graduate teachers, a partial portion consists of postgraduate teachers (12%).

Data Collection Tools

In the study; Two data collection tools were used, the first being the "Personal Information Form" and the other being the "Teacher EBA Awareness Scale". Personal Information Form is a 13-item data collection tool in which general information such as the province, branch, and seniority year of the teachers are filled. The Teacher EBA Awareness Scale is a scale developed by researchers as a 5-point Likert type, which consists of 56 items in total and includes the options "(1) Disagree", "(2) Partially Disagree", "(3) Undecided", "(4) Partially Agree", "(5) Agree".

In the development process of the Teacher EBA Awareness Scale; First of all, a literature review was conducted by an Information Technologies and Education (CEIT) Lecturer who is an expert in the field and an Information Technologies Teacher / CEIT Master's student, the skills under the "Help" section on the EBA web page were examined, and all the modules and functions in the EBA teacher section were analyzed and a scale item pool was created with 81 items under a total of 15 titles consisting of 14 modules and membership titles. Opinions were received from a Turkish Language and Literature teacher in order to ensure the linguistic validity of the created scale pool, and from four Information Technologies teachers and two academicians working in the field of CEIT in order to increase the content validity. Finally, the scale was piloted and construct validity (exploratory factor analysis) and reliability analyzes were applied with the IBM SPSS 22 package program.

The suitability of the data obtained as a result of the pilot application for factor analysis was examined by the Kaiser-Mayer-Olkin (KMO) coefficient and the Bartlett sphericity test. When the results were examined, it was seen that the KMO value was 0.958, and the Bartlett test was calculated as $\chi^2= 19541,629$, $sd=2278$, $p= .000$. According to these results, it was decided that the scale was suitable for factor analysis (Büyüköztürk, 2018). As a result of the factor analysis, items with factor loading values below 0.30 and items with similar load values in more than one factor ($K=25$) were removed from the measurement tool and the remaining 56 items of the measurement tool were analyzed again.

When the item load values from the outputs given as a result of the factor analysis and the "Total Explained Variance" table are examined; It was seen that the $K=56$ items included in the analysis were gathered under two factors with an eigenvalue greater than 2. The variance explained by these two factors regarding the scale is 64,401%. Accordingly, it was seen that these two factors together explained most of the variance of the scale. After factor rotation using the Varimax method, it was determined that the first factor consisted of 35 items and the second factor consisted of 21 items.

Table 3. Some information on the factors resulting from the analysis

Factor	Number of Article	Articles Related to EBA Modules	Articles' Load Value Range in Factor
Factor 1	35	My Page – Courses – Exams – Library – Lists – Studies – Reports – Groups – Portfolios – Files – Calendar	.533 - .805
Factor 2	21	Professional Development – Content Production – Question and Exam System	.593 - .848

As can be seen in Table 3, the load values of the articles in Factor 1 range from ,533 to ,805, while the load values of the articles in Factor 2 are between ,593 and ,848. When the EBA modules to which the articles in the first factor are related are examined, this factor is called "Social Sharing Awareness" because all of them contain awareness about social skills such as sharing and interacting with students. Since the EBA modules to which the articles in the second factor are related include professional development, content production, and awareness of teachers' professional development by producing, such as creating questions and exams, this factor is also called "Professional Development and Production Awareness".

The most frequently used method for reliability calculation in Likert-type measurement tools is the calculation of Cronbach's Alpha coefficient (Büyüköztürk, 2018). The reliability calculation results of the Teacher EBA Awareness Scale are given in Table 4.

Table 4. Reliability results regarding the sub-dimensions of the teacher EBA awareness scale

Factors	Number of Articles	Cronbach's Alpha Internal Consistency Coefficient (α)
Factor 1 – Social Sharing Awareness	35	.940
Factor 2 – Professional Development and Production Awareness	21	.937
Total	56	.946

While determining the reliability of a measurement tool, it is generally considered sufficient if the calculated reliability coefficient is .70 or higher (Büyüköztürk, 2018). As can be seen in Table 4, the reliability of the measurement tool used in the research was calculated very high both in terms of sub-dimensions and total value.

While determining the participants of the research; announcements were made on digital communication platforms (forum sites, e-mail, social Media communities, communication applications) that teachers frequently are, and teachers were determined on voluntary basis.

Data Analysis

The analysis of the data collected within the scope of the research was made using the IBM SPSS 22 statistical package program. The averages of the items under the two factors in the EBA Awareness Scale applied to the teachers participating in the research were taken and these scores were categorized. Tuncer (2005) formula was used to calculate the gap width while categorizing (4 ranges / 5 options = $4/5 = 0.80$). The levels were found as follows by adding 0.79 to each range, taking into account the integer value.

1.00 – 1.79: Very Low Awareness

1.80 – 2.59: Low Awareness

2.60 – 3.39: Moderately Aware

3.40 – 4.19: High Awareness

4.20 – 5.00: Very High Awareness

It was accepted that the data showed a normal distribution as the (KMO) and Barlett sphericity tests, which were applied to determine the suitability of the data for factor analysis, were significant (Büyüköztürk, 2018). In this case, in order to determine the findings related to the research problems, descriptive statistics, Independent Samples T-Test for pairwise comparisons, and one-way ANOVA techniques for multiple comparisons were used. In the interpretation of the results, the level of significance was accepted as $p=0.05$.

FINDINGS

Findings Regarding EBA Awareness Levels of Teachers:

The descriptive statistics regarding the EBA general awareness levels of teachers and the two factors of the Scale, Social Sharing Awareness and Professional Development and Production Awareness, are presented below.

Table 5.1. EBA awareness mean and standard deviation values of teachers

	\bar{X}	S
Social Sharing Awareness	3,41	1,03
Professional Development and Production Awareness	3,06	1,13
General Awareness	3,24	1,02

According to Table 5.1, the general awareness of the teachers participating in the research is "moderate" according to the EBA awareness mean and standard deviation values. While Social Sharing Awareness, which is the first of the two factors in the scale, was determined at "high" level, Professional Development and Production Awareness was found to be at "moderate" level.

Table 5.2. Distribution of teachers according to their EBA awareness levels

	Very Low		Low		Medium		High		Very High		TOTAL	
	N	%	N	%	N	%	N	%	N	%	N	%
Social Sharing Awareness	23	9,4	20	8,2	69	28,3	72	29,5	60	24,6	244	100
Professional Development and Production Awareness	36	14,8	42	17,2	76	31,1	47	19,3	43	17,6	244	100
General Awareness	26	10,7	29	11,9	78	32,0	66	27,0	45	18,4	244	100

When Table 5.2 is examined; According to the general awareness of EBA, it was found that teachers were at medium level with 78 participants (31.1%) and this was followed at high level with 66 participants (27%), very high with 45 participants (18.4%), low with 29 participants (11%) and a very low level with 26 (10.7%) participants. EBA Professional Development and Production Awareness of the teachers is in parallel with these statistics, while according to the Social Sharing Awareness, it is seen that the highest number of teachers is at a high level with 72 participants (29.5%). This was followed accordingly by 69 participants (28.3%) with a medium level, 60 participants with a very high level (24.6%), 23 participants with a very low level (9.4%), and 20 participants with a low level (8.2%).

Findings Regarding EBA Awareness of Teachers by Branch Variable:

In order to determine whether the EBA awareness of teachers differs according to their branches, the descriptive statistics and the findings of the one-way ANOVA test applied are presented below.

Table 6.1. Descriptive statistics for the branch variable of EBA Awareness of Teachers

	N	X	SS
Classroom Teaching	56	3,11	1,10
Technology Branches	35	3,77	,79
Verbal Branches	38	3,17	1,01
Numerical Branches	35	3,24	,90
Language Branches	28	3,46	,87
Branches Requiring Special Abilities	22	3,25	1,07
Developmental Branches	30	2,68	,99
Total	244	3,23	1,01

Table 6.2. ANOVA results regarding the branch variable of teacher EBA awareness

Variance Source	Sum of Squares	SD	Squares Avarage	F	P	Significant difference
Between groups	21.847	6	3,641	3,769	.001	Techn. B > Class T., Developmental B. Language B. > Developmental B.
In-group	228,959	237	,966			
Total	250,806	243				

In order to test whether there is a significant difference in the EBA awareness of 244 teachers working in different branches according to their branches, one-way analysis of variance was performed and it was observed that there was a significant difference between the average scores of the groups ($F(6-237) = 3.769, p < 0.05$). Tukey test was applied to find out between which groups the differences between the branches were. Accordingly, the teachers in the Technology Branches ($\bar{X} = 3.77$) were found to have more EBA awareness than the primary school teachers ($\bar{X} = 3.11$) and the teachers in the developmental branches ($\bar{X} = 2.68$), and the teachers in the language branches ($\bar{X} = 3.46$) than the teachers in the developmental branches ($\bar{X} = 2.68$). The effect size value of the dependent variable, which indicates the ratio of the variance explained by the independent variable, was found to be $\eta^2 = .087$ and showed that the branch variable had a moderate effect on teacher EBA awareness (Büyüköztürk, 2018).

Findings Regarding EBA Awareness of Teachers by School Type Variable:

In order to determine whether teachers' EBA awareness differs according to the types of schools they work in, descriptive statistics and the findings of the one-way ANOVA test applied are presented below.

Table 7.1. Descriptive statistics of teachers' EBA Awareness regarding school type variable

	N	\bar{X}	SS
Primary and Preschool	77	3,03	1,10
Secondary School	112	3,44	,87

High School and Special Education	55	3,11	1,08
Total	244	3,23	1,01

Table 7.2. ANOVA results of teachers' EBA awareness regarding to school type variable

Variance Source	Sum of Squares	SD	Squares Average	F	P	Significant difference
Between groups	8,818	2	4,409	4,391	.013	Secondary > Primary and preschool
In-group	241,988	241	1,004			
Total	250,806	243				

A one-way analysis of variance was performed to test whether there was a significant difference in the EBA awareness of 244 teachers participating in the study according to the type of school they worked in, and it was observed that there was a significant difference between the average scores of the groups ($F(2-241) = 4.391$, $p < 0.05$). Tukey test was applied in order to find out between which groups the differences are according to the type of school in eba awareness. According to this, it was seen that the teachers working in secondary schools ($\bar{X} = 3.44$) had more EBA awareness than the teachers working in primary and pre-school schools ($\bar{X} = 3.03$). The effect size value, which indicates the ratio of the variance explained by the independent variable, was found to be $\eta^2 = .035$ and showed that the school type variable had a moderate effect on teacher EBA awareness.

Findings Regarding the Effect of Technological Tools on EBA Awareness:

The results of the independent samples t-test applied to see the effect of the number of technological tools that teachers have on their EBA awareness are presented below.

Table 8. Teacher EB by the number of technological devices owned awareness t-Test Results

Tool number	N	\bar{X}	SS	sd	t	p
1 or 2	151	3,11	,98	242	-2,52	.012
3 or 4	93	3,44	1,03			

According to the independent sample t-test results in Table 8, it was observed that there was a statistically significant difference in the EBA awareness of teachers according to the number of technological tools they had [$t(242) = -2.52$, $p = .012$]. Accordingly, it can be said that teachers who have 3 or 4 technological tools ($\bar{X} = 3.44$) have more EBA awareness than teachers who have 1 or 2 tools ($\bar{X} = 3.11$). The effect size value of the dependent variable, which indicates the ratio of the variance explained by the independent variable, was found to be $\eta^2 = .026$ and showed that the variable of the number of technology owned had a moderate effect on teacher EBA awareness.

Findings on the Effect of Teachers' Technology Use Skills on EBA Awareness:

One of the questions in the Personal Information Form, which is one of the data collection tools used within the scope of the study, is "What level do you think your technology use skills are?" consisting of two options as "Low" and "High". is the question.

The results of the independent samples t-test applied to see the effect of teachers' technology use skills on their EBA awareness are presented below.

Table 9. T-test results of teacher EBA awareness according to technology use skills

	N	\bar{X}	SS	sd	t	p
Low	98	2,82	,96	242	-5,56	.000
High	146	3,51	,95			

According to the independent sample t-test results in Table 9, there was a statistically significant difference in teachers' EBA awareness according to their technology use skills [$t(242) = -5.56$, $p < .05$]. Accordingly, it can be said that teachers with high technology use skills ($\bar{X} = 3.51$) have more EBA awareness than teachers with low technology use skills ($\bar{X} = 2.82$). The effect size value of the dependent variable, which indicates the ratio of the variance explained by the independent variable, was found to be $\eta^2 = .114$ and showed that the technology use skill variable had a moderate effect on teacher EBA awareness.

Findings on the Relationship Between Having ITC Teachers in Schools and EBA Awareness of Teachers:

The results of the independent samples t-test, which was applied to see the effect of the presence of ITC teachers in the schools where the teachers participating in the research, on their EBA awareness are presented below.

Table 10. T-test results showing the EBA awareness of teachers according to the presence of ITC Teachers in schools

Is there ITC ?	N	\bar{X}	SS	sd	t	p
Yes	147	3,26	,96	242	,427	.670
No	97	3,20	1,08			

According to the independent sample t-test results in Table 10, it was seen that there was no statistically significant difference in the EBA awareness of the teachers according to the presence of ITC teachers in the schools where they work [$t(242) = 0.427, p = .670$].

Findings on EBA Awareness of Teachers According to Their EBA Education Status:

The results of the independent samples t-test applied to see the effect of the teachers' training on EBA on their EBA awareness are presented below.

Table 11. T-test results showing teachers' awareness according to their EBA education status

EBA Training	N	\bar{X}	SS	sd	t	p
Having	102	3,41	.95	242	2,260	.025
Not having	142	3,11	1,04			

According to the independent sample t-test results in Table 11; It was seen that there was a statistically significant difference in the EBA awareness of the teachers who received training on EBA ($\bar{X} = 3.41$) compared to those who did not receive EBA training ($\bar{X} = 3.11$) [$t(242) = 0.427, p = .670$]. The effect size value was found to be $\eta^2 = .021$ and it showed that teachers' EBA training had a low level of effect on their EBA awareness.

Findings Regarding the Effects of Teachers' Awareness of the Latest Updates in EBA on EBA Awareness:

EBA was finalized, and was added on the basis of the date of this research. The distribution of the answers given by the teachers to this question is as follows:

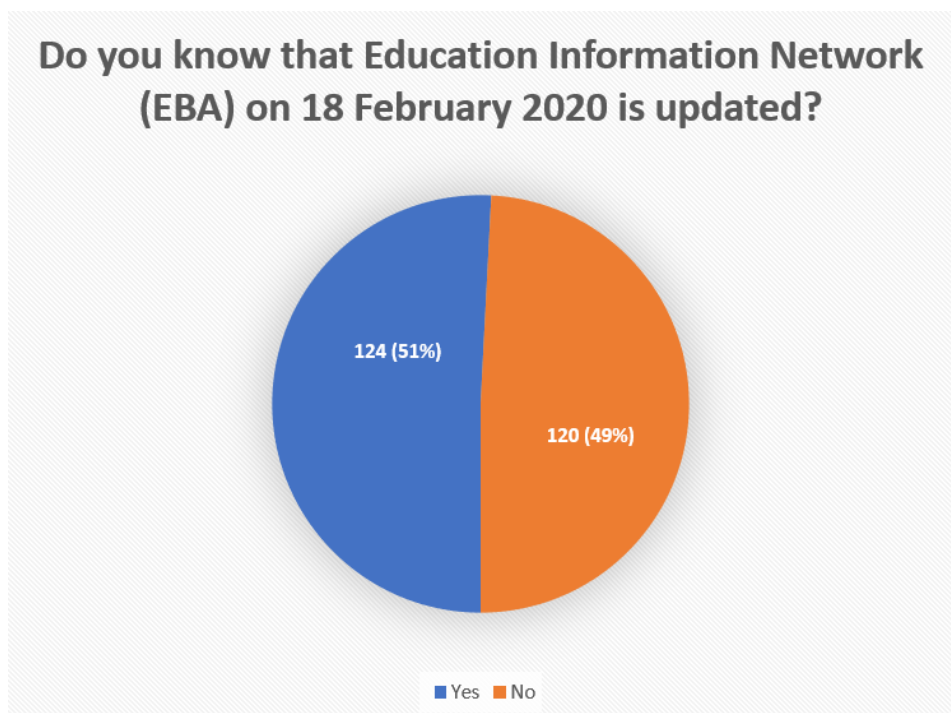


Figure 1. Distribution of teachers' awareness of the latest EBA update

In Figure 1, it is seen that 51% of the teachers are aware of the latest update in EBA, while 49% of them are unaware of this update. The results of the independent samples t-test applied to investigate the effect of this situation on EBA awareness are presented below:

Table 12. T-test results showing EBA awareness according to the situations of being informed of the EBA update

Being Aware of The Updates	N	\bar{X}	SS	sd	t	p
Yes	124	3,73	.81	242	8,977	.025
No	120	2,72	.95			

According to the independent sample t-test results in Table 12; it was seen that there was a statistically significant positive difference in EBA awareness of teachers ($\bar{X} = 3.73$) who were aware of the last update in EBA compared to those who were not aware of the update ($\bar{X} = 2.72$) [$t(242) = 8.977, p < .05$]. The effect size value was found to be $\eta^2 = .250$ and it showed that teachers' awareness of the latest update in EBA has a very high effect on their awareness of EBA (Büyüköztürk, 2018).

Findings on Examining EBA Awareness of Teachers According to the Number of EBA Modules They Use:

In order to determine whether teachers' EBA awareness differs according to the number of EBA modules they use, descriptive statistics and the findings of the one-way ANOVA test applied are presented below.

Table 13.1. Descriptive statistics on EBA awareness of teachers and the number of EBA Modules they use

	N	\bar{X}	SS
Never using	24	2,10	1,10
Only one module	38	2,75	,79
Only 2 modules	40	2,81	1,01
Only 3 modules	36	3,40	,90
Only 4 modules	40	3,67	,87
Only 5 modules	26	3,65	1,07
6 modules and above	40	3,93	,99
TOTAL	244	3,23	1,01

Table 13.2. ANOVA results regarding the correlation between teacher EBA awareness and number of modules they use

Variance Source	Sum of Squares	SD	Squares Average	F	P	Significant difference
Between groups	79,592	6	13,265	18,362	.000	+6 modules, only 5, only 4> none, only 1, only 2, only 3> none, only 1
In-group	171,215	23,7	.722			
Total	250,806	24,3				

In order to test whether there is a significant difference in the number of modules used by the teachers in their EBA awareness, one-way analysis of variance was performed and it was observed that there was a significant difference between the average scores of the groups ($F(6-237) = 18,362$, $p < 0.05$). The Games-Howell test was applied to find out between which groups the differences were. Accordingly, it is seen that EBA awareness of teachers using 6 modules or more ($\bar{X} = 3.93$), teachers using only 5 modules ($\bar{X} = 3.65$), and teachers using only 4 Modules ($\bar{X} = 3.67$) have found to be significantly higher than the EBA awareness of the teachers who have never used EBA ($\bar{X} = 2.10$), using only 1 module ($\bar{X} = 2.75$) and using only 2 modules ($\bar{X} = 2.81$). In addition, it was observed that teachers using only 3 Modules ($\bar{X} = 3.40$) had significantly more EBA awareness than teachers who never used EBA ($\bar{X} = 2.10$) and only used 1 module ($\bar{X} = 2.75$). Effect size value, which indicates the ratio of the variance explained by the independent variable to the dependent variable was found as $\eta^2=317$ and showed that the number of modules used had a very high effect on teacher EBA awareness.

Findings on the Relationship Between EBA Usage Frequency and Awareness of Teachers:

In order to determine whether the EBA awareness of teachers differs according to the frequency of EBA use, the descriptive statistics and the findings of the one-way ANOVA test applied are presented below.

Table 14.1. Descriptive statistics on teachers' EBA Awareness and EBA Usage Frequency

	N	\bar{X}	SS
None	27	2,27	1,15
Several Times a Year	38	2,76	,95
Several times in a term	55	3,15	,84
A Few Times A Month	47	3,52	,80
Several Times a Week	62	3,60	,82
Every Day	15	4,04	1,10
TOTAL	244	3,23	1,01

Table 14.2. ANOVA results regarding the frequency of EBA use of EBA awareness of teachers

Variance Source	Sum of Squares	SD	Squares Average	F	P	Significant difference
Between groups	55,718	5	11,144	13,595	.000	Every Day> none, several times a year, several times in a term, several times a week, several times a month> no several times,year several times aPeriod> no
In-group	195,088	238	,820			
Total	250,806	243				

In order to test whether there is a significant difference in the EBA awareness of the teachers according to the frequency of EBA use, one-way analysis of variance was performed and it was observed that there was a significant difference between the mean scores of the groups ($F(5-238) = 13.595$, $p < 0.05$). Tukey test was applied to find out between which groups the differences were. Accordingly, teachers who use EBA every day are found to have significantly more EBA awareness than ($\bar{X} = 4.04$); teachers who never used EBA ($\bar{X} = 2.27$), used it a few times a year ($\bar{X} = 2.76$), and used it a few times a term ($\bar{X} = 3.15$). In addition, the EBA

awareness of teachers who used EBA a few times a week ($\bar{X} = 3.60$) and a few times a month ($\bar{X} = 3.52$), were found to be significantly higher than the teachers never used EBA ($\bar{X} = 2.27$) and a few times a year ($\bar{X} = 2,76$). Finally, it was found that the EBA awareness of teachers who used EBA a few times during the period ($\bar{X} = 3.15$) was significantly higher than those who never used EBA ($\bar{X} = 2.27$), and the effect size value indicating the ratio of the variance explained by the independent variable of the dependent variable was calculated as $\eta^2=222$ and seen that the frequency of EBA usage has a high effect on teacher awareness.

Findings Regarding the Modules Used by Teachers with EBA Experience:

The distribution of modules used by teachers with EBA experience participating in the research is presented below.

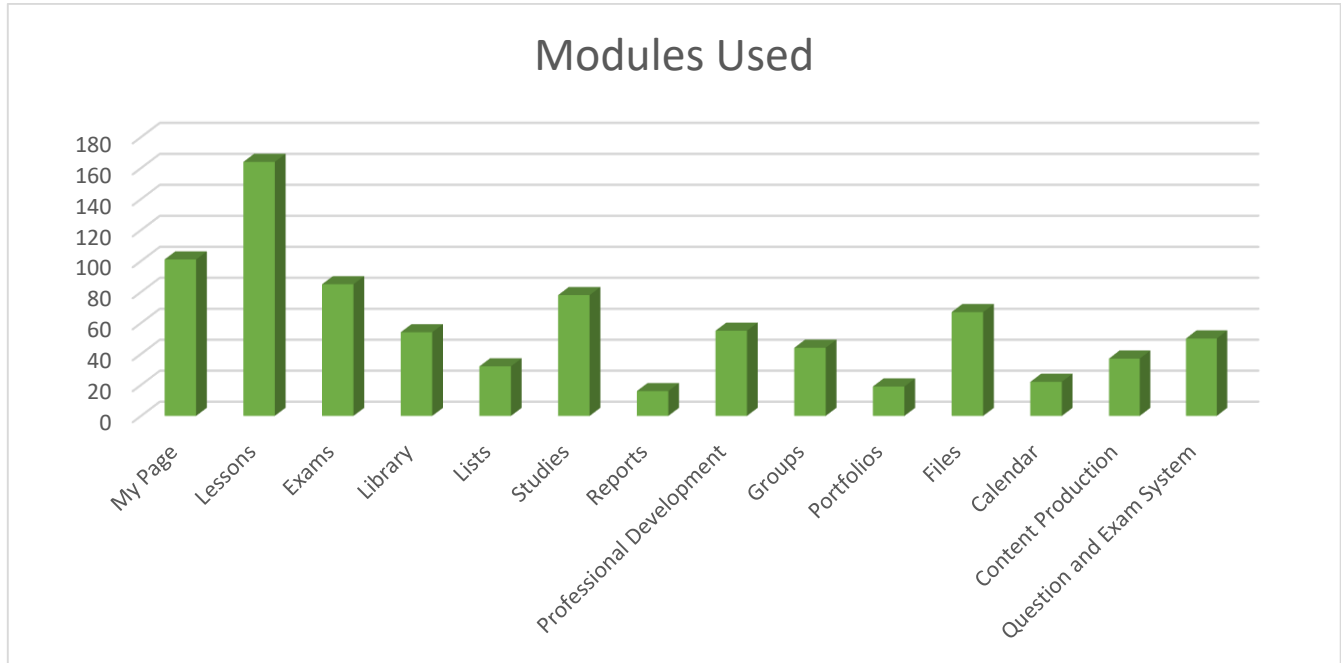


Figure 2. Usage distribution of EBA modules

As seen in Figure 2, the module most used by teachers in EBA is "Courses". It is seen that the two modules closest to this are the "My Page" and "Works" fields, respectively. The least used module is the "Reports" area. It is also noteworthy that the modules that make up the Social Sharing Awareness are used more than the Professional Development and Production Awareness modules. This situation shows parallelism with the awareness averages of the factors, which is the first finding of the study (see Table 4.1.).

DISCUSSION, CONCLUSION AND RECOMMENDATIONS

With this research, it was aimed to reveal the awareness levels of teachers about EBA and to examine them in terms of various variables, with an emphasis on "awareness", which is considered to have a significant effect on teachers' use of EBA. As a result of the descriptive analysis and comparisons made, teachers' awareness of EBA was found to be at "moderate" level and these awarenesses were found to show meaningful differences related to the branch, school type, number of technological tools owned, technology usage skills, education about EBA, being aware of the update made in EBA, EBA modules used and the frequency of EBA use but determined not to be affected from the variable of ITC teacher to be present at school.

The determination of teachers' EBA awareness as medium ($\bar{X}=3.24$) shows that these awarenesses are not yet at the desired and expected level. In a similar study, Sözcü and Karataş (2014) stated that teachers' awareness of the FATİH Project is weak. In other studies in the literature; Güvendi (2014) emphasizes that EBA is not introduced to teachers, Tutar (2015) suggests that teachers do not have knowledge about EBA, that it should be promoted and encouraged in schools, Alabay (2015) states that EBA-related training is needed and necessary promotions should be made to increase awareness about EBA. Kurtdele Fidan et al. (2016) say that teachers do not have enough knowledge about EBA, and Özgümüş (2018) state that EBA can be promoted through public service announcements or different broadcasting methods. The fact that even the teachers who are expected to guide students about the use of the EBA system do not have enough awareness about EBA reveals the necessity of implementing a new promotional model.

Considering the two sub-dimensions of the scale; It has been observed that the average of "Professional Development and Production Awareness", which includes Professional Development, Content Production and Question and Exam System modules, is lower and at "moderate" level compared to "Social Sharing Awareness". When the modules used by the teachers are examined, it is seen that the same modules are used less than the others. Aksoy (2017), Güvendi (2014) and Tutar (2015) stated that teachers

use EBA in order to benefit from existing content rather than producing content, Karaçorlu and Aıcı (2019) teachers do not use content production system, Kurtdebe Fidan (2016) stated that they did not develop relevant content related to their own fields. Pekdemir Gerede (2019) concluded that the videos uploaded by the teachers in the EBA Content module are not suitable for multimedia criteria. According to Tanrikulu (2017), although simple interface programs were added to EBA to prepare content, the purpose could not be achieved in terms of content. Ayan (2018), on the other hand, found in his thesis study that teachers do not sufficiently attend vocational courses in EBA. From all these, it can be deduced that teachers do not have enough awareness to participate in vocational courses and develop content-question-exams and that there is a need to take precautions in this context.

In the previous studies, Kuyubaşioğlu and Kılıç (2019) found that the level of EBA use did not differ in terms of branch variable, contrary to this study, in their study that aimed to determine the level of EBA use of secondary school teachers and to examine them in terms of various variables. In a similar study, Alabay (2015) determined that there is a significant difference between branches in terms of usage level. In this study, when the EBA awareness on the basis of the branch variable was examined, it was seen that the teachers in the Technology Branches had more EBA awareness than the classroom teachers and the teachers in the developmental branches (Special Education - Guidance - Preschool), and the teachers in the language branches had more EBA awareness than the teachers in the developmental branches. It is thought that this situation is due to the difference in technological literacy levels among teachers. It is thought that the high technological literacy of technological branches such as information technology teachers, together with the training they receive before service, has a positive effect on EBA awareness. In addition, it can be evaluated that this situation arises from the fact that teachers in developmental branches give more importance to face-to-face interaction and concrete materials.

Considering the EBA awareness of the teachers according to the school type variable, it was seen that the teachers working in secondary schools had more EBA awareness than the teachers working in primary and pre-school schools. In a similar study, Güvendi (2014) concluded that primary and secondary school teachers use EBA more than high school teachers. The reasons for this situation can be examined with further research.

When the EBA awareness of teachers is examined according to the number of technological tools, which is another variable of the research; As the number of technological tools owned increases, it is seen that EBA awareness also increases. Whether the application of tablet distribution to some of the teachers with the FATİH project of the Ministry of National Education supports this situation may be the subject of research.

Considering the relationship between teachers' technology use skills and EBA awareness, it is seen that teachers with high technology use skills have more EBA awareness. In this context, it may be important to increase the technological literacy of teachers before or in-service to increase EBA awareness.

In the schools practicing this project which was started by the Ministry of National Education with the FATİH project, there are ITC teachers who were assigned by the provincial/district National Education Directorates. One of the main duties of these teachers is to introduce and inform the teachers and students in the school about the use of EBA (Tekirdağ İl MEM, 2017). One of the results of this research is the finding that the presence of ITC teachers in schools does not have a significant effect on EBA awareness. In line with this finding, it can be suggested to review the effectiveness of teachers working as ICT in schools.

Many previous studies have revealed that: promotional and training activities significantly increase the rates of EBA usage (Alabay, 2015; Coşkunserçe and Becit İştürk, 2019; Güvendi, 2014; Kuyubaşioğlu and Kılıç, 2019). In Aksoy (2017)'s research, teachers stated that adequate in-service training about EBA was not provided as the reason why other teachers could not use EBA competently. Becit İştürk and Turan (2018) stated that teachers' lack of training on EBA or that they do not find the training they receive sufficient affects their use of EBA negatively. EBA-related education status of teachers, which is thought to be an important variable in this study, positively affects their awareness of EBA. However, it is very thought-provoking that almost half of the teachers participating in the research (N = 102) have not received any training on EBA. In this case, as stated in previous studies (Alabay, 2015; Karaçorlu & Aıcı, 2019; Pekdemir Gerede, 2019), the number of in-service training for teachers on EBA can be increased and more teachers can use EBA. In addition, in line with the finding that was the subject of the previous discussion; presentations for other teachers by BTR teachers during the beginning and end of the year professional development programs of teachers, etc. By organizing activities, both the use of EBA and the effectiveness of BTR teachers can be increased.

Within the scope of the research, the teachers were asked whether they were aware of the revision on February 18, 2020, which was the last update of the EBA as of the date of implementation. It is noteworthy that 49% (N = 120) of the teachers were not aware of this revision. Similarly, in the study of Saklan and Ünal (2019), the promotion of EBA was found insufficient. EBA Alabay (2015) found in his study that teachers who have knowledge about the FATİH project use EBA more than those who do not. In this study, the relational analysis showed a similar situation. Being aware of the updates had a high positive effect on teachers' EBA awareness.

When EBA awareness of teachers is examined according to the variables of the number of modules used and the frequency of EBA use, it can be said that the number of modules and their frequency of use have a positive effect on their EBA awareness. It can be said that teachers who use a large number of modules and teachers who use EBA more frequently have more EBA

awareness. It would not be wrong to express this in reverse: As EBA awareness increases, teachers use EBA more frequently and more modules. If it is aimed to increase the use of this platform, teachers' awareness of EBA should be increased in line with this finding.

As a result, the findings obtained in this study revealed the following: Teachers' awareness of EBA is at "moderate" level and these awarenesses are; It differs significantly according to the variables of branch, school type, number of technological tools owned, technology usage skills, EBA education, being aware of the update made in EBA, the number of EBA modules used and the frequency of EBA use, but is not significantly affected by the variable of the presence of ITC teachers in schools. In this regard, the following recommendations are made to the relevant authorities and researchers in the field:

- Since it is important to be aware of the platform when using EBA, taking measures to announce and share new applications and features published on the platform to teachers can increase awareness. In this sense, it can be suggested to use more effective methods for promotion.
- Providing technical support to teachers regarding EBA, especially during the entry process, can increase both awareness and level of use.
- The modules that teachers prefer less to use in EBA can be determined through the statistics in the system and measures can be taken for this.
- Considering the in-service training provided, courses focusing on "practice" can be organized to increase the use of EBA, as stated in previous studies.
- Various events (competitions, awards, etc.) can be organized to draw attention to the use of EBA.
- Considering that one of the findings obtained in the study is the low level of teacher use of content creation modules in EBA; a standard content preparation guide can be created for teachers. In addition, considering that the presence of an ITC teacher, which is another finding, does not have a significant effect on EBA awareness; It can be ensured that both the level of use of these modules and the effectiveness of ITC teachers can be increased with applied content production activities for other teachers by ITC teachers during the beginning and end of the year professional development programs of teachers.
- Considering both the effect of technology use skills on EBA awareness and the fact that content production modules are not used frequently by teachers, according to the study; A general awareness of technology usage can be created from the pre-service period by focusing more on the design, production and use of e-content in the instructional technologies and material design courses of the teachers during their undergraduate education.
- By making the "Technology Integration in Education" course compulsory in all faculties and departments that train teachers, it can be ensured that all teacher candidates are technology literate individuals and they are trained knowing how to integrate technological elements into education and training processes.
- Similarly, more reliable and valid studies can be conducted with a wider participant base and by considering different variables.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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Statements of publication ethics

We hereby declare that the study has not unethical issues and that research and publication ethics have been observed carefully.

Researchers' contribution rate

The study was conducted and reported with equal collaboration of the researchers.

Ethics Committee Approval Information

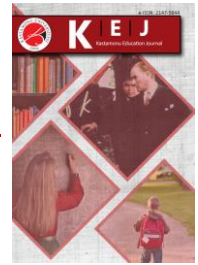
Ethics Committee Approval for the research was obtained from Van Yüzüncü Yıl University Social and Human Sciences Ethics Committee with its official letter dated 09/06/2020 and numbered E.36805.

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| Research Article / Araştırma Makalesi |

“I’ve Decided to Become an English Teacher”: Pre-service EFL Teachers’ Reasons for Choosing Teaching as a Career

“İngilizce Öğretmeni Olmaya Karar Verdim”: İngilizce Öğretmeni Adaylarının Öğretmenlik Mesleğini Seçme Nedenleri

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Keywords

- 1.Pre-service EFL teachers
- 2.Career motivations
- 3.Reasons for choosing to teach
- 4.English language teaching
- 5.Academic achievement

Anahtar Kelimeler

1. İngilizce öğretmeni adayları
2. Kariyer motivasyonları
3. Öğretmenlik mesleğini seçme nedenleri
4. İngilizce öğretmenliği
5. Akademik başarı

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Abstract

Purpose: The present study aimed to probe pre-service EFL teachers’ reasons for choosing teaching as a field of study and future career in the under-researched context of Turkey. The variance in their career motivations in terms of grade level was also examined in the study. Besides, the study aimed to explore whether any of the factors influencing their career motivations predict their academic achievement.

Design/Methodology/Approach: The Factors Influencing Teaching Choice Scale (Watt & Richardson, 2006) was administered to 155 pre-service EFL teachers enrolled in the English language teaching (ELT) department of a state university in Turkey. The emergent data were first descriptively analyzed to find out the career motivations of the participants. Multivariate analysis of variance (MANOVA) was also performed to explore whether grade level significantly affects pre-service EFL teachers’ career motivations. Lastly, a standard multiple regression analysis was used to investigate whether any causal relationships exist between the participants’ career motivations and their achievement as represented by their GPA.

Findings: The results of descriptive statistics demonstrated that the participants had moderately high level of career motivations. Grade level did not have any significant impact on their career motivations. The findings of the multiple regression analysis demonstrated that, of the factors affecting teaching choice, only *time for family*, *desire to work with children*, *intrinsic career values*, and *desire to make social contribution* emerged as the predictors of GPA, explaining 47% of the variance in the pre-service EFL teachers’ academic achievement.

Conclusion: In the process of teacher education, it is vital to acknowledge and incorporate the multiple motives of career choice that EFL student teachers hold. Organizing teacher education programs drawing on multiple motives might contribute significantly to completion of teacher education and teacher retention in future profession.

Öz

Çalışmanın amacı: Bu çalışmanın amacı, İngilizce öğretmeni adaylarının öğretmenlik mesleğini seçme nedenlerini ortaya çıkarmaktır. Çalışmada İngilizce öğretmen adaylarının üniversitedeki sınıf düzeylerinin kariyer motivasyonlarında etkili olup olmadığı da incelenmektedir. Ek olarak, bu çalışma kariyer motivasyonlarının akademik başarı üzerindeki etkisini ortaya çıkarmayı amaçlamaktadır.

Materyal ve Yöntem: Bir devlet üniversitesinin İngilizce Öğretmenliği programında öğrenim görmekte olan 155 İngilizce öğretmeni adayına demografik sorulardan ve Öğretmenlik Mesleğini Seçmeyi Etkileyen Faktörler (FIT-Choice) Ölçeğinden (Watt ve Richardson, 2006) oluşan bir anket uygulanmıştır. Katılımcıların kariyer motivasyonlarını ortaya çıkarmak için anketten elde edilen veriler ilk olarak betimsel olarak analiz edilmiştir. Sınıf düzeyinin kariyer motivasyonu üzerinde etkisi olup olmadığını belirlemek için çoklu varyans analizi (MANOVA) yapılmıştır. Son olarak, öğretmen adaylarının kariyer motivasyonlarının akademik başarıları üzerindeki etkisini ortaya koymak amacıyla standart çoklu regresyon analizi kullanılmıştır.

Bulgular: Betimsel analiz sonuçları, katılımcıların orta derecede yüksek kariyer motivasyonuna sahip olduklarını göstermiştir. Sınıf düzeyinin kariyer motivasyonları üzerinde anlamlı bir etkisi görülmemiştir. Çoklu regresyon analizi sonuçları ise öğretmenlik mesleğini seçmede etkili olan faktörlerden yalnızca *aileye ayrılan zaman*, *çocuklar ile çalışma arzusu*, *içsel kariyer değerleri* ve *sosyal katkıda bulunma arzusu* faktörlerinin İngilizce öğretmen adaylarının akademik başarılarındaki varyansın %47’sini açıklayarak akademik başarının yordayıcıları olduğunu göstermiştir.

Sonuç: İngilizce öğretmeni adaylarının bu mesleği seçmelerinde çok sayıda birbirinden farklı güdünün etkili olduğu görülmektedir. Öğretmen yetiştirme programlarının bu durumun göz önünde bulundurularak düzenlenmesi, öğretmen adaylarının programı tamamlayabilmelerine ve ileride de uzun süre bu meslekte kalmalarına önemli ölçüde katkı sağlayacaktır.

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INTRODUCTION

It is widely acknowledged that teachers exert a powerful influence on the improvement of societies and development of future generations (Richardson & Watt, 2006). Thus, it is vital to employ qualified and committed teachers in the profession. In addition to personal and professional characteristics of good teachers, understanding their motivation is of the utmost importance as teachers are considered to be the most significant factor affecting the level of learner motivation (Dörnyei, 2001). As stated by Dörnyei (2001), "If a teacher is motivated to teach, there is a good chance that his or her students will be motivated to learn" (p. 156). While amotivation of teachers has a negative effect on learners' motivation, enthusiasm on the part of the teacher exerts a positive influence on learners' motivation in classroom settings (Igawa, 2009). Thus, it is essential for teachers to possess a great degree of job satisfaction and motivation in order to create a classroom atmosphere that is conducive to the development of the learner (Griffin, 2010).

Since the 1960s, much research (e.g. Brookhart & Freeman, 1992; Hennessy & Lynch, 2017; König & Rothland, 2012; Lestari & Arfiandhani, 2019; Shih, 2016; Watt & Richardson, 2008) has been devoted to probing teachers' motivations so as to find out the reasons behind individuals' choices to become a teacher. This increasing interest in investigating who chooses to teach and why they do so has been fueled by shortages of teachers worldwide and great levels of teacher attrition (OECD, 2009). All around the world, it has become more and more challenging to stimulate young individuals to choose the teaching profession and retaining them in the job (Watt & Richardson, 2007) although the case is not the same in Turkey in which a surplus of nearly 700000 teachers has been reported (Türk Eğitim Sen, 2020). Therefore, it is crystal clear that the extent of teacher shortages and teaching career motivations tend to vary from country to country (Zumwalt & Craig, 2008).

In teacher education literature, the reasons for choosing teaching as a career have been categorized into three groups: intrinsic, extrinsic, and altruistic motives (Moran, Kilpatrick, Abbot, Dallat, & McClune, 2001; Kyriacou, Hultgren, & Stephens, 1999). *Intrinsic* motives involve inherent aspects concerning the love of teaching, a desire to use their expertise, and a desire to work with children whereas extrinsic motives encompass such facets of the occupation that are not inherent in the job itself as salary, social status, and long holidays. As for altruistic motives, they are concerned with perceiving teaching as a valuable profession to contribute to the growth of people and the improvement of the society (Chong & Low, 2009; Erten, 2014; Moran et al., 2001).

In addition to this tripartite framework (Moran et al., 2001; Kyriacou et al., 1999), some theories concerning career choice have also been proposed. Self-concept theory developed by Super (1953), for instance, suggests that the self-perception of an individual exerts a strong impact on career choice. Another taxonomy of teaching motivation is the FIT-Choice model (Watt & Richardson, 2007), which draws upon the expectancy-value theory. The theory accounts for how expectancies for success and values have a direct or indirect effect on a variety of task-related choices including career choice, performance, effort, and persistence (Wigfield & Eccles, 2000).

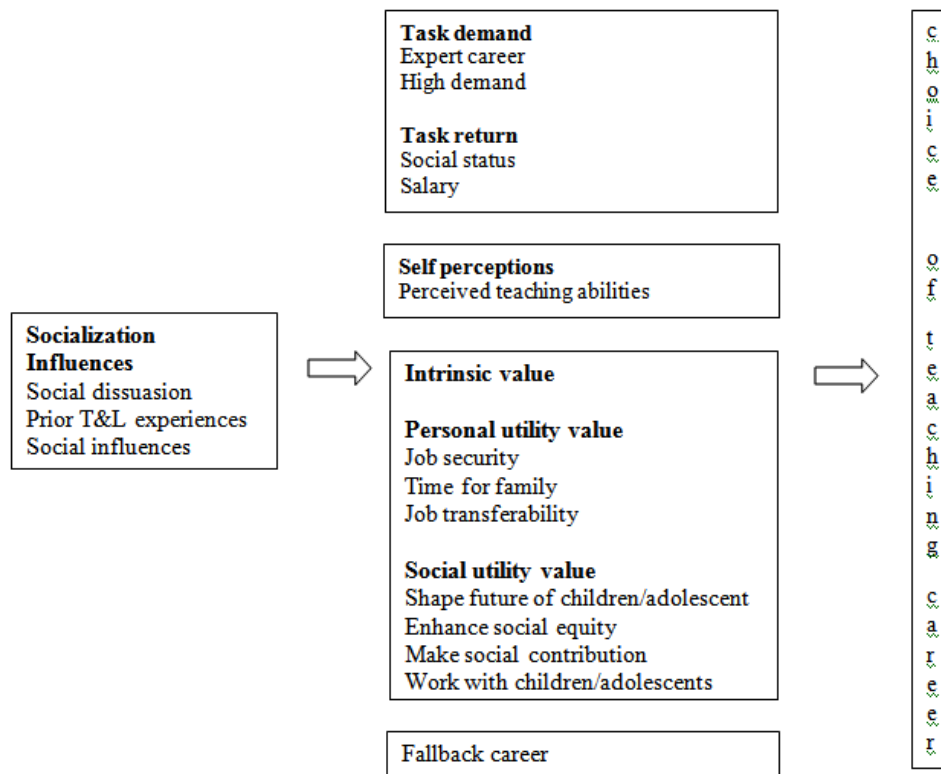


Figure 1. The Fit-Choice model (Watt & Richardson, 2007, p.176)

As can be seen in Figure 1, even though different terms are used in the FIT-Choice framework, they represent intrinsic, extrinsic and altruistic motives which are also stated in the tripartite framework (Watt & Richardson, 2007). Ability and intrinsic career value are similar to satisfaction gained from the pleasure of teaching. Factors in the social utility value section correspond to altruism since they put emphasis on making a difference and assisting other people to improve. In a similar way, factors in the personal utility value are in agreement with extrinsic motives. However, the FIT-Choice framework seems to deal with teaching motivations in a more detailed way compared to the tripartite framework, as it covers broader categories, identifies further key factors which have not mentioned before, and considers the impacts of prior teaching and learning experiences, and social influences on an individual's career choice (Low, Ng, Hui, & Cai, 2017).

Much research has been conducted to scrutinize pre-service teachers' motives for choosing teaching profession across subject disciplines and in a variety of contexts, e.g. North America (Kyriacou & Benmansour, 1999; Sinclair, 2008), Australia (Richardson & Watt, 2006; Watt & Richardson, 2007), the Netherlands (Bruinsma & Jansen, 2010), Germany (Hennessy & Lynch, 2017; König & Rothland, 2012; Rothland, 2014), Turkey (Akar, 2012; Damar, 2018; Erten, 2014; Kılınc, Watt, & Richardson, 2012; Topkaya & Uztosun, 2012), Indonesia (Lestari & Arfiandhani, 2019), Taiwan (Shih, 2016; Wang, 2004), and Finland (Goller, Ursin, Vähäsantanen, Festner, & Harteis, 2019). From the tripartite model perspective, previous studies have generally indicated that intrinsic motivations tend to dominate (Igawa, 2009; Kassabgy, Boraie, & Schmidt, 2001; König & Rothland, 2012; Pizarro & Laborda, 2017; Saban, 2003; Topkaya & Uztosun, 2012). As Gagne and Deci (2005) claims, pre-service teachers who have intrinsic motivations seem to be more involved in their jobs, demonstrate greater interest and enthusiasm in their work and perform their tasks more effectively. Altruistic reasons have also been commonly reported among student teachers in most cultures (Spear, Gould, & Lee, 2000; Saban, 2003; Balyer & Özcan, K., 2014). It is suggested that teachers who start their career with high levels of intrinsic and altruistic motivation are more likely to be committed to their job (Bakar, Mohamed, Suhid, & Hamzah, 2014) whereas a high level of extrinsic motivation may result in negatively influencing prospective teachers' long-term commitment to teaching profession (Yong, 1995).

From the FIT-Choice perspective, earlier research (e.g. Kılınc et al., 2012; Lin, Shi, Wang, Zhang, & Hui, 2012; Rothland, 2014) has revealed that social utility value, which can be regarded as altruistic motivation, is the most significant factor affecting teaching choice. Socialization influences have also been found to be among the factors influencing pre-service teachers' career choices (Andrews & Hatch, 2002; Lin et al., 2012). Perceived teaching ability has been reported as another reason for selecting a teaching profession (Fokkens-Bruisma & Carrinus, 2012; Watt & Richardson, 2007). In line with the findings gained from the global literature, research results of the studies carried out in Turkey (e.g. Balyer & Özcan, 2014; Topkaya & Uztosun, 2012) have shown that the altruistic motive of social utility value and intrinsic reasons dominate as the influential factors for choosing teaching profession. Besides, the extrinsic motive of job security has been reported as a key factor influencing Turkish student teachers' teaching choices in several research studies (e.g. Gürbüz & Sülün, 2004; Kılınc et al., 2012; Saban, 2003).

When the related literature within the field of English Language Teaching has been examined, it is seen that the issue of choosing teaching as a career has not attracted the attention of researchers in Turkey so far, with only a few exceptions (Damar, 2018; Erten, 2014; Topkaya & Uztosun, 2012). Topkaya and Uztosun (2012) suggested that social utility values, intrinsic values, and perceived teaching abilities are the main career motivations among pre-service EFL teachers. They also reported no significant difference between freshmen and seniors' career motivations. The study of Erten (2014) revealed that student teachers are generally intrinsically motivated rather than being extrinsically motivated, with altruistic reasons being fewer than other kinds of reasons. In another study (Damar, 2018), prior learning experiences and social utility values were reported as the major motivation factors for pre-service EFL teachers. Given that those socio-cultural factors have a key role in teaching motivations (Goller et al., 2019), more investigations are needed to further our understanding of the reasons underlying Turkish student teachers' desire to become an English teacher. Understanding their motives to become EFL teachers may help gain insights on motivating elements within teacher education programs. These insights, in turn, are expected to enable teacher education policy makers and practitioners to maintain and improve these elements. With these considerations in mind, the main purpose of the present study, which addresses an evident gap in the literature regarding career motivations of EFL student teachers, is to find out the reasons behind pre-service Turkish EFL teachers' choices of teaching profession. The study also aims to investigate whether grade level affects pre-service EFL teachers' career motivations. The study further aims to delve into the interactions between EFL student teachers' academic achievement and their career motivations. Depending on these concerns, the study has the following research questions:

1. What are the motivational factors that influence pre-service EFL teachers' choice of teaching as a career?
2. Does grade level significantly affect pre-service EFL teachers' career motivations?
3. Is it possible to predict pre-service EFL teachers' academic achievement by means of their career motivations? If so, what are the best predictors?

METHOD

Setting and Participants

The quantitative research design, which is defined as "data collection procedures that result primarily in numerical data which is then analyzed primarily by statistical methods" (Dörnyei, 2007, p. 24), was used in this study as it makes it easier for the researcher to generalize findings and arrive at conclusions about a phenomenon (Johnson & Christensen, 2008). The study employed a convenience sample of 155 pre-service EFL teachers majoring in English Language Teaching at a state university in Turkey. The participants had a mean age of 20.87 (SD = 2.71, minimum = 18; maximum = 42). 103 (66.5%) of them were female while 52 (33.5%) of them were male. Of the participants, 45 (29%) were first-year learners, 40 (25.8%) were second-year learners, 40 (25.8%) were third-year learners, and 30 (19.4%) were fourth-year learners.

Instruments

A two-part questionnaire was used to collect the data. The first part consisted of some demographic questions about the participants' age, gender, and grade. The second part included an adapted version of Watt and Richardson's (2007) Factors Influencing Teaching Choice (FIT-Choice) Scale. As it was not specifically designed to find out the career motivations of EFL teachers, the terms "language" and "language teacher" were added to the items wherever suitable.

The 61-item scale with a 7-point Likert type was composed of three sections developed to elicit data about teaching motivations (*Influential Factors*), perceptions about the profession (*Beliefs about Teaching*) and career choice satisfaction (*Your Decision to Become a Teacher*) (Watt and Richardson, 2007). The FIT-Choice Scale, which was developed and empirically validated by Watt and Richardson in a series of studies conducted in Australia (Richardson & Watt, 2006; Watt & Richardson, 2007, 2008), indicated high internal consistency, with reliability coefficients ranging from .90 to .97 (α). In this study, the internal consistency values of each section were found as the following: Influential Factors (40 items, $\alpha=.95$), Beliefs about Teaching (15 items, $\alpha=.94$) and Your Decision to Become a Teacher (6 items, $\alpha=.92$). In the Turkish context, the scale was also reported to show high construct validity according to fit indices yielded by confirmatory factor analyses (Kılınc et al., 2012). The students' grade point averages (GPAs) were also obtained through a self-report question in the questionnaire.

Procedures for Data Collection and Analysis

Before collecting data, permission was gained from Balıkesir University Ethics Committee (Document number: 19928322-302.08.01-E.34888 Date: 07/09/2020). The data were collected in the fall term of the 2020-2021 academic year through Google Forms application. The participants chose answers from a 7-point Likert scale varying from "not at all important" to "extremely important". The data analysis was carried out using SPSS, version 21. Descriptive statistics were computed to find an answer to

the first research question. Multivariate analyses of variance (MANOVA) were performed to explore whether grade level significantly affects pre-service EFL teachers' career motivations.

The researcher used a standard multiple regression analysis to investigate if there is any causal relationship between the student teachers' career motivations and their academic achievement (i.e. GPA). Effects of 18 factors were checked for their predictive property of academic achievement. In this study with 18 independent variables, a minimum 194 participants would be sufficient to meet the required number of participants (Pallant, 2010). However, the sample size ($n= 155$) was not perfectly adequate for regression analysis. Therefore, rather than the normal R Square value, the adjusted R square value was taken into consideration in the study in order to obtain a better estimate of the true population.

RESULTS AND DISCUSSION

What are the Motivational Factors that Influence Pre-service EFL Teachers' Choice of Teaching as a Career?

To explore career motivations of the participants, descriptive statistics were employed. Means and standard deviations were calculated. The data analysis demonstrated that the student teachers had moderately high level of career motivations ($M = 4.63$, $SD = 1.50$). It can be seen from the mean values for each item in Table 1 that nine factors were rated above 5 on a 7-point Likert scale, including *desire to shape future of children/adolescent* ($M = 5.83$, $SD = 1.29$), *expert career* ($M = 5.75$, $SD = 1.26$), *desire to make social contribution* ($M = 5.63$, $SD = 1.34$), *intrinsic career values* ($M = 5.43$, $SD = 1.68$), *satisfaction with choice* ($M = 5.37$, $SD = 1.64$), *prior teaching and learning experiences* ($M = 5.30$, $SD = 1.63$), *high demand* ($M = 5.25$, $SD = 1.39$), *desire to work with children* ($M = 5.07$, $SD = 1.74$), and *ability of teaching* ($M = 5.05$, $SD = 1.50$), indicating that these factors were perceived as important influences on the participants' decision of becoming a teacher.

Table 1. Mean values for factors affecting teaching choice

Career Motivations	Mean	SD
Shape future of children/adolescent	5.83	1.29
Expert career	5.75	1.26
Make social contribution	5.63	1.34
Intrinsic career values	5.43	1.68
Satisfaction with choice	5.37	1.64
Prior teaching and learning experiences	5.30	1.63
High demand	5.25	1.39
Work with children	5.07	1.74
Ability of teaching	5.05	1.50
Time for family	4.90	1.61
Job security	4.90	1.58
Enhance social equity	4.83	1.55
Job transferability	4.81	1.72
Social influence	4.61	1.95
Social status	4.55	1.61
Social dissuasion	3.80	1.92
Salary	3.20	1.60
Fallback career	3.03	1.96

Six other factors, such as *time for family* ($M = 4.90$, $SD = 1.61$), *job security* ($M = 4.90$, $SD = 1.58$), *desire to enhance social equity* ($M = 4.83$, $SD = 1.55$), *job transferability* ($M = 4.81$, $SD = 1.72$), *social influence* ($M = 4.61$, $SD = 1.95$), and *social status* ($M = 4.55$, $SD = 1.61$) were rated above four but below five, showing that they were considered as having relatively less important influences on preference for teaching profession. The least influential factor that has an impact on their career choice was *choosing teaching as a fallback career* ($M = 3.03$, $SD = 1.96$), which was followed by *salary* ($M = 3.20$, $SD = 1.60$) and *social dissuasion* ($M = 3.80$, $SD = 1.92$). In brief, while *desire to shape the future of children/adolescents* was the highest rated factor affecting career choice, the lowest rated one was *choosing teaching as a fallback career*.

Does Grade Level Significantly Affect Pre-service EFL Teachers' Career Motivations?

A one-way between-groups multivariate analysis of variance (one-way MANOVA) was performed to scrutinize if grade level significantly affected pre-service EFL teachers' career motivations. No violation of normality assumption was detected. Before presenting the findings emerged from one-way MANOVA, it is meaningful to provide the results of the descriptive statistics (see further Table 2) which portray the pre-service EFL teachers' career motivations in terms of grade level.

Table 2. The results of the descriptive statistics (MANOVA)

Variable	Motivations for teaching			Perceptions about the profession		Career choice satisfaction	
	N	M	SD	M	SD	M	SD
Grade							
1	45	196.37	37.24	69.73	10.94	27.28	7.21
2	40	197.17	35.29	73.05	10.37	27.40	7.29
3	40	199.87	31.29	72.97	13.40	27.62	6.97
4	30	205.03	27.84	75.16	9.96	28.03	4.27

As it is illustrated in Table 3, there was no statistically significant difference among four grade levels on the combined dependent variables, $F(9,362) = .572$, $p = .820$; Wilks' Lambda = .966; partial eta squared = .01. In other words, when grade level was considered, no significant difference was observed in the participants' career motivations.

Table 3. MANOVA: The effect of grade level

Effect	Wilk's Lambda	F	Hypothesis df	Error df	Sig.	Partial eta squared
Grade	.966	.572	9.000	362.000	.820	.01

Is it Possible to Predict Pre-service EFL Teachers' Academic Achievement by Means of their Career Motivations? If So, What are the Best Predictors?

A multiple standard regression analysis was carried out to understand if any of the factors affecting teaching choice predict the participants' academic achievement. No assumptions were violated as the multivariate outliers were not deemed to be of concern in terms of normality. The findings of the multiple regression analysis suggested that, of the factors affecting teaching choice, only *time for family*, *desire to work with children*, *intrinsic career values*, and *desire to make social contribution* emerged as the predictors of academic achievement, explaining extensively larger unique variation in student teachers' GPA than other factors. The general regression model was significant ($F = 7.581$, $p < .01$) and the amount of variation explained by the factors influencing teaching choice was large (adjusted $R^2 = .47$). The model explained 47% of the variance in academic achievement (see further Table 4).

Table 4. Regression analysis: Predictors of achievement

Predictors	Standardized Coefficients Beta	t	Sig.	Correlations		
				Zero order	Partial	Part
Time for family	-.720	-2.550	.012	-.043	-.216	-.149
Work with children	-.661	-2.496	.014	.029	-.212	-.146
Intrinsic career values	-.551	-2.198	.030	.091	-.187	-.129
Make social contribution	-.425	-2.147	.034	.076	-.183	-.126
Satisfaction with choice	-.103	-.830	.408	.064	-.072	-.049
Prior teaching and learning experiences	-.349	-1.714	.089	-.007	-.147	-.100
High demand	-.012	-.068	.946	-.103	-.006	-.004
Expert career	.225	1.338	.183	.119	.115	.078
Ability of teaching	-.261	-1.197	.233	.106	-.103	-.070
Shape future of children/adolescents	-.033	-.151	.880	.112	-.013	-.009
Job security	-.237	-1.241	.217	.106	-.107	-.073
Enhance social equity	-.313	-1.512	.133	.083	-.130	-.088
Job transferability	-.322	-1.661	.099	.122	-.143	-.097
Social influence	-.307	-1.329	.186	.109	-.115	-.078
Social status	.282	.775	.440	-.054	.067	.045
Social dissuasion	.003	.046	.963	.021	.004	.003
Salary	.210	1.289	.200	.043	.111	.075
Fallback career	-.472	-1.961	.052	-.114	-.168	-.115

Note: adjusted R^2 for the model = .473.

Having a close look at the findings of the study, it can be readily understood that the pre-service EFL teachers had a moderately high level of career motivations, which is in line with the findings of the study of Topkaya and Uztosun (2012). It can therefore be assumed that with regard to occupational motivations they showed enthusiasm for entering a teacher education program. The current study also showed that pre-service EFL teachers accord great importance to their *desire to shape the future of children/adolescents* more than the other reasons, which suggests that they are more altruistically motivated in their career preference. Nevertheless, the subsequent highly rated factors are *expert career, desire to make social contribution, intrinsic career values* and *satisfaction with choice*, which are related to intrinsic and altruistic motivations. These results are in accord with previous studies (e.g. Balyer & Özcan, 2014; Lestari & Arfiandhani, 2019; Lin et al., 2012; Pizarro & Laborda, 2017; Rothland, 2014; Topkaya & Uztosun, 2012) indicating that the altruistic motive of social utility value and intrinsic reasons dominate as the influential factors for choosing teaching profession. The reason why the pre-service EFL teachers rated the highest on the altruistic social utility value may be attributed to Turkish culture's collectivist nature, which attaches great significance to group goals rather than individual aims and interests (Kılınç et al., 2012).

In the present study, it was also revealed that *choosing teaching as a fallback career* is the least influential reason for the participants' career preference. This result corroborates the findings of a great deal of the previous study (e.g. Erten, 2014; Goller et al., 2019; Lee, Kang, & Park, 2019; Richardson & Watt, 2006; Topkaya & Uztosun, 2012), which suggested that student teachers did not prefer teaching as a last resort career whereas it is contrary to those of Kılınç and associates (2012), and Klassen and associates (2011) showing that they chose teaching profession since they did not have better choice or failed in other areas of study. Therefore, the combination of findings provides some support for the fact that many of the participants were bound and determined to become EFL teachers. Another finding was that grade level did not make any significant difference in the pre-service EFL teachers' career motivations, which is in agreement with Topkaya and Uztosun's (2012) finding. This implies that training that they received during their teacher education did not have any effects on their perceptions about their choice of being an EFL teacher. Besides, in the current study, of the factors affecting teaching choice, only *time for family, desire to work with children, intrinsic career values*, and *desire to make social contribution* were found as the predictors of GPA, explaining 47% of the variance in the participants' academic achievement. A possible explanation for this might be that prospective teachers' choice of teaching profession due to such reasons as *time for family, desire to work with children, intrinsic career values*, and *desire to make social contribution* exerts influence on their success in teacher education programs. This result is promising for pre-service EFL teachers' future careers because a clear association between the willing choice of teaching and academic achievement was noted (Özgüngör, 2008).

CONCLUSION

The main purpose of this research was to scrutinize pre-service EFL teachers' reasons for choosing teaching as a future career in the under-researched context of Turkey. The second aim of the study was to explore the impact of grade level on their career motivations. Besides, the study attempted to explore whether any of the factors influencing their career motivations predict their academic achievement. This study has shown that the student teachers had a moderately high level of career motivations. One of the more significant findings to emerge from this study is that the highest-rated factor affecting career choice was *desire to shape the future of children/adolescents* whereas the lowest rated one was choosing teaching as a fallback career. Grade level made no significant difference to their career motivations. Additionally, only time for family, desire to work with children, intrinsic career values, and desire to make social contributions emerged as reliable predictors of academic achievement.

Some tentative conclusions and pedagogical implications can be drawn from the findings of the study. First of all, pre-service EFL teachers manifest more altruistic and intrinsic reasons for becoming an EFL teacher with very few of them reporting that they preferred this profession as a fallback career. This can be seen as a valuable asset for the training of future student teachers as altruistic and intrinsic motivations are commonly characterized by higher levels of success and zeal in the practice of teaching. It can therefore be assumed that teaching is generally a career of choice for pre-service EFL teachers rather than something that they fall back on when their other choices are not realized. However, as Topkaya and Uztosun (2012) assert, more investigations should be undertaken to provide information about how and why student teachers with high level of motivation lose their zeal for teaching. It is essential to understand what affects teacher motivation negatively or positively in different phases of their professional development (Erten, 2014). Secondly, in the current research, grade level did not have any significant impact on English teacher candidates' career motivations, which implies that their four-year teacher education had no impact on their career motivations. Nevertheless, observing them all through their years of teacher education might enable us to arrive at more definite and more reliable conclusions. Lastly, prospective teachers' career motivations were revealed to exert influence on their success in teacher education programs. This is promising for prospective English teachers' future careers since there exists a direct link between eagerly choosing teaching and academic achievement (Özgüngör, 2008). All in all, it is advisable for teacher education institutions to endeavour to point out to student teachers that teaching is about altruism and self-devotion. In the process of teacher education, it is vital to acknowledge and incorporate the multiple motives of career choice that EFL student teachers hold. Organizing teacher education programs drawing on multiple motives might contribute significantly to completion of teacher education and teacher retention in future professions.

This study has certain limitations. The major limitation of this study is that it probed career motivations of the prospective teachers of English majoring in English Language Teaching at a particular state university in Turkey. Thus, the findings cannot be generalized across universities or across countries. Further research might be conducted with different participants from different ELT departments. Another limitation lies in the fact that the study used only quantitative methods to collect data. Future studies that involve data triangulation by means of employing both qualitative and quantitative data collection methods need to be carried out. In spite of its limitations, the study certainly adds to our understanding of the career motivations of prospective teachers of English.

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Statements of publication ethics

I hereby declare that the study has no unethical issues and that research and publication ethics have been observed carefully.

Author's Contributions

There is only one author of this article. Tutku Başöz is responsible for all of the work done for this article.

Ethics Committee Approval Information

The ethics committee approval was obtained from Balıkesir University with a document number of 19928322-302.08.01-E.34888 on 07/09/2020. All participants provided written informed consent prior to enrolment and data collection in this study.

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| Research Article / Araştırma Makalesi |

Gamified Lesson Design Model Proposal for Mathematics Instruction

Matematik Öğretimi için Oyunlaştırılmış Ders Tasarımı Model Önerisi¹

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Keywords

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instructional design
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Abstract

Purpose: This study aims to present a gamified lesson design model proposal for mathematics instruction and to determine the design principles of this model. Apart from the general models in the literature, the lack of a gamification design model that meets the needs of the field of mathematics instruction is the main motivating factor in the study.

Design/Methodology/Approach: The educational design research carried out for this purpose, the Gamification Development Model, Mathematical Knowledge for Teaching Model, and the process of designing a gamified mathematics lesson of 8 pre-service teachers, who constitute the participants of the research, were discussed together. In the study, which was completed in 6 phases and 14 sessions in total, data were collected through video and audio recordings, weekly reflection reports, general evaluation reports, and the Gamified Mathematics Lesson Checklist created by researchers.

Findings: Based on the content analysis and the literature, the gamification design steps that are aimed to guide teachers and/or instructional designers for mathematics teaching are proposed as a model. This model has a spiral structure in which each step affects the previous or next step. The current model includes goal analysis, design, development, implementation, and evaluation-improvement steps. Each of these steps includes gamification elements and what needs to be done within the scope of Mathematical Knowledge for Teaching as design principles.

Highlights: The current study proposes a new and detailed gamified lesson design model for mathematics instruction (GLDMfMath). The model proposal is expected to contribute to the field of mathematics teaching, especially with the guiding principles it offers and gamified lesson design examples to be created through these principles. Given that the motivation, participation, and achievement of learners increase in the teaching environments, where gamification is used, designs that can be created with the model presented by the current study can offer similar contributions to the mathematics education literature.

Öz

Çalışmanın amacı: Makalenin özeti, Mevcut araştırma matematik öğretimi için oyunlaştırılmış ders tasarımına yönelik bir model önerisi sunmayı ve bu modele ait tasarım ilkelerini belirlemeyi amaçlamaktadır. Alanyazında yer alan genel modellerin dışında matematik öğretimine yönelik alanın ihtiyaçlarını karşılayan bir oyunlaştırma geliştirme modelinin olmaması çalışmanın yapılmasındaki temel motivasyon unsurudur.

Materyal ve Yöntem: Yürütülen eğitsel tasarım araştırmasında, alanyazında yer alan Oyunlaştırma Geliştirme Modeli, Öğretmek için Matematik Bilgisi Modeli ve araştırmanın katılımcılarını oluşturan 8 öğretmen adayının oyunlaştırılmış matematik dersi tasarlama süreçleri birlikte ele alınmıştır. Toplam 6 aşamada ve 14 oturumda tamamlanan çalışmada veriler video ve ses kayıtları, haftalık yansıma raporları, genel değerlendirme raporları ve araştırmacılar tarafından oluşturulan Oyunlaştırılmış Matematik Dersi Kontrol Listesi aracılığıyla toplanmıştır.

Bulgular: İçerik analizine tabi tutulan verilerden ve alanyazından yola çıkılarak, matematik öğretimi için öğretmen ve/veya öğretim tasarımcılarına kılavuzluk etmesi hedeflenen oyunlaştırma tasarım adımları belirlenmiş ve bu adımlar bütünü bir model olarak önerilmiştir. Bu model spiral bir yapıya sahip olup, her bir adım önceki veya sonraki adımı etkilemektedir. Model hedef analizi, tasarım, geliştirme, uygulama ve değerlendirme-iyileştirme adımlarından oluşmaktadır. Bu adımlardan her biri tasarım ilkeleri olarak oyunlaştırma unsurlarını ve Öğretmek için Matematik Bilgisi kapsamında yapılması gerekenleri içermektedir.

Önemli Vurgular: Bu çalışma, matematik öğretimi için yeni ve ayrıntılı oyunlaştırılmış bir ders tasarım modeli önermektedir. Model önerisinin, özellikle sunduğu yol gösterici ilkeler ve bu ilkeler üzerinden oluşturulacak oyunlaştırılmış ders tasarım örnekleri ile matematik öğretimi alanına katkı sağlaması beklenmektedir. Oyunlaştırmanın kullanıldığı öğretim ortamlarında öğrenenlerin motivasyonu, katılımı ve başarısının arttığı göz önüne alındığında, bu çalışmada sunulan modelle oluşturulabilecek tasarımlar matematik eğitimi literatürüne benzer katkılar sağlayabilir.

¹ It is derived from PhD dissertation of Nilüfer Zeybek conducted under the supervision of Elif Saygı.

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INTRODUCTION

"Effective mathematics teaching requires understanding what students know and need to learn, then encourage and support them to learn what they need well." (NCTM, 2000, p.11). Teachers are one of those who play the main role in achieving this. Ball, Thames, and Phelps (2008) state that a mathematics teacher has responsibilities such as presenting mathematical ideas in the learning environment, choosing appropriate examples and representations, making connections between topics, and organizing activities to proceed from the easy to the difficult. In addition to these stated responsibilities, it is necessary for the teacher to have knowledge about the student, instruction, and the curriculum and to put this knowledge into practice for effective mathematics teaching to occur (Ball et al., 2008).

When the roles and responsibilities of teachers in teaching are considered, it is seen that the teacher no longer assumes the role of transferring knowledge, but the roles of organizing learning and designing teaching (Hoogveld, Pass, & Jochems, 2005). Moreover, Darwin (2004) states that it is a necessity for a teacher to be an instructional designer because of changing teaching goals, student characteristics, and expectations. In this context, for effective mathematics teaching to occur, the teacher should assume the role of the instructional designer going beyond the roles of knowledge transmitter and practitioner. Instructional design in the broadest sense is defined as the creation of ideal conditions for improving teaching, facilitating learning, and accomplishing effective teaching (Arslan & Sağlam Arslan, 2016). As an instructional designer, the teacher should determine the current situation of the students, and make teaching effective, attractive, and efficient through practices and theories proposed to reinforce teaching (Malamed, 2010; Merrill, Drake, Lacy, Pratt, & ID₂ Research Group 1996). All of these can be achieved through instructional designs in which the objectives are clearly stated, the practices designed in accordance with the objectives, informative feedback, and strong intrinsic and/or extrinsic motivation (Perkins, 1992).

The fact that it contains objectives, applications complying with the objectives, feedback, and motivation (Zichermann & Cunningham, 2011; Werbach & Hunter, 2012) shows that gamification can be used as an instrument in instructional design. Defined as "*the use of game elements in non-game environments*" (Deterding, Dixon, Khaled, & Nacke, 2011; p.1), gamification is grounded on the concept of the game and motivates the individual to act, learn or solve the problem situation by including game elements in the process. In cases where gamification is employed, the objectives are presented to the individual desirably and interestingly, and feedback is given throughout the process so that the person can live positive experiences such as fun, success, and progress (Simões, Redondo, & Vilas, 2013). Gamification, which is frequently used in the fields of marketing, health, and sports in recent years, has the potential to meet the needs of students and teaching in the design of teaching. The studies on gamification in the field of education have revealed that the use of gamification method in learning environments positively affects the motivation, participation, and academic achievement of learners (Begosso, Cunha, Pinto, de Lemos, & Nunes, 2018; Çağlar & Kocadere, 2015; Dominguez, Saenz-de-Navarrete, de-Marcos, Fernández-Sanz, Pagés, & Martínez-Herráiz, 2013; Featherstone, 2018; Glover, 2013; Goehle, 2013; Gulinna & Lee, 2020; Haman, Pincioli, & von Mammen, 2018; Hanus & Fox, 2015; Muntean, 2011; Putz, Hofbauer, & Treiblmaier, 2020; Sari & Altun, 2016; Sezgin, Bozkurt, Yılmaz, & van der Linden, 2018). In addition to the contributions mentioned in the studies in the literature, the gamification method also allows the learner to receive feedback throughout the process and to have learning environments suitable for his/her differences (Çağlar & Kocadere, 2015).

If we look at gamification in more detail, we can see that the game elements included in the definition of gamification are story, dynamics, mechanics, and technology (Kim, Song, Lockee, & Burton, 2018). While the *story* is expressed as an artificial situation in which the characters, objectives, and struggle are presented to individuals who experience the gamification process, *dynamics* are the feelings and experiences that the individual will be engaged in during the process. *Mechanics*, on the other hand, are expressed as the toolbox of gamification and are all of the rules, missions, rewards, and status indicators that enable the dynamics to be experienced. Finally, *technology* refers to the concrete materials, information, and communication technologies employed for the gamification process to occur.

In gamification, one or all of the elements mentioned above are included depending on the needs of the design. The presence of these elements should not mean that gamification is performed accurately; the design of these elements and how they will be used for what purposes should be determined within a certain system (Werbach & Hunter, 2012). In education and instruction, Kim et al. (2018) and Reiners and Wood (2015) presented models containing design principles for the creation of gamified content. *The Gamification Development Model* (Kim et al., 2018), one of these models, argues that an educational gamification content can be created by following the phases of target analysis, design, development, implementation, and evaluation-improvement. The phases of the mentioned model and the design principles to be followed in these phases are listed in Table 1:

Table 1. Phases of the gamification development model and design principles (Kim et al., 2018)

Design Phases	Design Principles
Target Analysis	Defining needs, goals, and scope Analyzing the characteristics of students and learning environments
Design	Design of motivation strategies Story and dynamics design The design of the mechanics
Development	Deciding on the game type Creating material Testing the material
Implementation	Distribution Implementation Observing teaching
Evaluation-Improvement	Evaluating the learning achievement and the fun element of teaching Improvement

As can be seen in Table 1, the steps to be taken for gamification development and the design principles explaining how to take these steps draw a general framework and are not defined specifically for any learning area. When the study of the gamification development model in education offered by Kim et al. (2018) is examined, it is seen that the study gives detailed information about the definition of the elements in gamification and the use of these elements. However, this study kept the focus on game elements and did not include topics such as how to integrate instructional content and instructional needs and teaching methods in the design principles. Similarly, Prash and Rao (2015) in their study on how to use gamification in education, just like Kim et al. (2018), focused on game elements, ignoring educational and instructional aspects. Pirker and Gült (2015), on the other hand, defined the steps of gamification development in science teaching and stated that they addressed definitions in the context of the objectives, teaching methods, and content of science teaching. Although the studies have pointed out that gamification can offer opportunities for effective mathematics teaching, the fact that gamification in education is a new subject and that the gamification development models in the literature draw a general framework causes various difficulties in the creation of gamified content. Just as in science teaching, there are field-specific requirements, knowledge, reasoning styles, learning processes, and teaching methods involved in mathematics teaching. When the needs specific to this field are considered, it is thought that the gamification development models created for education and the design principles offered by these models may be insufficient to meet the needs of mathematics teaching and give rise to various uncertainties. Moreover, besides the gamification development model and the structure of the content to be gamified, one of the important factors that will affect the design is the designer. As an instructional designer, the teacher/pre-service teacher employing the knowledge and skills specific to the above-mentioned field in a gamified lesson design process will shape the structure and content of this design. At this stage, the Mathematics Knowledge for Teaching, which the teacher has in the context of teaching mathematics, comes to the fore. The Mathematics Knowledge for Teaching refers to the knowledge a teacher should have for teaching mathematics, regardless of any context (such as country or culture) (Ball et al., 2008). This knowledge includes content and pedagogical content knowledge. Content knowledge refers to the knowledge possessed by the teacher about his/her subject area and the subjects addressed in the related curriculum while pedagogical content knowledge includes student knowledge, teaching techniques knowledge, and curriculum knowledge that the teacher uses while designing and delivering mathematics instruction (Ball et al., 2008).

To summarize, given the reasons such as the role of mathematics teaching knowledge in the creation of gamified lesson content as an instructional design, the inadequacies and uncertainties that arise due to the lack of detailed description of the steps to be taken to employ gamification in existing models and the lack of instructional elements and the limited sample gamification applications for mathematics teaching, it is a need to create a gamification design model specific to mathematics teaching and design principles detailing this model. For these reasons, the present study aims to propose a new model for mathematics teaching that can guide teachers and/or instructional designers for the design of gamification, which has a recent history in education and rare samples in mathematics teaching and that can meet the needs of the field. With the educational design research conducted to reveal this model, the theoretical knowledge regarding gamification design in the literature and the gamified mathematics lesson designs of the pre-service middle school mathematics teachers developed within the context of the current study were analyzed. With the data obtained from this theoretical construct and practical process, answers to the following research question and sub-questions were sought:

1. What is the gamified lesson design model for mathematics instruction (GLDMfMath)?
 - a. What is the structure of the gamified lesson design model for mathematics instruction?
 - b. What are the phases of the gamified lesson design model for mathematics instruction?

METHOD/MATERIALS

Research Model and Procedure

In the current study, the educational design research model was used to create the design model for a gamified mathematics lesson. "Educational design research can be defined as a type of research that provides repeatable solutions to practical and complex educational problems and provides a theoretical understanding that contributes to the literature" (McKenney & Reeves, 2012, p. 7). Educational products, processes, programs, or policies can be created in educational design research; moreover, this research process is adaptable, collaborative, context-oriented, flexible, interactive, and benefit-oriented (Kelly, 2003; van den Akker, Gravemeijer, McKenney, & Nieveen, 2006). Linn, Davis, and Bell (2004) and van den Akker (1999) state that educational design research provides benefits such as providing guiding principles for designs and identifying key features. The determination of these principles and features provides information on how to make similar designs for similar environments/situations, especially for education designers (Nieveen & Folmer, 2013). In the present study, gamified lesson designs that can be expressed as educational products were created by the pre-service teachers through educational design research. The process of creating these lesson designs was investigated within the context of both gamification and Mathematics Knowledge for Teaching. As a result of this investigation, it was aimed to create a design model by determining the guiding principles and key points for gamified lesson design in mathematics instruction. In the current study, data were collected using both qualitative and quantitative methods, and answers were sought to the research question and sub-questions. The pre-service teachers' processes of designing a gamified lesson were examined with qualitative methods, and the gamified lesson designs formed as a result of the process were examined with quantitative methods.

In the present study, the stages defined as the core processes of educational design research by McKenney and Reeves (2012) and customized in the context of the study as in Figure 1 were employed. During the Analysis and Exploration stage, which is the first of these stages, the researchers conducted a literature review for gamification and geometry teaching (a sub-learning area of mathematics instruction), which is the content to be gamified. After the literature review, a five-week gamification training was given to the pre-service teachers to design gamification work in the second stage - that is, to move to the Design Stage. The content of this training includes the introduction of gamification, motivation, engagement, elements of gamification, and player types. In the third stage, the pre-service teachers were asked to get into 2 groups of 4 and to design a gamified lesson focused on the objectives set in the Geometry and Measurement Learning Area in the Mathematics Curriculum (MEB, 2018) by employing their knowledge of gamification and mathematics teaching together. These gamified lessons were created by the pre-service teachers employing the Target Analysis, Design, and Development phases, which are the steps of the Gamification Development Model, under the guidance of researchers, and this process was completed in five weeks.

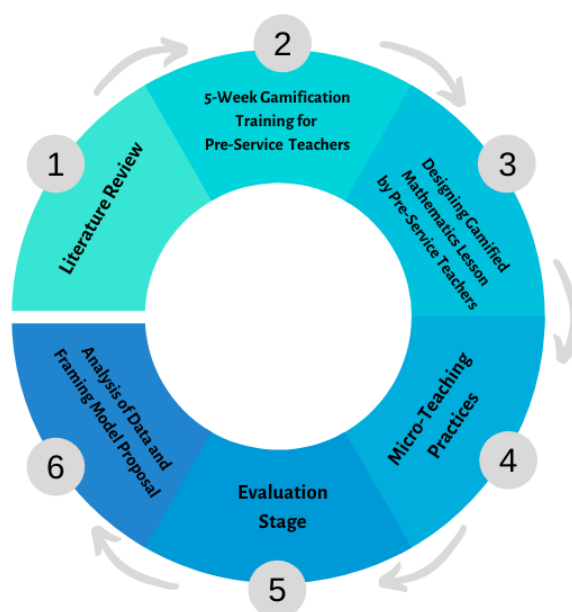


Figure 1. Research procedure

Following the completion of the designs, in the fourth stage, micro-teaching practices in which one pre-service teacher from each group took the role of teacher and the other pre-service teachers and the researchers took the role of learner, and the *Implementation Stage* of the educational design research was completed in two weeks. With a session held at the fifth stage, the pre-service teachers and researchers evaluated each implementation in terms of both gamification and mathematics teaching and made suggestions for improvement. In this way, the *Evaluation Stage* of the study was completed. In addition to these evaluations

and suggestions, the groups held another session to improve their designs, taking into account the experiences in micro-teaching practices. Thus, a fourteen-week process including five-week training, five-week design, two-week implementation, and two-week evaluation with the pre-service teachers was completed. In the last stage, the researchers analyzed the pre-service teachers' gamified mathematics lesson design processes together with the product that emerged as a result of this process, and the data obtained were combined with the literature and presented as a model proposal. Thus, the study was completed with the *Model Proposal Stage*, which is the last stage of the study.

Study Group

The study group, which includes the participants who played a role in the gamified lesson design of the research and the evaluation of these designs, was determined by using the purposive sampling method, and consists of 6 females 2 males; a total of 8 senior pre-service middle school mathematics teachers attending a state university. One of the reasons why pre-service teachers were included in the study was the conviction that conducting a 14-week process within the context of a course with the participation of the pre-service teachers who were taking the course would minimize the loss of data and participants. Another reason is the pre-service teachers' level of *Mathematics Knowledge for Teaching*, which may be one of the factors that will affect the design. This level can be controlled through the courses taken by the pre-service teachers related to this knowledge. As Fraenkel, Wallen, and Hyun (2012) stated, in the selection of the participants, criteria were determined by the specific purpose of the research within the context of purposive sampling. This criterion was the pre-service teachers' having the necessary knowledge for the geometry learning area that the study focused on. The pre-service teachers' possession of this required knowledge was checked through their achievement in the following courses required in their undergraduate education; "Geometry", "Teaching Elementary School Mathematics", "Middle School Mathematics Curriculum" and "Special Instruction Methods II" focused on geometry teaching. Table 2 presents the grades of pre-service teachers in these courses.

Table 2. The Grades of pre-service teachers in the courses determined as the criterion

Courses	PST1	PST2	PST3	PST4	PST5	PST6	PST7	PST8
Geometry	C1	A1	D	D	B2	D	B2	D
Teaching Elementary School Mathematics	A3	A2	B3	B2	B1	A3	A2	A2
Middle School Mathematics Curriculum	A3	B2	B2	B3	B3	A3	B3	B1
Special Instruction Methods II	A1	A1	A1	A1	A1	A1	A1	A1

*PST: Pre-Service Teacher

** A1=100-95 A2=94-90 A3=89-85 B1=84-80 B2=79-75 B3=74-70 C1=69-65 D=54-50

The grades taken from the "Special Instruction Methods II" course are the primary criterion in determining the participants in the study, and this course includes information about middle school students' perceptions of and development in the Geometry and Measurement Learning Area in mathematics teaching, learning and teaching approaches and instructional methods used in this area, which is focused on in the current study. The pre-service teachers were expected to have mastered the definitions and concepts in this learning area in the "Geometry" course and to have gained knowledge about the prior learning of middle school students in the "Teaching Elementary School Mathematics" course. The pre-service teachers were also expected to have gained knowledge about the objectives they would create for their designs and about the place of these objectives in the curriculum in the "Middle School Mathematics Curriculum" course. In this context, the success of the pre-service teachers in these courses is important for the lesson design that the pre-service teachers are expected to do.

From the participants in the study, two groups of 4 people were formed, each group consisting of 3 female pre-service teachers and 1 male pre-service teacher. While forming the groups, it was aimed to have parallelism between the groups in terms of gender and the grades taken from the courses determined as the criteria. The distribution of the pre-service teachers and their genders across the groups is shown in Table 3.

Table 3. Groups and gender distribution

Groups	Female	Male
Group 1	PST1, PST2, PST3	PST4
Group 2	PST5, PST6, PST7	PST8

Data Collection Tools

In the present study, the data were obtained from the gamified lesson design process and the products formed as a result of this process. In addition to the video and audio recordings of the entire design process, weekly reflection reports and general evaluation reports prepared by the pre-service teachers were used as data sources. With their weekly reflection reports, the pre-service teachers were asked to summarize what they did in all the phases of the design process for each session. The general evaluation reports, on the other hand, included the opinions of the pre-service teachers about the overall process and gamification. Qualitative data of the research were obtained through these sources. Whether the pre-service teachers' designs

contained the necessary elements or not was determined through the "Gamified Mathematics Lesson Checklist" developed by the researchers. This checklist enabled quantitative data to be collected in the study and in the development of the checklist, the Gamification Development Model developed by Kim et al. (2018) and the Mathematics Knowledge for Teaching that should be possessed for mathematics teaching and is defined by Ball et al. (2008) were taken as the basis. In the checklist grounded on the literature, there are 50 items subsumed under 4 dimensions. In the first of these dimensions called "Target Analysis", there are 12 items; in the second dimension called "Design", there are 26 items; in the third dimension called "Development", there are 6 items and in the fourth dimension called "Implementation", there are 6 items. The developed checklist was submitted for expert review to ensure content validity, and thus the final version of the checklist was given. Each item is scored with "1" or "0" depending on whether the process evaluated has satisfied the corresponding statement. The dimensions in the checklist and sample items from these dimensions are given below.

1. Target Analysis:
 - a. Was the design suitable for having the student think about the concept focused on?
 - b. Was the prior learning of students taken into consideration in the design?
2. Design:
 - a. Could the story and the elements of the story answer the question "Which knowledge of mine can I use to overcome this problem?"
 - b. Did the experiences lived through the dynamics involved in the design create a sense of progress?
3. Development:
 - a. Were materials created for the design (digital or concrete)?
 - b. Was a feedback system established for the levels included in the design?
4. Implementation:
 - a. Could the gamified lesson design be implemented in the planned time?
 - b. Did the design create the instructional opportunities planned during the implementation?

Data Analysis

The qualitative data obtained from the pre-service teachers' processes of designing the gamified mathematics lesson and the product produced as a result of this process through video, audio recordings, and weekly reports were subjected to content analysis. Content analysis refers to the analysis of qualitative data in various forms (such as text, audio and/or video recordings, observation notes, interview transcripts, etc.) and interpretation and presentation of them in the most convenient way (Creswell, 1998). While conducting the content analysis in the current study, the analytical strategy defined by Creswell (1998) was used. According to this analytical strategy, all data collected are reviewed and preliminary notes are taken. Then the researcher starts the data reduction process by converting ideas and/or actions into metaphors, thus a temporary code list is obtained. Later, the data are reviewed and the code list is arranged and the related codes are collected under categories. Finally, by making a comparison with the related literature, necessary arrangements are made regarding the codes, categories, and themes and the structure obtained is visualized.

In the current study, the above-mentioned procedures were carried out using the MAXQDA 2018 Qualitative Data Analysis software. The data obtained from two different groups were first analyzed in the context of the groups, and then a construct was obtained by comparing the obtained data (codes, categories, and themes). After the process was completed, the data were rearranged and finalized by comparing with the literature. Also, 40% of the data randomly selected were examined by 2 field experts and the inter-coder reliability was found to be over 80%.

The gamified mathematics lesson designs of the pre-service teachers were evaluated through the "Gamified Mathematics Lesson Checklist". Both participants and researchers individually evaluated the designs through this checklist. The means of the scores which made up the quantitative data obtained with this checklist were calculated for each item and thus mean scores for both the sub-dimensions of the checklist and the whole checklist were found. Through the calculations made scores to be taken from both the sub-dimensions and the whole checklist, success percentages of the participants were determined.

FINDINGS

In this section, the data that led to the emergence of the gamified lesson design model proposal for mathematics teaching aimed at the current study are presented. First, it was investigated whether the gamified mathematics lesson contents created by the pre-service teachers had the necessary design elements. Then, the design process of these course contents was analyzed and the actions taken by the pre-service teachers in the process were determined. In this analysis, the focus was not on describing how the design processes were, but on the basic principles and elements employed while producing the design. In the conclusion part of the study, based on the data in this section and the information in the literature, a gamified lesson design model proposal for mathematics teaching is presented.

One of the data sources in the study is the gamified mathematics lesson contents. These lesson contents were designed by the pre-service teachers and then implemented via micro-teaching. After the implementation, the contents were evaluated by both the pre-service teachers and researchers through the Gamified Mathematics Lesson Checklist. The purpose of this evaluation was to check whether the necessary teaching elements were included in each step of the pre-service teachers' designs and whether the basic gamification processes were fulfilled. With this evaluation, it was tried to predict the adequacy of the existing content to create a model from the gamified lesson content and the design process of this content. For example, the minimum number of things to be done in the design phase was determined to be 26 items in the checklist. Through the scores taken from these items, the adequacy level in the design dimension was attempted to be determined. In this context, the design of each group was evaluated for each measurement dimension separately and as a whole. The mean scores and success percentages of the two gamified lesson contents whose adequacies were investigated with the checklist in 4 dimensions are given below.

When the scores and percentages of the designs of the groups in Figure 2 are examined, according to the results obtained by the average of the scores of all raters in each dimension, the designs of the groups are 11.1 and 10.6 out of 12 points in the target analysis dimension; 24.8 and 22.3 points out of 26 points in the design dimension; 6 and 5.9 points out of 6 in the development dimension and 5.6 and 4.9 points out of 6 points in the implementation dimension. Looking at the total score average, it was determined that the designs got 47.5 and 43.7 points out of 50 points. When these scores are converted into percentages in each dimension and in general, it is seen that the values obtained are above 80%. This gives the knowledge that pre-service teachers' designs have a high rate of gamification and contain the necessary elements for mathematics teaching, and set the ground for the creation of a gamified lesson design model proposal for mathematics teaching based on the design process of these products and these products.

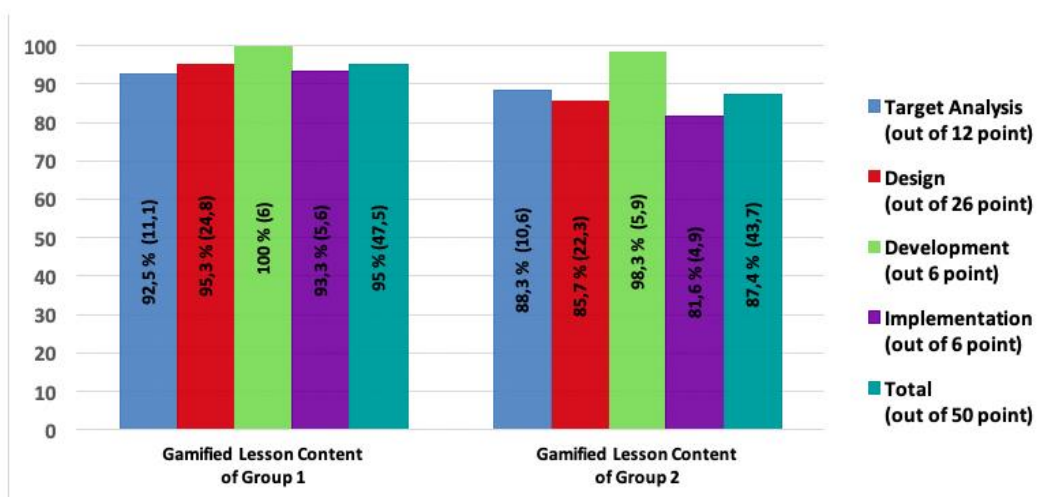


Figure 2. Mean scores and success percentages of the pre-service teachers' designs obtained with the Gamified Mathematics Lesson Checklist

Another data source of the current study is the processes followed by the pre-service teachers in creating their gamified mathematics lesson contents. The data about these processes were collected through video, audio recordings, and weekly reflection reports. The target analysis, design, implementation, and evaluation-improvement phases (Figure 1: Research Procedure Phases 3, 4, and 5) followed until the design reached its final form were handled and analyzed as the process of creating gamified lesson content. The phases of the Gamification Development Model (Kim et al., 2018), which formed the basis of the current study, were determined as themes because they shaped the study. These themes are *target analysis*, *design*, *development*, *implementation*, and *evaluation-improvement*. The codes and subcodes subsumed under these themes are given in Table 4.

Table 4. Themes involved in the analysis of the pre-service teachers' processes of developing the gamified lesson and the codes and sub-codes subsumed under these themes

Themes	Codes	Sub-Codes
Target Analysis	Content	Objectives
		Place in the Curriculum
	Learner	Concept
Prior Learning		
Tools	Tools	Misconceptions and Their Possible Causes
		Common Mistakes
		Student Strategies
		Concrete Materials
		Information and Communication Technologies
Design	Motivational Elements	Intrinsic Elements
		Extrinsic Elements
		The Situation
	Story	Characters
		Goals, Performance Goals, In Order to Chain
		Metrics
	Dynamics	Barriers and Conflicts
		Control
		Predictable Unexpected
		Competition
Mechanics	Completion	
	Fellowship	
	Other dynamics in the FunPLEX Model	
	Rewards	
		Reward Schedules
		Avoidance
		Status
		Quest
Development	Mathematical Content	Organization of Story Elements According to the Subject and Curriculum
		Choosing the Appropriate Activities for Dynamics
	Use of Technology / Materials	Structuring the Mechanics According to The Subject Content
		Preparing Generative Mathematical Questions
		Determination of Technology and Materials Suitable for The Subject
Feedback	Designing / Selecting Appropriate Technology and Materials for The Subject	
	Use / Selection of Subject-Specific Model and Visual	
		Designing Feedback to Show Progress
		Design of Feedback to Highlight Difficulties and Errors
		Design of Feedback to Provide Mathematical Explanations
Implementation	Learning Environment	Physical Preparation of the Learning Environment
		Technical and Technological Preparation of The Learning Environment
	Duration	Providing Materials
		Use of Duration
	Unexpected Situations	Completion of Sub-processes
Flow		
Functioning of Gamification Elements		
		Instructional Content
		Student Thoughts
		Deviation from The Plan
Evaluation- Improvement	Criteria	Gamification Elements
		Instructional Content
	Problems / Drawbacks	Learning Needs
		Problems
		Missing Aspects
Suggestions	Aspects That Need Improvement	
	Suggestions for changes	
Implementation of the Suggestions	Improvement suggestions	
	Choosing the Appropriate one from the Suggestions	
		Fulfill the Suggestions

As can be seen in the table above describing the data analysis, the pre-service teachers were able to bring together the information they obtained from their training about gamification and their *Mathematics Knowledge for Teaching*, which includes the content knowledge and pedagogical content knowledge they have obtained in their undergraduate education. It is seen that the codes under the themes determined in the processes of creating gamified mathematics lesson contents by the pre-service teachers are not only about gamification or teaching mathematics. These codes include the amalgam of information about mathematics teaching and gamification. The sub-codes are detailed as elements included in each code.

In the target analysis phases, the pre-service teachers were asked to examine the content of the lesson they would gamify according to the *Gamification Development Model* defined by Kim et al. (2018) in the context of the target, scope, student, and learning environments. At this stage, both groups first discussed the place of the lesson content to be gamified in the curriculum. Then, they examined the objective they dealt with both between classes and at the same class level and focused on the concepts included in the outcome. With these examinations, the pre-service teachers stated that they aimed to determine the objectives that students would achieve with gamification, and that they determined which concepts and how their designs should be limited. In light of these statements of the pre-service teachers, it can be stated that they used their subject area and curriculum knowledge included in the scope of pedagogical content knowledge. In this context, a content code emphasizing the goal and scope of the design was created under the theme of target analysis, and based on the statements of the pre-service teachers, *the objectives, place in the curriculum, and concept* sub-codes were included. It was observed that the pre-service teachers examined the dimension of "analysis of student characteristics" in the context of the *Gamification Development Model*, without giving many details, in terms of prior learning, misconceptions, mistakes, and student strategies by using their subject area and student knowledge within the scope of pedagogical content knowledge. For this reason, *prior learning, misconceptions and their possible causes, common mistakes, and student strategies* sub-codes are included under the *learner* code.

During the design phase, firstly, with group discussions, both Group 1 and Group 2 discussed the elements that could motivate the student. Group 1 stated that they chose the feeling of *curiosity* to foster motivation in students, while Group 2 stated that they chose the feeling of *struggle*. One of the members of Group 1, PST4 emphasized the importance of curiosity by stating that "If there is no curiosity, the student does not want to continue through the process. The next step, the next part of the story or the next action should make them feel curious." In the discussion conducted by Group 2, all the group members emphasized the importance of the sense of struggle and in this regard, one group member PST6 stated that "Who does not want to win?, think about it, you are progressing through a process getting gradually more challenging; you want to be successful, even to manage the more difficult; this motivates the student." while another member of Group 2 PST7 said the following; "It is not enough to be successful; it is necessary to show this, such as points, badges. A student can even stay in the process just to get all the badges." From these discussions of the pre-service teachers, motivational elements and this motivation's being intrinsic (such as sense of curiosity, struggle) or extrinsic (such as points, badges) were determined as sub-codes.

In the story design, the story template proposed by Kapp (2013) for gamification was taken as the basis. Kapp (2013) stated that in the design of gamification in education and instruction, a goal-based story should be designed and the following elements should be included in this story: *the situation, characters, goals, performance goals, in order to chain, metrics, barriers and conflicts, control, and predictable unexpected*. These elements can be briefly explained as follows:

- *The Situation* refers to the existing conditions
- *Characters* refers to the roles that can be taken by students in the story
- *Goals* refers to the point aimed to be reached in the gamified process within the context of the story
- *Performance Goals* refers to the sub-targets that should be achieved to reach the main target in the story
- *In order to Chain* refers to the fulfillment of the previous goal to be able to accomplish the next goal to progress and reach the target
- *Metrics* refers to the indicators of success; indicators showing whether the target has been reached
- *Barriers and Conflicts* refers to elements that make the story exciting and it difficult for the character to reach the target
- *Control* refers to what the character can do in the story and his/her limitations
- *Predictable Unexpected* refers to events that are expected to happen in the story but are unexpected for the character.

The pre-service teachers designed stories that included these elements in the design process. For example, Group 2 summarized the story elements they formed as a result of the group discussions in their weekly reports as follows:

The Situation: The people of Cibutta change their country's borders every night to protect it from enemy attacks. The week in the country consists of 6 days and the borders of the country change to one of 6 geometric shapes every night without changing the surface area.

Characters: You, as a night watchman, will draw the borders of the country every night.

Goals: The main objective of the watchman is to draw the country in an appropriate geometric shape, without distorting the surface area.

Performance Goals and In order to Chain: The country should be rectangular on day 1, square on day 2, parallelogram on day 3, triangle on day 4, rhombus on day 5, and trapezoid on day 6. In order to move on to the next day, it is necessary to draw the shape correctly that night.

Metrics: The indicator of success is that night turns to day, resulting from correct drawing. For each correct drawing, a certain amount of gold will be deposited on the watchman's account.

Barriers and conflicts: The drawing process must be completed within the specified time at night. Otherwise, there will be a decrease in the surface area of the country and certain structures will be lost. For these structures to be rebuilt, a reduction will be made from the wage of the watchman.

Control: The watchman has no other way of fighting enemy attacks. The only action that can be taken is to draw the borders of the country by making the necessary calculations.

Predictable unexpected: To prevent the enemy attack, the match between the day and the shape planned for that day can be changed by the state and the new plan must be followed."

In the design of the dynamics, the elements of the FunPLEX model (Kim, 2013), which are expressed as struggling, completion, and stakeholder experiences and experiences that provide entertainment to the individual, were suggested to be included in the gamification during the gamification training. For example, Group 1 stated that in the story that they designed as including a group of mathematicians who would determine the boundaries of the fields after the flood of the Nile in Ancient Egypt, and that students would work together as mathematicians and would experience cooperation. Also, the same group stated that the success achieved by measuring all fields with the elements they included in the story would provide students with feelings and experiences such as complementing and relaxation, exploring by working in different regions, and competition with other mathematician groups.

In the design of mechanics, the groups were asked to include mechanical elements compiled by Kim et al. (2018) from the literature in their designs. Kim et al. (2018) mentioned the existence of many mechanical elements and classified these elements according to their intended use. This classification is as follows: *rewards, reward schedules, avoidance, status, and quest*. In this context;

- *Rewards* refers to elements to be given in return for success
- *Reward Schedules* refers to the frequency and amount of rewards
- *Avoidance* refers to the elements that will lead to rewards loss
- *Status* refers to the leader boards to be formed based on the received rewards, rankings, or the factors that will make people superior to others.
- *Quest* refers to the works to be completed to receive rewards.

However, there are dozens of different mechanical elements within these mechanical classes. For example, rewards include many different types of rewards such as mechanic class badges, points, levels, progression, virtual items, physical items, virtual money, and jewels. Considering all these, the pre-service teachers were asked to choose and include the mechanical elements from these mechanical classes in their designs that would be appropriate for their designs. Below is given the discussion between the members of Group 2 about their design:

PST8: "There is a shape specified for each night; 6 shapes for 6 nights. Then, let's take them as our levels; there are 6 levels. The wage they get at the end of each night is kind of the point. It's okay so far, isn't it?"

PST5: "Yeah I think we can give badges to those who draw fast. He/she can even turn this badge into a wage if he/she wants."

PST6: "Then let's not forget that there will be a reduction from his/her wage to compensate for the loss of land. Will he/she earn the same amount of wage every day?"

PST8: "Yes, but as the level progresses, I think the reduction to be made when they make mistakes should be increased."

PST7: "I think we need to show the wins and reductions in a table. So, we can see their state compared to others."

When the above-given discussion is examined in terms of the mechanical elements defined by Kim et al. (2018), it is seen that the group included elements such as levels, points, and badges as rewards and that they planned to give these rewards at fixed rates and fixed intervals within the context of the reward schedule. They also included a table of earnings as status and wage reductions as avoidance in case of failure. Finally, they determined the quest by establishing a structure defined as locked content where the countdown takes place and one step cannot be passed before the next step has been completed.

The groups that worked intensively on gamification elements until the development phase continued their designs with the integration of mathematical content in this phase. Both groups, based on the report they had prepared in the target analysis, focused on the targeted objective again. From the target analysis phase, Group 1 addressed the objectives of "determines the diagonals, interior and exterior angles of polygons; calculates the sum of interior angles and exterior angles" in the "Polygons Sub-Learning Area" in the 7th grade and Group 2 addressed the objective of "Solves problems related to the area". Within the context of these objectives, they matched the performance objectives with the outcome objectives in their stories, and they prepared problems considering the sequencing in the curriculum and prior learning of students to be presented from easy problems towards difficult problems. The discussion carried out by Group 2 in the development phase shows that the pre-service teachers used their *Mathematics Knowledge for Teaching* (curriculum, student, etc.) and their knowledge about gamification together and resulted in the coding of the actions performed as "*Organization of story elements according to the subject and curriculum*".

PST5: "In the story design, we already set performance goals as a geometric shape for each day. According to our plan, we will give a problem that includes the geometric shape determined in each performance objective."

PST6: "Consider the curriculum, in the 5th grade, he/she learns to calculate the area of the square and rectangle. The area of a triangle and parallelogram in the 6th grade; the area of a rhombus and trapezoid in the 7th grade ... So, we can say that it is easiest for the student to calculate the area of a rectangle. For the student, starting the level with the easy ones was also important in terms of gamification. Thus, we will set the first performance goals; that is, the first-night borders of the country as rectangular."

PST8: "Namely, he/she will solve the problem of a rectangle to draw the borders of the country."

In the process, within the other phases of the model, the pre-service teachers' design processes, discussions, research, examinations, and actions were analyzed. The pre-service teachers used their *Mathematics Knowledge for Teaching* intensively in the target analysis phase, their knowledge of games and gamification in the design phase, and both types of knowledge in the development, implementation, and evaluation-improvement phases. By following the systematic in the examples given above, these types of knowledge and the way they were used were determined with codes and sub-codes, and Table 4 was created.

In addition to the data obtained, the general evaluation reports written by the pre-service teachers at the end of the process were analyzed. In these reports, the pre-service teachers summarized the processes of developing gamified mathematics lessons content. When the general structure of this process was examined, it was seen that the pre-service teachers stated that the process of designing gamified mathematics lessons had a spiral structure and that they should use their knowledge of gamification and teaching mathematics in this structure. When the statements of the pre-service teachers in their general reports and the actions they had undertaken were examined, it was seen that while the actions undertaken at each phase laid the foundations of the other phase, there was a need for arrangements and additions in the dimensions of gamification and mathematical content in each phase. The statements of PST2, PST4, and PST7 regarding this process are given below:

PST2: "When I think about the whole process we designed, I can realize that we established a huge system by starting with what we would teach from the very basic, what kind of mathematical content we would use at the beginning. We designed the story and mechanics and blended them with our objectives. We always updated something until we arrived at the implementation phase. For example, we did not consider prior learning in the target analysis phase; we realized this while writing the story because we had to establish the chain of goals. Our design process was very active and some improvements continuously occurred in each phase. We both took what we did before into consideration and eliminated our past shortcomings as we progressed."

PST4: "It is impossible to separate the story, dynamics, and mechanics from each other. Even if you try to do this, it requires going back and revising them as the design progresses. When we integrate the mathematical content, a design that is built on top of each other and is constantly updated emerges."

PST7: "It was necessary to carry out the whole process by connecting its parts. We combined the mechanics we determined with mathematical content in the next phase. In this phase, we shouldn't ignore students' knowledge. The relationship between all these had to be considered at every step."

CONCLUSION

A gamified lesson design model proposal for mathematics instruction was put forward by conducting educational design research in the present study. The study aimed to make the gamification development process given in the literature specific to the field. To this end, the *Gamification Development Model* defined by Kim et al. (2018) and *Mathematics Knowledge for Teaching* (Ball et al., 2008) were brought together both in theory and in practice with pre-service teachers' designs by using the educational design model. The data obtained from the pre-service teachers' gamified lesson design processes were analyzed by using theory and the themes, codes, and sub-codes given in Table 4 were reached. Themes formed the design steps; codes and subcodes formed the design principles. The data obtained from this process revealed the relationship between the *Gamification Development Model* and *Mathematics Knowledge for Teaching*, and as a result, a gamified lesson design model proposal for mathematics instruction was developed.

The proposed model has a spiral structure due to the design process's nature (Figure 3). This structure shows that each next phase was built on the previous phase. However, the transition between these phases was intermittent and not rigid. On the contrary, each phase developed and changed with what was done in the previous and/or next phase. Thus, the design became dynamic and variable, providing flexibility to the design. As a result of the data collated from the review of the literature on gamification and the data collected from the pre-service teachers' gamified lesson design processes, the phases of the gamified lesson design process for mathematics instruction and the design principles involved in these phases can be expressed as follows:

1. **Target Analysis:** It is the phase in which educational and instructional needs are determined. In this phase, the levels of learners at the beginning of the process and their expected / targeted levels should be examined from various perspectives. This phase includes three sub-stages.
 - a. *Investigation of instructional content:* It entails the customization of the instructional scope of the design. For this, the subject/objective of the lesson to be gamified should be determined. It is also necessary to reveal the vertical and horizontal placement of this objective in the mathematics curriculum and determine the concepts covered by the objective and the relationship of these concepts with other concepts. These data will be effective in determining the points, subjects, and mathematical concepts that gamification design should focus on.
 - b. *Analysis of learner characteristics:* An instructional designer must have certain knowledge about the learner. While performing gamification design, learners' prior learning about the mathematical subject, common mistakes, misconceptions, knowledge of situations that can cause these mistakes, and learning strategies should be taken into

consideration. Besides, the general characteristics of learners (age, gender, etc.) should be known and reflected in the design.

- c. *Examination of the tools-equipment to be used in the instruction:* Concrete materials and information and communication technologies suitable for the subject should be determined before the design process. In this sense, concrete materials and information and communication technologies that can be included in the design should be examined in the context of the opportunities they will provide in the teaching of the subject.

2. Design: This phase refers to the design of gamification elements. How students will be motivated and how the story, dynamics, and mechanical elements will be included in the design are determined in this phase.

- a. *Determination of motivational strategies:* Motivation is of great importance for learners to participate and stay in the process. For this reason, what the intrinsic and extrinsic motivations of learners are, the factors affecting motivation, and learning theories related to motivation should be examined. Then, it should be determined how these elements of motivation will be included in the design.
- b. *Design of the story (optional):* The existence of the story element is optional in the gamification design process. However, if the story element is to be included in the design, the designed story must have the goal-based scenario elements. These elements include the situation, characters, goals, performance goals, in order to chain, metrics, barriers and conflicts, control, and predictable unexpected. Moreover, the elements included in the story should allow the learner to find answers to questions the learner will ask himself/herself such as "Why is it important to achieve this?", "Which problem can I solve with this knowledge?", "Which knowledge of mine should I use to solve this problem?", "Where did I make a mistake and how can I correct it?".
- c. *Design of the dynamics:* Dynamics refers to the feelings and experiences that learners will be engaged in during the process. These feelings and experiences should motivate learners and keep them engaged. In this context, dynamics such as competition, completion, and fellowship that are directly related to the motivation of learners should be included in the design.
- d. *Design of the mechanics:* The main purpose of mechanics is to create tools for experiencing dynamics. In other words, mechanics are the toolbox of the gamification process. The mechanics that define rewards, status, and the quest should be included in the design.

3. Development: It is the phase where the mathematical content is integrated by considering the target analysis and the design phase. In this phase, the scope of the subject that the design focuses on can be narrowed or expanded or the things done in the design phase can be updated. In these updates, the mathematics curriculum should be taken into consideration, and the subject/concept should be examined horizontally and vertically in the curriculum. In particular, level mechanics should be structured by considering these examinations and student knowledge. Following the operations made by focusing on the curriculum and learner characteristics, the information and communication technologies and/or concrete materials that will contribute to the provision of effective mathematics education should be determined, employed, or developed. Finally, the feedback system that will help students evaluate their progress, difficulties, and mistakes and will present the mathematical knowledge and explanations to be required by students in the implementation phase of the gamified lesson content should be constructed and thus the design should be finalized.

4. Implementation: It is the transfer of the developed gamification project to the learning environment. For this, first of all, the learning environment should be prepared for implementation. Then learners, instructional designers, and/or teachers should participate in the implementation phase and experience the gamification project. Attention should be paid to the duration planned for the implementation of the project and the flow that can be defined as the progress of the operations. In addition, unexpected situations related to instructional content and/or gamification elements should be addressed and resolved instantly by capitalizing on the information on teaching mathematics and gamification. All this implementation process should be videotaped to capture the opportunities for evaluation and improvement, and it should be supported with field notes to be taken by the implementer.

5. Evaluation-Improvement: It is the evaluation and improvement of the gamification elements and instructional content with the data obtained in the implementation phase. First of all, evaluation criteria that take into account the objectives of the design such as whether the gamification elements are working, their deficiencies, the extent to which the instructional design meets the learning needs should be determined. Tools such as checklists and rubrics based on these criteria should be created/selected and evaluated. After the completion of the evaluation, instructional designers and practitioners should identify the problems and offer solutions. Finally, the design should be finalized by reflecting the solution suggestions to the design.

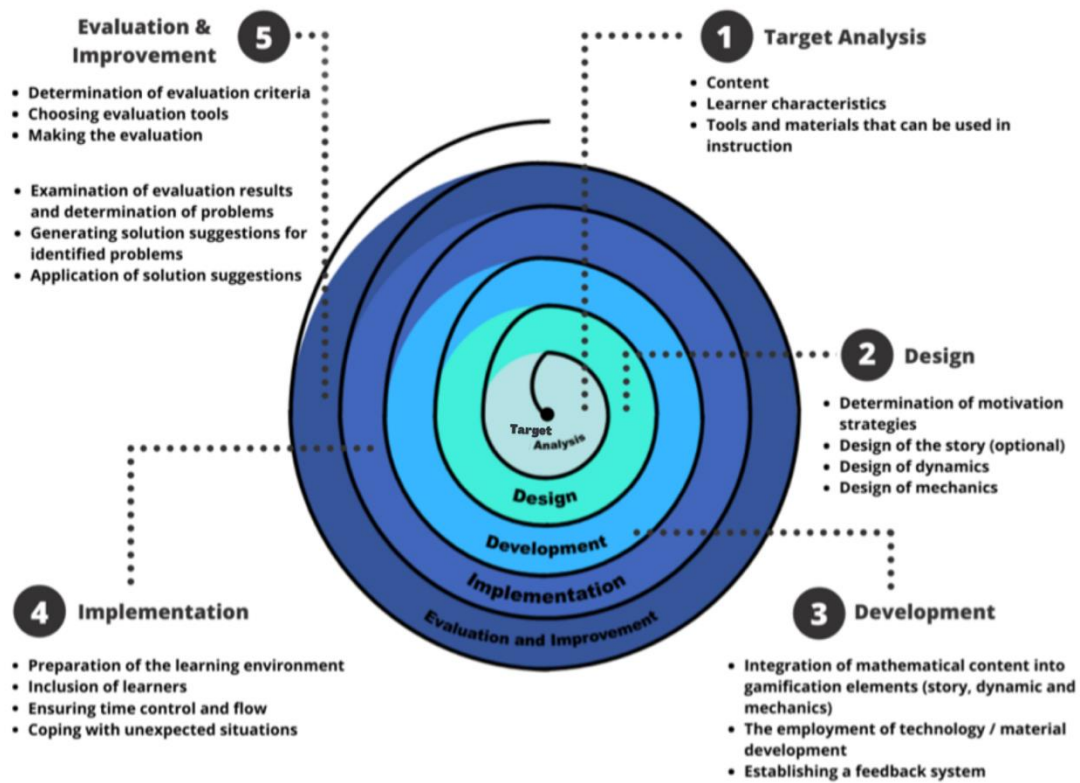


Figure 3. Gamified lesson design model proposal for mathematics teaching

DISCUSSION AND RECOMMENDATIONS

When the literature is reviewed, it is seen that many studies define gamification, explain the elements and functions of gamification or present examples of gamification. However, it is seen that studies on gamification in the field of education are limited; one of the reasons for this is that gamification is a new subject in the field of education. This naturally leads to the emergence of limited studies in the literature in which principles for the design of gamification in education are determined. Although researchers such as Kim et al. (2018) and Reiners and Wood (2015) have determined design principles for the development of gamification in the education dimension, these models need to be customized in various fields such as mathematics, foreign languages, and science because they form a general framework. Given that each field has its unique structure, learning and teaching processes, and differences from other fields, different methods such as gamification should be made specific to the field. Considering that the focus of the current study is mathematics education, it is a necessity to create a gamified lesson design model for mathematics instruction due to the specific requirements of this field.

With all these in mind, the current study proposes a new and detailed gamified lesson design model for mathematics teaching. This model includes field-specific design principles for teachers and instructional designers. While determining these design principles, the teacher knowledge model named *Mathematics Knowledge for Teaching* (Ball et al., 2008), which has a major role in the design and implementation of a lesson, the *Gamification Development Model* (Kim et al., 2018), which provides a general framework for the development of gamification, and the gamification development processes the pre-service teachers were involved in in the current study were taken as the basis. The emerging model proposal includes field-specific elements for design as different from the extant gamification development models in the literature. The model proposal, whose structure and general outline are given in Figure 3, is expected to contribute to the field of mathematics teaching, especially with the guiding principles it offers and gamified lesson design examples to be created through these principles. Given that the motivation, participation, and success of learners increase in the teaching environments where gamification is used (Çağlar & Kocadere, 2015; Begosso et al., 2018; Dominguez, Saenz-de-Navarrete, de-Marcos, Fernández-Sanz, Pagés, & Martínez-Herráiz, 2013; Considering Foster et al., 2012; Haman et al., 2018), designs that can be created with the model presented by the current study can offer similar contributions to the literature.

Moreover, as the model proposal put forward in the current study is based on *Mathematics Knowledge for Teaching*, it emphasizes teacher duties and teacher knowledge. By trying to include the elements that a teacher should focus on while designing a lesson (such as student knowledge, teaching knowledge, and curriculum knowledge) in the model, it was aimed that

teachers should pay attention to these elements while designing a gamified lesson. The Target Analysis, which is the first phase of the model, by focusing on the student, content, and tools before the design, was attempted to draw attention to the very basic but necessary elements for effective mathematics teaching. In other phases, it was aimed to make a correct integration by fulfilling the special requirements of mathematics teaching and to increase the quality of the created gamified mathematics lesson.

Two main factors are affecting the shaping of this model proposed in the present study. The first of these elements is the pre-service teachers' Mathematics Knowledge for Teaching emphasized above. The control of the content and pedagogical content knowledge of the pre-service teachers involved in this type of knowledge was made with the courses they took during their undergraduate education. The second element is the pre-service teachers' knowledge about gamification. This knowledge was provided by the training given by the researchers. However, it should not be forgotten that the lack of these two elements will affect the designs. Although the model created emphasizes what knowledge teachers or instructional designers should have, the level of this knowledge is important in shaping the designs. In this context, it is thought that the quality of designs can be enhanced with evaluation tools such as checklists and micro-teaching practices. Moreover, as can be seen in Figure 3, the end of the model has been left open, and if necessary, after the evaluation and improvement phase, the sixth and seventh phases can be added as re-implementation, re-evaluation, and improvement. It is thought that these phases to be added may be effective in eliminating the problems and/or deficiencies caused by various reasons.

Finally, the emphasis on information and communication technologies is very limited in the model. In the design process, although they focused on information and communication technologies for teaching the subject and the use of these technologies, the pre-service teachers expressed their concern that the technological infrastructure of the institutions they would teach in the future would be weak. In line with these concerns, they emphasized the role of concrete materials and teachers, rather than digital platforms, especially in the implementation process. However, although they expressed their thoughts that in-class interaction would be stronger after the implementation, they stated that the whole process could be transferred to a digital platform and the process could be easier in terms of classroom management in the digital environment. The opinion of PST4 regarding the inclusion of information and communication technologies in the design is as follows:

PST4: "When we started designing, I thought we could make everything digitally. I even researched Web 2.0 tools that I could use after the lesson. But while working with my friends, we realized that such a design requires a computer and internet connection for all students. Considering the schools, we are doing our practicum teaching now, this seems to be impossible even in big cities of Turkey because of the poor infrastructure of schools. What we did would be unrealistic when we thought that the places where most of us would be appointed would be small cities. Therefore, using concrete materials and building the structure controlling and guiding the process over the teacher made it more logical and feasible. But it would have been easier for the teacher to carry out the process if the infrastructure had been more suitable."

Although the pre-service teachers' thoughts are parallel to the studies in the literature (Denmeade, 2015; Gachkova, Somova, & Gaftandzhieva, 2020), many researchers have emphasized digital platforms and teaching management systems where gamification can be carried out and their benefits (Pastor-Pina, Satorre-Cuerda, Molina-Carmona, Gallego-Durán, & Llorens-Largo, 2020; Zaric, Gottschlich, Roepke, & Schroeder, 2020). In this context, the Design, Development, and Implementation phases of the model can be carried out through learning management systems such as Moodle, which can enable the creation of gamification designs.

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Statements of publication ethics

We hereby declare that the study has no unethical issues and that research and publication ethics have been observed carefully.

Author contribution statements

This study was prepared from the first author's PhD dissertation under supervision by the second author. For this reason, the study was conducted and reported with equal collaboration of the researchers.

Ethics Committee Approval Information

This study was prepared from the first author's PhD dissertation and the dissertation has ethical approval.

Approving Institution Name: Hacettepe University Ethics Committee

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The Change of Students' Science Related Affective Characteristics over Years: The Comparison of PISA 2006-2015 Assessments

Türkiye'deki Öğrencilerin Fen Dersine Yönelik Duyuşsal Özelliklerinin Yıllar İçindeki Değişimi: PISA 2006-2015 Karşılaştırması

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Keywords

1. Science literacy
2. Affective characteristics
3. Enjoyment of science
4. Science self-efficacy
5. Science activities

Anahtar Kelimeler

1. Fen okuryazarlığı
2. Duyuşsal özellikler
3. Fenden zevk alma
4. Fen özyeterliği
5. Fen etkinlikleri

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Abstract

Purpose: In this study, it was aimed to investigate the trend of the affective characteristics related to science literacy of the students who participated in PISA 2006 and 2015 assessments from Turkey based on their responses to the common items. In this regard, the characteristics measured by common items in both assessments, which are enjoyment of science, instrumental motivation, science self-efficacy, science activities, environmental awareness and optimism were discussed.

Design/Methodology/Approach: The sample of this research, that cross-sectional survey model was used, consisted of PISA 2006 and 2015 Turkey sample. Data analysis was carried out based on the common items in both assessments. The percentage distribution of the students' responses to the response categories of these items according to their years of assessment was summarized and was presented by comparative graphics. Whether there is a significant difference between the percentage distribution of students' responses to response categories according to the assessment years was analyzed by z test.

Findings: According to the results of the research, between 2006-2015 assessments it was observed that there was a decrease in the rate of students who enjoyed science and had high environmental optimism; however, an increase in the rate of students with high self-efficacy and high participation in science activities. On the other hand, no significant change was observed in students' instrumental motivation. For the environmental awareness characteristics, increases and decreases were concluded depending on the context of the environmental problem.

Highlights: The results of this study revealed that there is not a trend with a specific pattern in students' science-related affective features over assessment years. This situation puts an emphasis for students to be competent in science literacy as they need it to understand society and nature better and determine the relationship with affective features.

Öz

Çalışmanın amacı: Bu çalışmada PISA 2006 ve 2015 uygulamalarına Türkiye'den katılan öğrencilerin fenle ilgili duuşsal özelliklerindeki eğilimin ortak maddelere verilen tepkiler üzerinden karşılaştırmalı olarak incelenmesi amaçlanmıştır. Bu doğrultuda her iki uygulamada ortak maddelerle ölçülen fen öğrenmekten zevk alma, fen öğrenimine yönelik araçsal motivasyon, fenle ilgili öz yeterlik, fen etkinlikleri, çevresel konular hakkında farkındalık ve çevresel konular hakkında iyimserlik özellikleri ele alınmıştır.

Materyal ve Yöntem: Kesitsel tarama modelinin kullanıldığı bu araştırmanın örneklemini PISA 2006 ve 2015 Türkiye örneklemi oluşturmaktadır. Buna göre araştırmanın örneklemini PISA 2006 ve 2015 uygulamaları için sırasıyla 4942 ve 5895 öğrenciden oluşmaktadır. Araştırma verileri 2006 ve 2015 PISA uygulamaları kapsamında toplanan verilerin ayıklanması ve düzenlenmesiyle elde edilmiştir. Verilerin analizi ortak maddeler üzerinden yürütülmüştür. Uygulama yıllarına göre öğrencilerin bu maddelere verdikleri tepkilerin tepki kategorilerine yüzdelerle dağılımları özetlenerek bu bilgiler karşılaştırmalı grafikler kullanılarak sunulmuştur. Uygulama yıllarına göre öğrencilerin tepki kategorilerine yüzdelerle dağılımları arasında manidar farklılık olup olmadığı z testi ile analiz edilmiştir

Bulgular: Araştırma sonuçlarına göre 2006-2015 uygulamaları arasında fenden zevk alan ve çevresel iyimserliği yüksek olan öğrenci oranlarında azalış, fen özyeterliği ve fen etkinliklerine katılımı yüksek olan öğrenci oranlarında artış olduğu görülmüştür. Diğer yandan öğrencilerin araçsal motivasyon özelliğinde manidar bir değişim olmadığı dikkati çekmiştir. Bunlara ek olarak çevresel farkındalığın, çevre sorununun bağlamına göre artış ya da azalış gösterdiği sonucuna ulaşılmıştır.

Önemli Vurgular: Bu çalışmanın sonuçları göstermiştir ki öğrencilerin fenle ilişkili duuşsal özelliklerinde uygulama yılları arasında belirli bir örüntüye sahip eğilim bulunmamaktadır. Bu durum doğanın ve toplumun daha iyi anlaşılması için öğrencilerin yetkin olması gereken fen okuryazarlığı alanındaki öğrenci performansının duuşsal özelliklerle ilişkisinin kurulmasının önemini ortaya koymaktadır.

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INTRODUCTION

Comparability of the measurement results is as important as measuring learning outcomes in education. While having reliable and valid measurement results has always been a focus for measurement and evaluation process, obtaining comparable data gained importance by time; therefore, required different standards. It was the 1950's when researchers started to collect comparable data in order to match learning outcomes between states in the USA have begun. Objections to the studies which tried to collect data about student achievement and educational practices using standardized achievement tests had begun to increase through the mid 20 century. The main points of the criticism are that not every school has the same economical input, students' profile is different in every school, the main focus is only the measured content because of the concern of the high scores and they ignore the other content areas and such like. Additionally, due to the requirements such as the interpretation and use of the information provided by the standard achievement tests in different contexts, economies have started to apply large-scale tests. The first large-scale assessments started in the United States. The purpose of these studies was determined as collecting comparative data between states countries and using social dynamics in directing education policies (Kirsch, Lennon, Davier, Gonzales & Yamamoto, 2013). Thus, the educational levels of the countries can be determined, developed countries can be taken as an example in this sense, student achievement, which is getting more complex, can be measured in a more systematic and planned setting and how successful the education policies of countries are can be answered. Accordingly, First International Mathematics Study (FIMS) was conducted with 13 years old students from 11 countries in 1964 by International Association for the Evaluation of Educational Achievement (IEA). Later, First International Science Study (FISS) was held in 1970-1971 (Medrich & Griffith, 1992). These studies led to the first application of Trends in Mathematics and Science Study (TIMMS), which was conducted in 1995. In 1999, only eighth grade students participated to the TIMMS assessment (<https://www.iea.nl/about/org/history#section-480>). In the context of TIMMS assessments, which is carried out every four years, comparative data are collected from fourth and eighth grade students.

Programme for International Student Assessment (PISA) is one of the survey studies which is held by the Organization for Economic Co-operation and Development (OECD) every 3 years to collect comparable data between countries, to specify educational policies and to make determinations about the related variables. Within the context of PISA, fifteen-year-old students' reading literacy, mathematical literacy and science literacy are measured and various information about student, teacher, parents and school characteristics are collected. Every three year makes a cycle and each round focuses on a major domain, which is called a major domain. Various information related to the major domain are collected from students, teachers, parents and schools. The very first PISA assessment took place in 2000 (OECD, 2002). In 2003, which was the first assessment that Turkey participated, the focus was on mathematics, science in 2006, reading in 2009, mathematics in 2012, science in 2015 and reading in 2018 (OECD, 2004; OECD, 2006; OECD, 2010; OECD, 2013; OECD, 2017; OECD, 2019a). In each assessment, affective characteristics that are thought to be related to the major domain are evaluated together with the major domain. Science literacy has been the major domain only twice until today in 2006 and 2015 assessments, and affective characteristics related to science literacy have been measured only in these assessments (OECD, 2006; OECD, 2017).

When students' science literacy performances who participated from Turkey are examined, it can be said they show fluctuations over the years. Although the science literacy performances of 15-year-old students from Turkey increased gradually between PISA 2003-PISA 2012 rounds, a sharp decrease was experienced in 2015 assessments. There was an increase in science literacy performances again in PISA 2018. Science literacy average scores of students who participated from Turkey to PISA assessments increased (424, 454, 463) gradually since 2006, until PISA 2015 assessment that occurred with a big decrease (425) (Özgürlük, Ozarkan, Arıcı & Taş, 2016). In fact, according to the PISA 2015 results, there are no students for science literacy in proficiency level 6, which indicates the most sophisticated learning process of students, in the Turkey sample. The rate of students at the fifth level is only 0.3%. On the other hand, students who show low performance and are also below the second proficiency level performed little decrease (from 46,6 to 44,4) in PISA 2006 when the major domain was science literacy. Together with this, the increase in the student rates who performed at the first proficiency level or below from PISA 2012 to 2015 is quite large. When the distribution of students' science performances by their proficiency levels in PISA 2018 is examined, it is seen that the rate of students below the basic competence level of Turkey is above the OECD average, and the rate of students at the basic competence level and above is below the average (OECD, 2019b). Turkey ranked 33rd among 41 countries in 2003 in terms of international rankings in science literacy; 43rd among 57 countries in 2006; 43rd among 72 countries in 2009 and 2012; 51st among 72 countries in 2015 and 39th among 79 countries in 2018. In PISA 2018, it is seen that Turkey's science literacy average score increased again (468) and rose above the average (463) in the 2012 assessment, which is the highest average until then. Moreover, according to PISA 2018 results, the country with the highest increase in science literacy performance is Turkey (MEB, 2019). In the PISA 2018 assessment, it is seen that Turkey is one of the five countries that increased the average science literacy performance (OECD, 2019b). Based on these, it can be said that the science literacy performance of the students tends to increase except for the 2015 assessment. As PISA provides opportunities to the researchers by repetitive data collection procedures, it presents researchers a wide study area. PISA allows to relate the increase or decrease of students' achievement in a specific domain with the information collected within the context of the assessment. By this, it offers an opportunity to discover the trends of student achievement.

Today, science and science-based technologies have become essential not only for professionals, but also for being a party to many events and situations, and to carry out the process in the most beneficial way for themselves and for people around them. Now, the reason and solution of many problems at the global and local level can only be seen and solved by people who are educated in the field of science. For this reason, countries expect students who have completed secondary education to be "able to participate in conversations about science, present an idea and use technologies based on science". Current programs in science education recognize that having an understanding of science is very important and is a central element in the education of every young person (OECD, 2016). PISA measures students' science performance and their science knowledge in science-related issues in the processes of recognizing problems, acquiring new information, explaining scientific facts and making evidence-oriented conclusions (OECD, 2019a). Science literacy, which is one of the subjects of international assessments, is defined as the ability to deal with ideas and issues related to science as an active citizen in PISA 2015 science literacy framework (OECD, 2016). Science literacy is important for individuals and nations, both nationally and internationally. Understanding the problems faced by humanity such as the danger of water shortage, epidemics, and slowing down global warming etc. and solving them can only be achieved by understanding the logic in science and natural phenomena and acquiring the necessary information. Actions that can be taken on an individual scale such as avoiding consuming genetically modified foods, eating healthy and balanced nutrition, paying attention to personal hygiene and reducing the production of non-recyclable waste can also be supported with science education. Making the right decision for human health in avoiding consuming genetically modified foods, eating healthy and balanced nutrition, paying attention to personal hygiene and reducing the production of non-recyclable waste and many other areas will be possible with the contributions of science and technology (OECD, 2017). Joss and Durant (1995) stated that young people should have a certain awareness in science in order to take part in solving problems in science and technology. For this, individuals do not need to become scientists. It will be enough for them to understand the social effects of discussions about science and natural events among experts and to be able to make the best decision for themselves and their environment. In this sense, considering the contributions of science literacy made to the personal, social and academic lives of the individuals, an awareness and understanding in the field of science and technology is important for the "readiness for life" of young people (OECD, 2017). Science literacy, as measured by PISA, refers to the student's knowledge of science, what she/he can do with her/his knowledge, and how she/he can use this knowledge in real life situations (OECD, 2016).

Based on the definition of science literacy, it can be said that students' science performance has an affective aspect. Students' attitudes or tendencies towards science can be considered as an indicator of their interests. In this way, students can be motivated to take action, take responsibility, etc. (Osborne, Simon & Collins, 2003; Schibeci, 1984). When the literature is examined, it can be seen that there are studies that students' academic success in general, science achievement in particular, is related to affective characteristics. Uzun, Gelbal and Öğretmen (2010) conducted a study where they modelled the relationship between science achievement and affective characteristics and concluded that students' science self-efficacy, attitudes towards science, the importance of science and classroom activities related to science are correlated with their science achievement. Attitude scores and self-efficacy scores of high school 2nd grade students towards chemistry courses are predictors of chemistry course performance according to the result of another research by Kan and Akbas (2006). Kazazoglu (2013) studied the relationship between attitude towards courses and academic achievement and found out that there is a relationship between these two variables. Denton and McKinney (2004) measured their students' interest, value, effort, perceived capacity, absence of pressure and belonging to friends and faculty over 2 years in their longitudinal study. Based on the results of that study, there is a positive relationship between each variable and the students' course scores. Şimsek and Demirtaşlı (2012) concluded that academic self-concept and students' university entrance scores are effective predictors of students' academic achievement. Lay, Ng and Chong (2015) investigated the relationship between students' mathematics and science achievement and their value and expectations based on TIMSS data. Results showed that students' positive values towards science and mathematics can be the main factors that forms the students' science and mathematics achievement. The findings of Glynn's (2007) study, which aimed to reveal the relationships between the affective characteristics of non-science students and their achievement in science, showed that students' science motivation had a direct effect on their science achievement. Students' motivation is associated with how much their careers are related to science. Singh, Chang, and Dika (2006) aimed to reveal the relationships between students' science achievement and many affective characteristics in their study, in which they investigated why students in the USA show lower performance in science than their classmates. In this context, attitude towards science, self-concept, motivation, interest and participation characteristics were analyzed with path analysis. The findings of the study revealed that students' affective characteristics are directly or indirectly related to their science achievement. Sikhwari (2007) studied student achievement with affective characteristics at the university level. Self-concept, motivation and attitude are affective characteristics selected for the study. The findings of the study show that the theoretically claimed relationships are empirically verified.

It is essential in large-scale assessments to make use of the maximum amount of information that can be extracted from the data with the help of advanced statistical techniques to benefit from the advantages of repetitive data collection. Test equalization techniques are used to be able to make the results of the assessments, which are conducted on certain times, comparable (von Davier, 2013). There are two options for researchers if they want to examine the trends in PISA assessments. These are either to study through common items or scaled indices. In this study, trends were studied through common items. The reason to decide

on this option is that the comments made based on a single index score do not give as detailed information as item-based analysis could. In addition, there might be different trends for different items in the same subscale, and the examination of trends based on index scores may not reflect these differences. When the literature is examined, it is possible to come upon studies that investigate students' tendencies. When those studies are examined, (Aloisi & Tymms, 2010; Hipkins & Cameron, 2018; OECD, 2010; OECD, 2019b), it can be seen that trends are often limited to cognitive domains. Additionally, trends in learning domains and changes in trends are frequently studied through total scores. In addition to this, it was observed that the tendencies in some affective characteristics of the students in addition to the cognitive domain were also examined through the 2000 and 2009 assessments data, where reading skills were considered as the major domain. In this context, the change in students' attitudes towards reading skills and their relationship with school was examined (OECD, 2010). On the other hand, it was observed that there has been no study examining the trends of 15-year-old students regarding students' the science-related affective characteristics through common items. With this study, it was thought that this gap in the literature can be closed.

In 2006 and 2015 PISA assessments, science literacy was the major domain. Various affective characteristics (interest in learning science, science self-concept, future oriented science motivation, general value of science etc.) that were thought to be related to students' science literacy performance were measured in those assessments. Those affective characteristics are known to be effective on science literacy performance (Fonseca, Valente & Conboy, 2011; Kjærnsli & Lie, 2011; Sun, Bradley & Ackers, 2012; Ozel, Caglak & Erdoğan, 2013). In this context, the aim of this study is to examine the trends in affective characteristics of students participating in PISA 2006 and 2015 from Turkey through analyzing common items. For this purpose, enjoyment of science, instrumental motivation, science self-efficacy, science activities, awareness of environmental issues and environmental optimism subscales, which are related to science literacy and measured in both assessments, were discussed. Research questions to be answered in this study are as follows:

1. How are students' distributions of response categories to the common items of the subscales which measure science related affective characteristics (enjoyment of science, instrumental motivation, science self-efficacy, science activities, environmental awareness and environmental optimism) in PISA 2006 and 2015 Turkey sample?

2. Do the students' distributions to response categories of the common items of these subscales differ significantly between PISA 2006 and 2015?

METHOD

Research Design

In this study, it is aimed to examine the trend in affective characteristics related to science literacy of students who participated in PISA 2006 and 2015 assessments from Turkey. It is survey research. Survey research studies are carried out on a group in the universe in order to define the various characteristics of individuals from the same universe. Research data are collected by asking questions to the individuals in this group (Fraenkel, Wallen & Hyun, 2012). The main purpose of survey research is to define the properties of the universe. It is a cross-sectional survey model since student characteristics were measured both in 2006 and 2015 years. In cross-sectional survey models, data are collected at a single point in time, regardless of the length of the data collection process.

Population and Sample

The population in PISA assessments is defined as the 15 years old students who continue their education. The accessible universe of the research consists of 782875 and 925366 students for 2006 and 2015 assessments, respectively (OECD, 2009; MEB, 2015). In PISA assessments, the sample is selected using the two-stage stratified sampling method. In this context, schools where 15-year-old students are educated are selected by taking into account various school characteristics such as size, location, and type firstly. Secondly, students in the 15-year-old age group studying at these schools are listed, and selected from the lists randomly. The PISA 2006 and 2015 Turkey samples consist of 4942 students in 160 schools (EARGED, 2010) and 5895 students in 187 schools (MEB, 2015), respectively.

Data Collection Tools

The data of this research consists of data collected from PISA 2006 and 2015 Turkey assessments via student surveys. OECD publishes PISA data, reports containing information on data collection tools and various documents related to assessments on its official website (<https://www.oecd.org/pisa/>). The data used in this study was downloaded from the official website of the institution and organized according to the research purpose. Since science literacy is the major domain in 2006 and 2015 assessments, student surveys include subscales that aim to measure science related affective characteristics. Science related affective characteristics measured in 2006 and 2015 assessments and their subscales are presented in Table 1.

Table 1. Science related affective characteristics measured in PISA 2006 and 2015 assessments

PISA 2006	PISA 2015
Interest and Enjoyment of Science Learning	Science Interest
Interest in Science Learning	Enjoyment of Science

Enjoyment of Science Learning	Interest in Broad Science Topics
Motivation to Learn Science	Environmental Awareness and Optimism
<i>Instrumental Motivation to Learn Science</i>	<i>Environmental Awareness</i>
Future-oriented Science Motivation	<i>Environmental Optimism</i>
Self-Related Cognitions in Science	Science-Related Dispositions
<i>Science Self-Efficacy</i>	<i>Science Self-Efficacy</i>
Science Self-Concept	Epistemological Beliefs about Science
Value of Science	<i>Students' Science Activities</i>
General Value of Science	Science Learning in School
Personal Value of Science	Disciplinary Climate in Science Classes
Science-Related Activities	Inquiry-based Science Teaching and Learning Practices
Science Activities	Teacher Support in a Science Classes
Scientific Literacy and Environment	Teacher-directed Science Instruction
<i>Awareness of Environmental Issues</i>	Perceived Feedback
Perception of Environmental Issues	Adaption of Instruction
<i>Environmental Optimism</i>	<i>Instrumental Motivation</i>
Responsibility for Sustainable Development	
Science Career Preparation	
School Preparation for Science Career	
Student Information on Science Careers	
Science Learning and Teaching	
Science Teaching: Interaction	
Science Teaching: Hands-on Activities	
Science Teaching: Student Investigations	
Science Teaching: Focus on Models or Applications	

Common items measured in both 2006 and 2015 assessments were focused as the aim of this study is to examine the changes in affective characteristics related to science literacy by years. These characteristics, which are common in both assessments and are measured by scales with common items, are presented in italics in Table 1. Enjoyment of science, instrumental motivation, science self-efficacy, science activities, and environmental awareness and optimism are the names of these scales.

Various steps have been taken in the development processes to ensure the international validity of the scales. These steps are basing from the solid theoretical foundations of the psychological feature, composing items that are the indicators of the theoretical foundation, building consensus about the items, running both development and adaptation processes simultaneously, conducting field trials and analyzing psychometric properties, examining the conceptual significance of the scales with other variables and such like (OECD, 2009). Information on the subscales is presented below.

Enjoyment of Science: Enjoyment of science subscale was measured with the same scale consisting of five items in both assessments. Students were asked to indicate to what extent they agreed with the items given. The response categories of the items are 'strongly agree', 'agree', 'disagree' and 'strongly disagree'. The reliability coefficients of this subscale are 0.91 for PISA 2006 Turkey sample and 0.95 for PISA 2015 Turkey sample (OECD, 2009; OECD, 2017).

Instrumental Motivation: While instrumental motivation was measured with a five-item scale in PISA 2006, one of the items in the scale was removed in PISA 2015. Only two of four items remained same. Therefore, there are two common items for this subscale in 2006 and 2015 PISA. Students were asked to indicate to what extent they agreed with the items given. The response categories of the items are 'strongly agree', 'agree', 'disagree' and 'strongly disagree'. The Cronbach reliability coefficients of instrumental motivation are 0.91 for PISA 2006 Turkey sample and 0.90 for PISA 2015 Turkey sample (OECD, 2009; OECD, 2017).

Science Self-Efficacy: Science self-efficacy subscale was measured with the same scale consisting of eight items in both assessments. Students were asked to state their thoughts on how easy it would be to perform the tasks on their own. The response categories are "I could do this easily", "I could do this with a bit of effort", "I would struggle to do this on my own", and "I couldn't do this". Reliability coefficients of science self-efficacy subscale are 0.81 for PISA 2006 Turkey sample and 0.89 for PISA 2015 Turkey sample (OECD, 2009; OECD, 2017).

Science Activities: Science activities subscale was measured with a six-item scale in the 2006 assessments. One of the items in the scale was removed for PISA 2015 and four new items were added. Therefore, there are five common items in both assessments. Students were asked to indicate how often they perform the activities mentioned. The response categories for the items are "very often", "regularly", "sometimes", and "never or hardly ever". Cronbach Alpha reliability coefficients in science activities subscale for PISA 2006 and 2015 Turkey samples are respectively 0.82 and 0.94 (OECD, 2009; OECD, 2017).

Environmental Awareness: While environmental awareness was measured with a five-item scale in PISA 2006, one of the items in the scale was removed in PISA 2015 and three new items were added. There are four items common to both assessments. Students were asked how informed they are about environmental issues. The response categories are in a four-point Likert scale in the categories "I have never heard of this", "I have heard about this but I would not be able to explain what it is really about",

"I know something about this and could explain the general issue", "I am familiar with this and I would be able to explain this well". Cronbach Alpha reliability coefficients for this subscale are 0.72 for PISA 2006 Turkey samples 2006 and 0.90 for PISA 2015 Turkey samples (OECD, 2009; OECD, 2017).

Environmental Optimism: Environmental optimism subscale was measured with a six-item scale in 2006 assessments. One of the items in the scale was removed in PISA 2015 and two new items were added. However, there are five items common to both assessments. Students were asked whether problems associated with the environmental issues would improve or get worse over the next 20 years. The response categories are "improve", "stay about the same", and "get worse". Cronbach Alpha reliability coefficients for environmental optimism subscale are 0.87 for PISA 2006 Turkey samples and 0.93 for PISA 2015 Turkey samples (OECD, 2009; OECD, 2017).

Data Analysis

The data sets containing the student questionnaires of PISA 2006 and 2015 assessments were downloaded from the official website of the OECD. Although the affective characteristics considered within the scope of the study were measured in both assessments, it was observed that some scales were revised by adding new items or removing some of the old items in the 2015. For this reason, analyzes were conducted on common items instead of scale scores or indices. In this context, common items in each subscale were determined. Then, the distributions of responses to these items by years were summarized. This information is presented using comparative graphics. The z test was used to analyze whether there is a significant difference between the percentage distributions of students' response categories over the years. The approaches used to test the significant difference between the two statistics, such as two arithmetic means, ratio, reliability coefficient, variance and examination of the significant difference of percentage distributions are similar. For this purpose, a Z value is obtained by dividing the difference of the coefficients by the standard error of this difference. This value indicates the deviation from the unit normal distribution curve. This value should be equal or greater than the value 1.96 for 0.05 significance level and 2.36 for 0.01 significance level (Akhun, 1982). The reason for using this test is to determine the significance of the difference in the percentages of the response categories of the items by year.

In data analysis, the response categories of the items were examined firstly. Except one of the six subscales have four response categories and one subscale has three categories. For the subscales with four response categories, two sequential categories were combined and interpreted according to the appropriate meaning. For example, in the subscale of enjoyment of science learning, strongly agree and agree categories were combined and interpreted as the students who enjoy learning science. By this, the percentages of students who enjoy and don't enjoy were decided. Then the significance of the difference of the percentages between years was determined. The purpose of this combination is to enable a clearer interpretation of the change in the level of students' participation in items over the years.

FINDINGS

Percentage distributions of students' responses to common items in subscales of affective characteristics for science that are common in student surveys in PISA 2006 and 2015 Turkey assessments were presented in graphics. The z test results for comparing the difference between these percentages are presented below.

What is the Trend in the Enjoyment of Science Characteristics of Students Between 2006 and 2015 Turkey PISA Assessments?

The common items of the enjoyment of science subscale used in PISA 2006 and PISA 2015 are as follows:

I1: I generally have fun when I am learning broad science topics.

I2: I like reading about broad science.

I3: I am happy working on broad science topics.

I4: I enjoy acquiring new knowledge in broad science.

I5: I am interested in learning about broad science.

In Figure 1, percentage distributions of students' responses to the common items of the enjoyment of science subscale are presented.

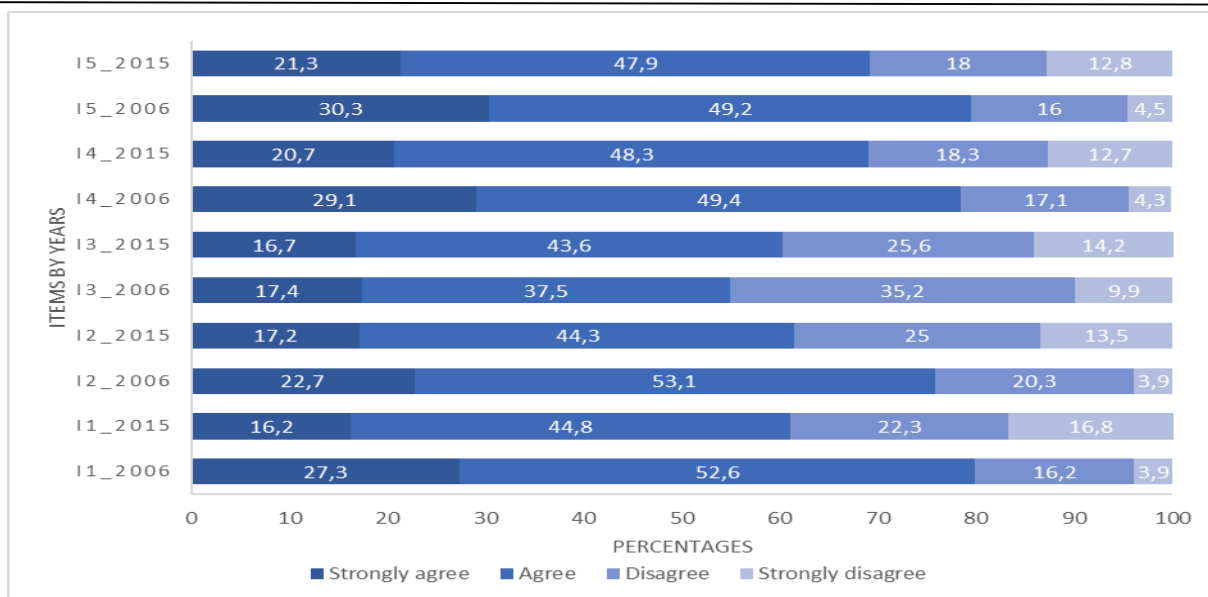


Figure 1. Distributions of students' responses to the common items of enjoyment of science subscale by years

When the percentage distribution of students' responses to the subscale of enjoyment of science, which is presented in Figure 1, is examined, it can be said that most of the students cluster in the "I agree" category. The distribution of the students to extreme response categories, which are "strongly agree" and "strongly disagree" categories, has had a huge change over the years. Accordingly, it is striking that while the rate of students who enjoy learning science decreased (the rate of students who say I strongly agree with the items), the percentage of students who do not enjoy learning science at all increased (the rate of students who say they strongly disagree with the items). Change in middle response categories is less than change in extreme response categories. Another point that draws attention is that the students who agree with the statement *I am happy working on broad science topics*, represented by item 3 (I3), have a lower percentage of participation compared to the other items. Based on these findings, it can be concluded that the rate of students who enjoy learning science very much has decreased and the rate of students who do not enjoy learning science at all has increased.

By combining "strongly agree" and "agree" categories, the students were divided into two groups: those who enjoy learning science and those who do not. Percentages of students who enjoy science and the z test results regarding the significance of this difference between these percentages are presented in Table 2 below.

Table 2. The percentages of students with high science self-efficacy by years and z test results

Items	2006	2015	Change Rate (%)	z
I1	79,9	61	-18,9	21,10**
I2	75,8	61,5	-14,3	15,72**
I3	54,9	60,3	5,4	-5,59**
I4	78,5	69	-9,5	11,00**
I5	79,5	69,2	-10,3	12,02**

**p<0.01

When Table 2 is examined, it is seen that the proportion of students who enjoyed learning science generally decreased between 2006 and 2015. In other words, the rate of students who agreed to learn about broad science topics (I1), to read articles (I2), to gain new information (I4) and being interested in science topics (I5) decreased in PISA 2015. It has been concluded that the difference is significant at the 0.01 level ($z > 2.58$). Unlike the other items, there is a significant increase ($p < 0.01$) in the rate of students who agreed to the statement *I am happy working on broad science topics* (I3). On the other hand, agreement with this statement is relatively less in both assessments.

What is the Trend in the Instrumental Motivation Characteristics of Students Between 2006 and 2015 Turkey PISA Assessments?

The common items of the instrumental motivation subscale used in PISA 2006 and PISA 2015 assessment are as follows:

- I1: Making an effort in my <school science> subject(s) is worth it because this will help me in the work I want to do later on.
- I2: Studying my <school science> subject(s) is worthwhile for me because what I learn will improve my career prospects.

In Figure 2, the percentage distributions of students' responses to the common items of the instrumental motivation subscale are presented.

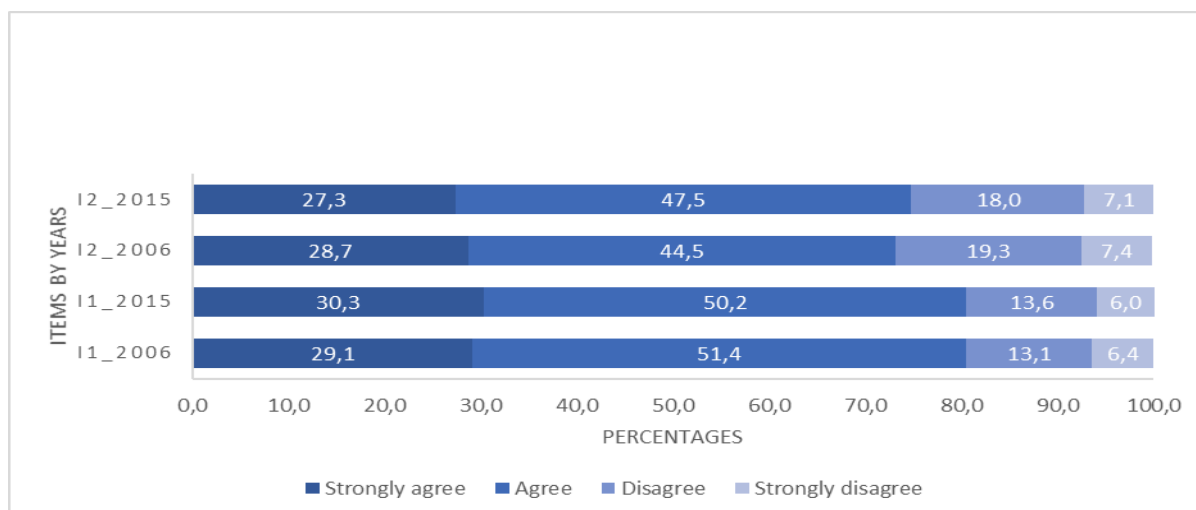


Figure 2. Distribution of students' responses to the common items of the instrumental motivation subscale by years

When Figure 2 is examined, it points that most of the students cluster in the "I agree" category. Between PISA 2006 and PISA 2015 Turkey assessments, it can be easily seen that there is no big difference in the distribution of the students' responses to the common items of the instrumental motivation subscale. Percentages of students with high instrumental motivation was determined by combining the "agree" or "strongly agree" categories. Z test results regarding the significance of the difference between these percentages are presented in Table 3 below.

Table 3. The percentages of students with high instrumental motivation by years and z scores

Items	2006	2015	Change Rate (%)	z
I1	80,5	80,4	-0,1	0,13
I2	73,3	74,8	1,5	-1,74

When Table 3 is examined, it is observed that there is a weak decrease in the proportion of students who reported agree or strongly agree for the first item (0.1%) while a weak increase in the proportion of students who reported agree or strongly agree for the second item (1.5%). However, the changes for both items in the percentages of students with high instrumental motivation by years are not significant ($z < 1.96$). In the light of these findings, it can be said that the trend for students' instrumental motivation remained stable between 2006 and 2015 Turkey assessments.

What is the Trend in the Science Self-Efficacy Characteristics of Students Between 2006 and 2015 Turkey PISA Assessments?

The common items of the science self-efficacy subscale used in PISA 2006 and PISA 2015 assessment are as follows:

- I1: Recognize the science question that underlies a newspaper report on a health issue.
- I2: Explain why earthquakes occur more frequently in some areas than in others.
- I3: Describe the role of antibiotics in the treatment of disease.
- I4: Identify the science question associated with the disposal of garbage.
- I5: Predict how changes to an environment will affect the survival of certain species.
- I6: Interpret the scientific information provided on the labelling of food items.
- I7: Discuss how new evidence can lead you to change your understanding about the possibility of life on Mars.
- I8: Identify the better of two explanations for the formation of acid rain.

In the science self-efficacy subscale, students were asked to report on how easy they thought the expressions stated in the items would be for them. Response categories for these items are "I could do this easily", "I could do this with a bit of effort", "I would struggle to do this on my own", and "I couldn't do this". In Figure 3, the percentage distributions of students' responses to items of the science self-efficacy subscale that has all items common in both assessments are presented.

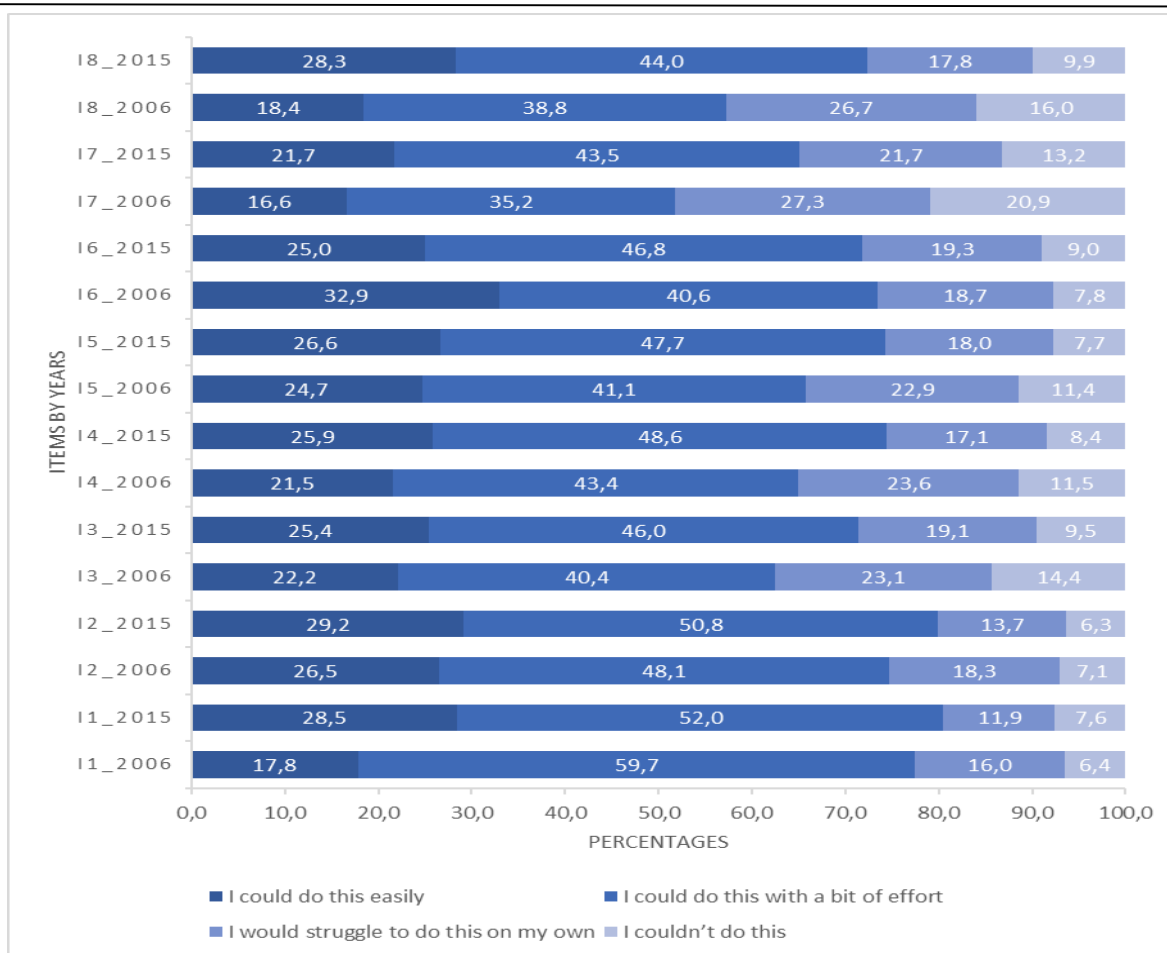


Figure 3. Distribution of students' responses to the common items of the science self-efficacy subscale by years

When the percentages according to response categories which are presented in Figure 2 are examined, it points to the fact that most of the students cluster in the "I could do this with a bit of effort" category. It was observed that for six items except for item 1 (I1) and item 6 (I6), the proportion of students who said "I could do this easily" and "I could do this with a bit of effort" increased. However, for item 1, it has been observed that there is an increase in the proportion of students who state that they could do it easily or they could do it with a bit of effort. Only the proportion of students, who stated that they could easily interpret the scientific information provided on the labelling of food items, specified in the item 6 (I6) decreased. Another remarkable finding is the increase in the proportion of students who reported that they couldn't either *recognize the science question that underlies a newspaper report on a health issue* (I1) or *Interpret the scientific information provided on the labelling of food items* (I6).

Students with high science self-efficacy, in other words, students who believe that they could do are determined by combining the response categories of "I could do this easily" and "I could do this with a bit of effort". The other two response categories are accepted to indicate the students with low self-efficacy. Percentages of students with high science self-efficacy and the z test results regarding the significance of this difference between these percentages are presented in Table 4 below.

Table 4. The proportion of students with high science self-efficacy based on common items by years and z scores

Items	2006	2015	Change Rate	z
I1	77,5	80,5	3	-3,77**
I2	74,7	79,9	5,2	-6,35**
I3	62,5	71,4	8,9	-9,66**
I4	64,9	74,5	9,6	-10,67**
I5	65,8	74,3	8,5	-9,48**
I6	73,5	71,8	-1,7	1,94
I7	51,8	65,2	13,4	-13,88**
I8	57,2	72,3	15,1	-16,17**

**p<0.01

Table 4 is examined, it is seen that the proportion of students with high science self-efficacy generally increased across the items except for item 6 in 2006 and 2015 assessments. In other words, in the 2015 assessment, there was a significant increase in the proportion of students who stated that they could do the mentioned behaviors for all items except item 6 easily or with a bit of effort ($p < 0.01$). For item 6, the difference between student proportions is not significant. To put it another way, students' science self-efficacy did not show a significant difference for this item. In the light of these findings, it can be said that although students' self-efficacy did not change in terms of interpreting the scientific information provided on the labelling of food items, it generally increased in terms of other common items of the subscale.

What is the Trend in Students' Participation of Science Activities Between 2006 and 2015 Turkey PISA Assessments?

The common items of the science activities subscale used in PISA 2006 and PISA 2015 assessments are as follows:

- I1: Watch TV programs about <broad science>
- I2: Borrow or buy books on <broad science> topics
- I3: Visit websites about <broad science> topics
- I4: Read <broad science> magazines or science articles in newspapers
- I5: Attend a <science club>

In science activities subscale, students were asked to report on how often they do the activities mentioned in the items. Response categories for these items are "very often", "regularly", "sometimes" and "never or hardly ever". In Figure 4, the percentage distributions of students' responses to the common items of science activities subscale are presented.

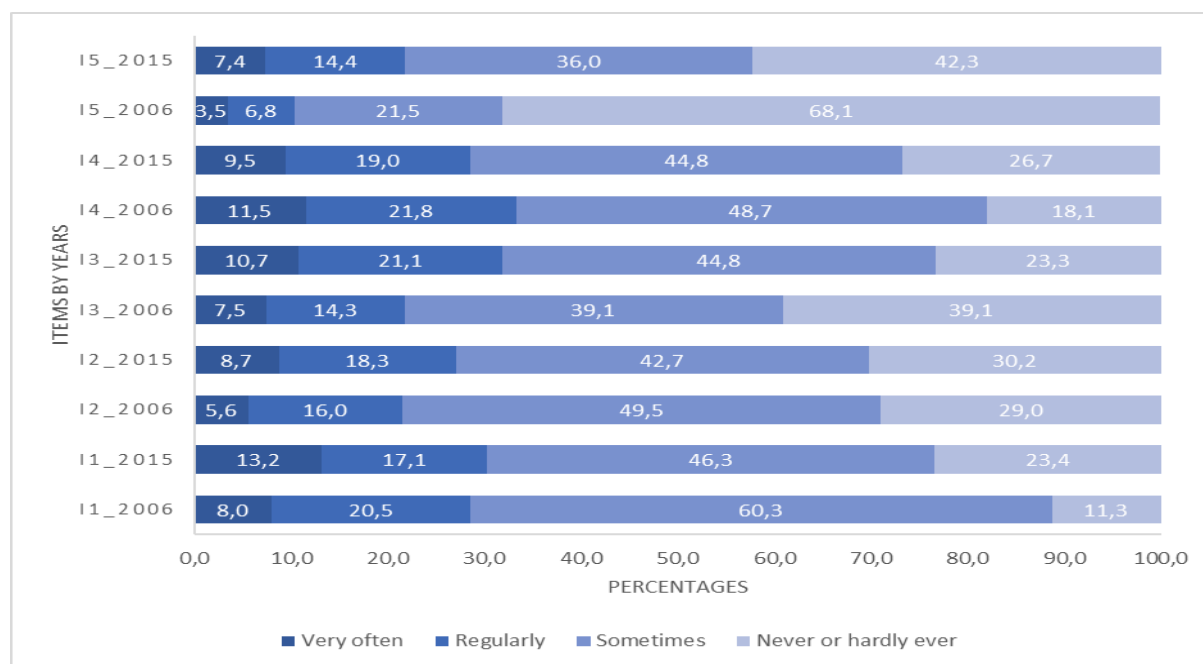


Figure 4. Distribution of students' responses to the common items of the science activities subscale by years

As presented in Figure 4, most of the students clustered in the "sometimes" response category and between the two assessments, the frequency of performing the activities generally tends to increase. However, regarding the frequency of participating in the science club in the fifth item, it is striking that in both assessments, the majority of the students (68% and 42%) clustered in the "never do" category. On the other hand, it is seen that the frequency of reading broad science magazines or science articles in newspapers, mentioned in I4, generally tends to decrease. In the light of these findings, it can be concluded that although the frequency of students attending a science club has increased between the two assessments, it is still rare and the frequency of reading broad science magazines or science articles in newspapers has decreased.

Students with high participation in science activities are determined by combining the response categories of "very often" and "regularly". Percentages of students with high participation in science activities and the z test results regarding the significance of the difference between these percentages are presented in Table 5 below.

Table 5. The percentages of students with high participation in science activities based on common items by years and z scores

Items	2006	2015	Change Rate	z
I1	28,5	30,3	1,8	-2,02*

I2	21,5	27	5,5	-6,53**
I3	21,8	31,9	10,1	-11,59**
I4	33,3	28,6	-4,7	5,19**
I5	10,4	21,7	11,3	-15,57**

**p<0.01, *p<0.05

When Table 5 is examined, it can be said that the proportion of students with high participation in science activities increased across the items between 2006 and 2015 assessments. In the 2015 assessment, while the proportion of students with high participation in the activity stated in the fourth item decreased, the proportion of students with high participation in the activities specified in the other items increased. The increase in the item 1 (I1) was found to be significant at the 0.05 level, the decrease in the item 4 (I4) and the increases in the other items were found to be significant at 0.01 level. According to these findings, while students' frequency of reading broad science magazines or science articles in newspapers decreased significantly, their frequency of watching TV programs about broad science, borrowing or buying books on broad science topics, visiting websites about broad science topics and attending a science club increased significantly.

What is the Trend in the Environmental Awareness Characteristics of Students Between 2006 and 2015 Turkey PISA Assessments?

The common items of the environmental awareness subscale used in PISA 2006 and PISA 2015 assessment are as follows:

I1: The increase of greenhouse gases in the atmosphere

I2: The use of genetically modified organisms (<GMO>)

I3: Nuclear waste

I4: The consequences of clearing forests for other land use

Within the environmental awareness subscale, students were asked to report on how informed they are about the environmental issues which are presented by items. Response categories for these items are stated as "I have never heard of this", "I have heard about this but I would not be able to explain what it is really about", "I know something about this and could explain the general issue", "I am familiar with this and I would be able to explain this well". In Figure 5, the percentage distributions of students' responses to the common items of the environmental awareness subscale are presented.

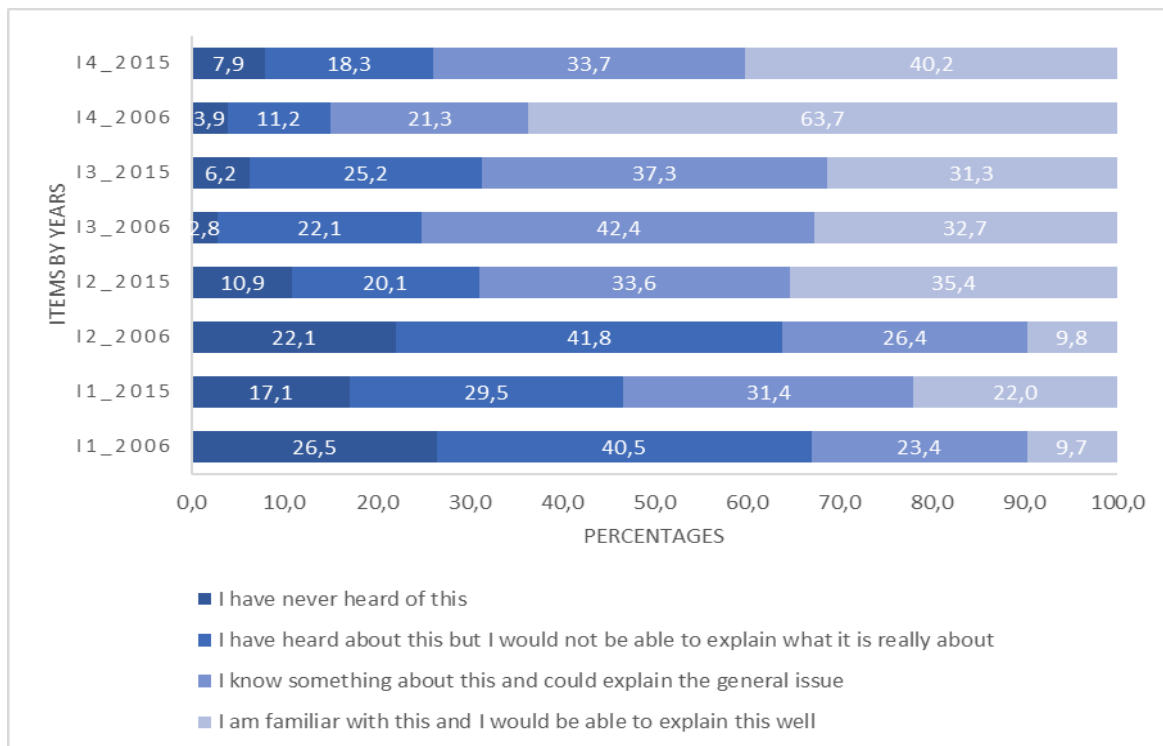


Figure 5. Distribution of students' responses to the common items of environmental awareness subscale by years

When the percentage distributions according to the response categories are examined in Figure 5, it is seen that there is no general trend regarding the students' environmental awareness. While the proportion of students with high environmental

awareness about the increase in greenhouse gases in the atmosphere and the use of genetically modified organisms has increased, the proportion of students with high environmental awareness about nuclear waste and the *consequences of clearing forests for other land use has decreased*. Another remarkable finding in Figure 5 is the excess rates of students who have never heard of these problems, which are very important problems of the world. According to the results of 2015 assessment, the issues with the lowest awareness of students are the increase in greenhouse gas, genetically modified organisms, the results of deforestation and nuclear waste, respectively.

Students who have environmental awareness at a certain level are determined by combining the response categories of “I know something about this and could explain the general issue” and “I am familiar with this and I would be able to explain this well”. Percentages of students with environmental awareness at a certain level and the z test results regarding the significance of the difference between these percentages are presented in Table 6 below.

Table 6. The percentages of students with environmental awareness at the certain level based on items by years and z scores based on common items

Items	2006	2015	Change Rate	z puanı
I1	33,0	53,3	20,3	-20,98**
I2	36,1	69,0	32,8	-33,65**
I3	75,1	68,6	-6,5	7,36**
I4	85,0	73,9	-11,1	13,95**

**p<0.01

When Table 6 is examined, it is seen that while the proportion of students with high environmental awareness increased for the increase in greenhouse gases in the atmosphere and the use of genetically modified organisms, it was observed that nuclear waste and the consequences of deforestation for other purposes decreased over years. These changes in the proportions of students with high environmental awareness were found to be significant at the 0.01 level.

What is the Trend in the Environmental Optimism Characteristics of Students Between 2006 and 2015 Turkey PISA Assessments?

The common items of the environmental optimism subscale used in PISA 2006 and 2015 assessments are as follows:

I1: Air pollution

I2: Extinction of plants and animals

I3: Clearing of forests for other land use

I4: Water shortages

I5: Nuclear waste

Within the environmental optimism subscale, students were asked to report on their thoughts about whether environmental issues which are presented by items will improve or get worse over the next 20 years. Response categories for these items are “improve”, “stay about the same”, and “get worse”. In Figure 6, the percentage distributions of students' responses to the common items of the environmental optimism subscale are presented.

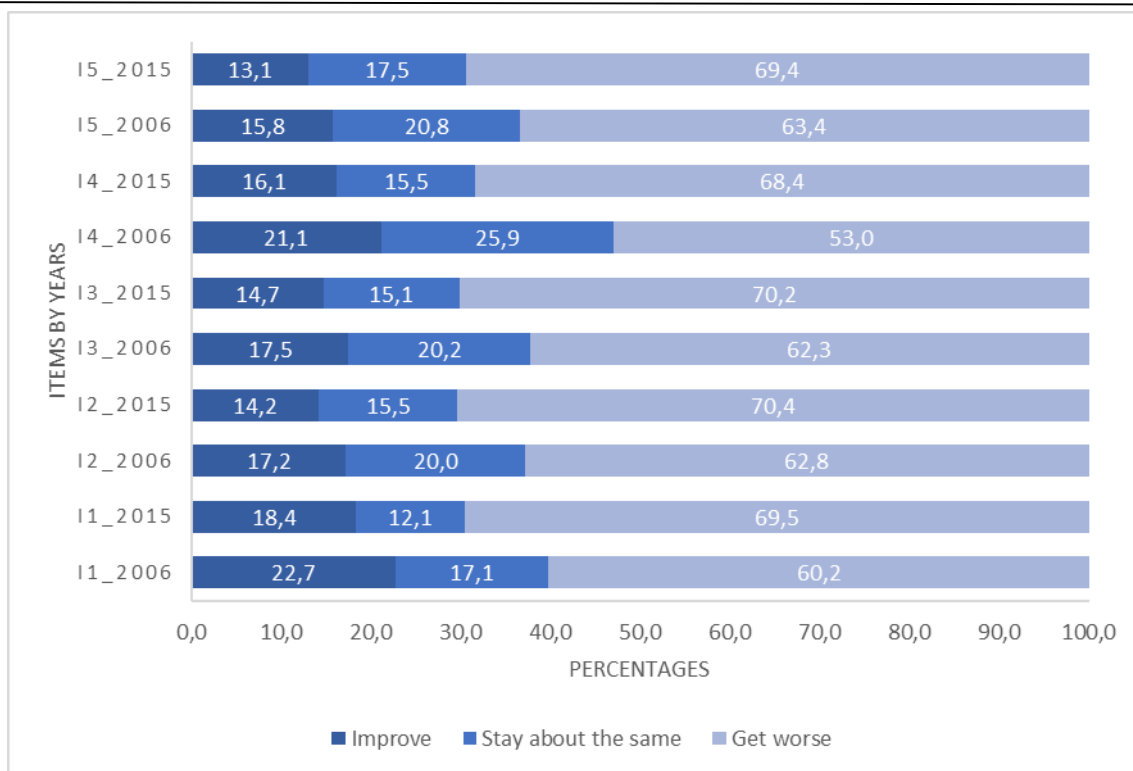


Figure 6. Distribution of students' responses to the common items of the environmental optimism subscale by years

When the distribution given in Figure 6 is examined, it can be easily seen that most of the students cluster in the “get worse” category for the future situation of environmental problems. In other words, the proportion of students who are optimistic about environmental issues is low in both assessments. In addition, the proportions in these categories have increased between two assessments. In the light of these findings, it can be said that the optimism of the students about environmental issues, which was already low, tends to decrease between two assessments.

The proportions of students with high environmental optimism determined by based on the “improve” category and the z test results regarding the significance of the difference between these proportions are presented in Table 7 below. The reason why changes in the proportions are examined for the ‘improve’ response category is that it is thought to reflect students' optimism better. For example, the change in the proportion of students who think that air pollution will improve would reflect their environmental optimism better.

Table 7. The percentages of students with high environmental optimism based on items by years and z scores

Items	2006	2015	Change Rate	z
I1	22,7	18,4	-4,3	5,48**
I2	17,2	14,2	-3	4,24**
I3	17,5	14,7	-2,8	3,91**
I4	21,1	16,1	-5	6,60**
I5	15,8	13,1	-2,7	3,94**

**p<0.01

When Table 7 is examined, it is seen that the proportion of students with high environmental optimism decreased for all items over the years. This decrease in these proportions was found to be significant at 0.01 level ($z > 2.58$). The change of the proportions is the highest for the expression "destruction of forests for other uses of the land" stated in the item 3 (I3). When these findings are examined, it can be said that students' environmental optimism, especially about the clearing of forests for other land use, has decreased between 2006 and 2015.

DISCUSSION

Within the scope of this study, it was aimed to reveal the trends in the common affective characteristics of students who participated in PISA 2006 and 2015 assessments from Turkey. In this context, enjoyment of science, instrumental motivation,

science self-efficacy, science activities, environmental awareness and optimism were discussed. It was concluded that there was no general trend for all science-related affective characteristics in PISA 2006 and 2015 assessments.

It was concluded that enjoyment of science subscale, which was considered in the context of science interest, tended to decrease over assessment years. It has been observed that there is a general and significant decrease in the proportion of students who enjoy learning science. Another important result of this study is the decrease in the proportion of students who enjoy learning science at a high level and the increase in the rate of students who do not enjoy learning science at all. Block (1971) stated that students' success in subject areas increases their enjoyment of the subject they are interested in. Between PISA 2006 and 2015 assessments, it is known that 15-year-old students in Turkey have a decrease in their enjoyment of science as well as their science literacy performance. This situation can be explained by the positive relationship between success and enjoyment suggested by Block. In addition, there are several studies showing that enjoyment of science has a positive and statistically significant relationship with science literacy performance (Yetişir, Batı, Kahyaoglu & Birel, 2018; Ötken, 2019). Yetişir et al. (2018) revealed that enjoyment of science is a significant predictor of science literacy performance for both socio-economically disadvantaged and non-disadvantaged groups in PISA 2015 Turkey sample. Considering the decrease in students' enjoyment of science education and their science achievement scores, it is noteworthy that more concrete steps should be taken to support the affective characteristics of students and to make science learning enjoyable.

It was concluded that there was no significant change in the instrumental motivation characteristic. Studies on instrumental motivation of students showed that instrumental motivation is a characteristic that contributes to learning (Soodman Afshar, Rahimi & Rahimi, 2014). Gardner (1991) states that both integrative motivation and instrumental motivation contribute to learning. It was pointed out that students with instrumental motivation studied longer than students without instrumental motivation and thought about science-related issues longer. Clement, Dörnyei, and Noels (1994) asserted that motivational features are related to student achievement. On the other hand, Yetişir et al. (2018) revealed that instrumental motivation is not a significant predictor of science literacy performance for the PISA 2015 Turkey assessment. From this point of view, it can be said that despite the decrease in students' science literacy performance in PISA 2006 and 2015 Turkey assessments, the lack of change in instrumental motivation is expected.

It was concluded that the characteristics of science self-efficacy and science activities, which were handled in the context of Self-Related Cognitions in Science, tend to increase. It was observed that the change in students' responses to science self-efficacy generally tended to increase. When the increasing tendency of the students' science self-efficacy and the decrease in their science literacy performance are evaluated together, it is seen that this result is inconsistent with the information in the literature. Several studies in the literature affirm a positive relationship between students' science self-efficacy and science literacy performance (Acar & Öğretmen, 2012; Çalışkan, 2008; Lavonen & Laaksonen, 2009). In addition, Ötken (2019), in his study with PISA 2015 Turkey data, showed that science self-efficacy plays a partial mediating role in the structural model he established regarding the mediating role of science self-efficacy in the relationship between science learning pleasure and science literacy achievement scores. The reason for the increase of students' science self-efficacy may be either due to the social desirability effect or the students' lack of awareness about their own knowledge and skills. Therefore, it is thought that there is a need for further studies to determine the causes. Another outstanding finding is that students' self-efficacy in interpreting labels on foods did not change significantly over years. When the literature is examined, reading the labels on foodstuffs stands out as one of the important issues addressed within the scope of food safety, nutritional information and health literacy (Besler, Buyuktuncer, & Uyar, 2012; Güneş, Aktaş, & Korkmaz, 2014; Karabacak 2019). Güneş, Aktaş, and Korkmaz (2014) found out in their study which was focused on examining the safe food purchase and consumption behaviors of consumers that approximately half of the people did not read the label information when purchasing packaged foods. Besler, Buyuktuncer and Uyar (2012) stated that the importance of food label information is not known in Turkey, the information on the labels is not understood and therefore not used effectively. In the same study, it was determined that the rate of people between the ages of 12-17 who read food labels frequently was 17%, and the rate of those who did not read at all was 40%. Karabacak (2019), in his study to evaluate the health literacy level of adolescents, revealed that 62% of the students between the ages of 14-15 were insufficient in the health literacy scale for food labels, healthy choices and keeping body weight in balance. These results in the literature, which are consistent with the findings of this study, reveal that students should be supported with various training in order to use the information on food labels.

It has been found that the rate of students performing science-related activities tends to increase. Students watch more science-related television shows, borrow or buy more books, attend science clubs and visit websites more often. On the other hand, there is a decrease in the proportion of reading broad science magazines or science articles in newspapers. One of the reasons for this could be the decrease in the proportion of reading newspapers and articles, as today a wide variety of information and sources of information can be easily accessed online. Another reason could be that students' desire to reach information in a faster and a more practical way may explain this situation. In addition to these, while some science related activities are more common among students, some are quite rare. Among the 15-year-old students participating in PISA 2015 assessment, the average rate of students who regularly follow websites and news related to science in OECD countries is 19% (OECD, 2016). In the Turkey sample, it is noteworthy that although this rate increased from 7.5% in 2006 to 10.7% in 2015, it remained quite below the OECD average. The fact that the average of Turkey is below the OECD average may be due to the students' limited digital and technological opportunities such as internet infrastructure and not having a technological product.

In the context of environmental awareness and optimism, it has been concluded that there is no general trend for environmental awareness while environmental optimism tends to decrease. Students' environmental awareness decreased for some subjects while increased for others. While students raised awareness of the increase in greenhouse gases and genetically modified organisms, their awareness of nuclear waste and deforestation for other uses of land decreased. Sachsman (2000) emphasizes that the mass media has a very important role in improving and developing the awareness of environmental issues. In that study, it was stated that communication tools that prioritize the events occurring in society tend to focus less on environmental issues and provide less information about environmental issues; therefore, people have little awareness of environmental issues and problems. According to the findings of another study conducted in China, primary and secondary school students' environmental awareness is low (Jinliang, Yunyan, Ya, Xiang, Xiafei, & Yuanmei, 2004). Studies in the literature revealed that different age groups generally have information about the same environmental problems (Islam, 2008; Strong, 1998). This situation makes the finding of the study meaningful. Studies show that environmental education and environmental awareness have not been developed sufficiently so far (Erten, 2006). Demir and Yalçın (2014) state that environmental education is generally considered as a spontaneous process in Turkey and therefore, environmental education is not as developed as desired. In their study, in which they examined the learning outcomes in the curriculum, it is concluded that there is no lesson related to environmental education in the curriculum in Turkey. According to the results of another study conducted by Demirbaş and Pekcan (2009), secondary school students are aware of environmental problems if they are arising from environmental pollution, air pollution and waste. Students mostly gave correct answers to the environmental problems they encounter and frequently see in daily life. However, the same students mostly gave wrong answers to the questions about the greenhouse effect, global warming, etc., which are among the current problems and are thought to be underestimated in the teaching environment. The findings of the study conducted by Bozkurt and Cansüngü-Koray (2002) point out that the greenhouse effect is not known by middle school students and is full of misconceptions. Considering all these, it can be concluded that the increase in greenhouse gases and students' awareness about genetically modified foods, which are the findings of this study, and the decrease in the awareness of nuclear waste and deforestation for the use of land for different purposes, is related to the inclusion of these issues in mass media and their teaching in school lessons.

It was concluded that students' environmental optimism decreased significantly between two assessments. According to the results of a study conducted in America, individuals' optimism regarding global environmental problems has also decreased. 83% of the study group saw global warming as a serious threat in 2007, it was reported that this level was only 70% in 2004 (Global Strategy Group, 2007). In another study conducted by Mor-Dirlik and Karatekin (2015), researchers tried to determine which students' characteristics are related with environmental awareness and optimism. The findings showed that students who are more successful in science courses have higher environmental awareness and optimism. In addition, the socioeconomic status of the family was also found to be a predictor of students' optimism and awareness. Considering the findings of this study together with the results obtained from the literature, it can be said that the decrease in students' environmental optimism can be explained by the increasingly apparent environmental problems and the increase in deaths due to environmental problems.

RESULTS AND RECOMMENDATION

According to the results of the study, affective characteristics examined were classified in four categories: characteristics that tend to increase, characteristics that tend to decrease, characteristics that there is no meaningful change and characteristics that a certain trend is not observed. While students' science self-efficacy and participation in science activities tend to increase, it is observed that their enjoyment of science and environmental optimism tend to decrease. Participation in science activities and science self-efficacy were expected to yield similar results. On the other hand, the decrease in the trend for enjoyment of science, which is closely associated with them, is an unpredictable finding of this study. It is also expected for students with high self-efficacy in science-related matters to participate in science activities. However, it is an unexpected and contradictory result that these students enjoy less science. It is recommended to examine the possible causes of this result. On the other hand, the lack of a meaningful trend in the students' instrumental motivation characteristics, that emphasizes the role of science as a mediator for realizing their wishes or achieving something, may indicate that there has not been a great change in the role of the science for acquiring a profession in the country conditions in the that ten years. Another result of the research is that environmental awareness does not show a general trend. It can be said that the increase in greenhouse gases and in students' awareness about genetically modified foods, and the decrease in the awareness of nuclear waste and deforestation for the use of land for different purposes, are related to the inclusion of these issues in mass media and their teaching in school lessons. The trend for environmental optimism to decrease can be considered as an indication that students think that adequate measures are not taken to protect the environment.

When the remarkable findings in the research results were examined, some suggestions could be made to researchers, policy makers and teachers. The first suggestion for researchers is to examine the reason for the increase in the proportion of students who enjoy solving problems related to science, although there is a general decrease in the proportion of students who enjoy science. Another point is the relationship between students' self-efficacy and science achievement and its contradiction with the literature. At this point, it is considered as important to determine the reasons for the increase in students' science self-efficacy.

It is also suggested to investigate the reasons why environmental awareness depends on the scope of the environmental issue, which is an interesting finding of this study.

One of the suggestions for teachers and policy makers is to take concrete steps to support and increase students' affective characteristics in science and to use new practices in curricula and classroom processes. Considering that students' environmental awareness is generally quite low, content that will increase students' awareness can be included within the scope of science education. Finally, it may be suggested that as students need some information to understand and use the information on food labels, necessary activities and training should be given inside or outside the classroom.

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Statements of publication ethics

We hereby declare that the study has no unethical issues and that research and publication ethics have been observed carefully.

Researchers' contribution rate

The study was conducted and reported with equal collaboration of the researchers.

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This study requires no ethics committee approval.

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Examining Development Prospective Mathematics Teachers Measurement and Evaluation Knowledge and Curriculum Knowledge through Lesson Study Method

Matematik Öğretmeni Adaylarının Ders İmecesı Yöntemiyle Ölçme-Değerlendirme ve Program Bilgilerinin Gelişiminin İncelenmesi¹ Meltem Koçak², Yasin Soylu³, Fatih Hayat⁴

Keywords

1. Lesson Study,
2. Measurement - Evaluation Knowledge,
3. Curriculum Knowledge
4. Prospective Teacher

Anahtar Kelimeler

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- 2.Ölçme-Değerlendirme Bilgisi
- 3.Müfredat Bilgisi
- 4.Öğretmen Adayı

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Abstract

Purpose: The purpose of this study is to examine the development of prospective mathematics teachers' knowledge on measurement-evaluation and curriculum through lesson study method.

Design/Methodology/Approach: In this study, a qualitative paradigm was adopted, and among designs, a case study method was used. The participants of the study were five senior students of the Secondary Mathematics Teacher Training program, who had already taken the teaching practice course. The data of the study were collected within a teaching practice course. In this process, observation and semi-structured interviews were done, and descriptive analysis techniques were used for the analysis of the data. Observations were used to collect data related to measurement and evaluation knowledge the observation form developed by Gökkuurt (2014) and were to collect data related to curriculum knowledge the observation form developed by Şahin and Soylu (2017). Semi-structured interviews with prospective teachers as for were done upon the effectiveness, usability, etc. of lesson study method.

Findings: When the data were analyzed, it was seen that the measurement - evaluation knowledge and curriculum knowledge of the prospective teachers were developed by the of the lesson study method. When interviews with prospective teachers were examined, it was observed that they were aware of this. When the explanations of the prospective teachers were examined, it was seen that discussions made in the process of lesson planning, discussions and evaluations during the evaluation of the applications after observation made a contribution to their pedagogical knowledge.

Highlights: Measurement - Evaluation Knowledge and Curriculum Knowledge are significant due to the role of instruction. With this study, it is provided to develop this two pieces of information which have important roles in the development of pedagogical knowledge of prospective teachers. This situation is important for the prospective teachers to perform the appropriate teaching to learning outcome in the program and also to develop the skills of measuring and evaluating to the extent that the program predicts. This study, carried in real life context, provides valid and reliable results

Öz

Çalışmanın amacı: Bu çalışmanın amacı matematik öğretmeni adaylarının ölçme – değerlendirme ve program(müfredat) bilgilerinin ders imecesı yöntemiyle gelişiminin öğretmenlik uygulaması dersi kapsamında incelenmesidir.

Materyal ve Yöntem: Nitel araştırma yaklaşımının benimsendiği bu çalışmada durum çalışması yöntemi kullanılmıştır. Çalışmanın katılımcılarını ilköğretim matematik öğretmenliği programının, son sınıfta öğrenim gören ve öğretmenlik uygulaması dersini hali hazırda alan 5 öğretmen adayı oluşturmaktadır. Çalışmanın verileri gözlem ve yarı yapılandırılmış mülakat teknikleri ile öğretmenlik uygulaması dersi kapsamında toplanmıştır. Toplanan verilerin analizinde betimsel analiz tekniği kullanılmıştır.

Bulgular: Veriler incelendiğinde öğretmen adaylarının ölçme - değerlendirme ve müfredat bilgilerinin ders imecesı yöntemiyle geliştirildiği görülmüştür. Öğretmen adayları ile yapılan görüşmeler incelendiğinde bunun farkında oldukları görülmüştür. Öğretmen adaylarının açıklamaları incelendiğinde ders planlama sürecinde yapılan tartışmaların, uygulamaların gözlem sonrası değerlendirilmesi sırasında yapılan tartışma ve değerlendirmelerin pedagojik bilgilerine katkı sağladığı görülmüştür.

Önemli Vurgular: Ölçme-değerlendirme ve müfredat bilgisi öğretimin rolü açısından önemlidir. Bu çalışma ile öğretmen adaylarının pedagojik alan bilgisinin gelişiminde önemli roller olan bu iki bilginin gelişimi sağlanmıştır. Bu durum, öğretmen adaylarının programda öğrenme kazanımlarına uygun öğretimi gerçekleştirmeleri ve programın öngördüğü ölçüde ölçme ve değerlendirme becerilerini geliştirmeleri açısından önemlidir. Gerçek hayat bağlamında yürütülen bu çalışma, geçerli ve güvenilir sonuçlar vermektedir.

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INTRODUCTION

Lesson study method can be expressed as a system of teachers' learning which involves basic research processes in which a small group of teachers work in collaboration and aim at solving problems related to teaching, developing educational practices and improving learning (Perez Gomez, Soto Gomez, & Servan Nunez, 2015). A qualified lesson study method includes certain characteristics such as "assisting in improving teaching in the classrooms by developing the teachers' content knowledge and pedagogical content knowledge, providing them with the skills to monitor and analyse students' learning, getting them to develop perspectives, and finally ensuring better student learning" (Fernandez & Yoshida, 2012, p. 141). In the lesson study process, teachers come together, plan a lesson collaboratively so as to ensure effective student learning, implement, observe, and evaluate it, repeat the lesson in its revised form, and collect data in the process in order to understand the role of the lesson in the learning of the students (Murata, 2011; Takahashi, Lewis & Perry, 2013).

Within this context, it has been reported that this method gives teachers the opportunity to observe their colleagues and contributes to their mutual professional development culture and the development of their pedagogical knowledge that plays a role in transferring their special field competence (Akiba & Wilkinson, 2016; Boran & Tarim, 2018; Dotger & Walsh, 2015; Güner & Akyüz, 2017).

One of the fields where the lesson study method is used the most frequently is mathematics education (Fernandez, Cannon & Chokshi, 2003). This situation may be stemming from the fact that mathematics is one of the fields in which students have the most difficulty (Baklaci, 2017; Van de Walle, Karp & Bay-Williams, 2014), and therefore ensuring the professional and pedagogical development of teachers in mathematics teaching is gaining importance each passing day. Within this context, teachers' development in their knowledge of teaching strategies, subject and content, measurement and evaluation, curriculum and understanding the learning process of students occupies an important place in their professional and pedagogical development (An, Kulm, Wu, 2004; Shulman, 1986; Tamir, 1988). In this framework, many models related to the components of pedagogical content knowledge (PCK) have been developed, and these models are summarized as in Table 1 (Gökkurt, 2014).

Table 1. Models developed in relation to the components of pedagogical content knowledge

Researchers	Teaching Knowledge	Purposes knowledge for teaching	Understanding students learning	Curriculum knowledge	Teaching methods and presentation Evaluation	Content knowledge	Context knowledge	Pedagogical knowledge
Shulman (1987)			X		X			
Tamir (1988)			X	X	X			
Smith and Neale (1989)		X	X		X			
Marks (1990)			X	X	X	X		
Grossman (1990)		X	X	X	X			
Cochran et al. (1993)			X			X	X	X
Geddis (1993)			X	X	X			
Fernandez-Balboa and Stiehl (1995)		X	X		X	X	X	
Gokbulut (2010) as cited in Tuan (1996)			X	X	X	X	X	
Magnusson et al. (1999)		X	X	X	X			
Carlsen (1999)		X	X	X	X			
Hashweh (2005)		X	X	X	X	X	X	X
An, Kulm and Wu (2004)	X			X		X		
Loughran et al. (2006)		X	X		X	X	X	X
Kaya (2009)			X	X	X	X		
Gokbulut (2010)			X	X	X	X		

When Table 1 was examined, it was seen that researchers examined different components of PFK. In this context, Shulman (1987) stated in the model he developed that the pedagogical content knowledge had two key components. One of these components is the knowledge of understanding student learning (knowledge of understanding students), and the other one is the knowledge of teaching strategies (teaching presentation knowledge). Tamir (1988) expanded this model expressed by Shulman (1987) and added curriculum knowledge and evaluation knowledge to PFK. In the model developed by Smith and Neale (1989), a content knowledge component was included for the first time. When the models developed for PFK by other researchers were examined, it was seen that they actually mentioned similar components, and that the names for some components were expressed differently by various researchers. Still, a skeletal structure was formed for PFK.

It has been emphasized that these knowledge types included in the pedagogical content knowledge are related to the experience gained by the teacher while teaching a certain subject again and again, and that they do not develop by studying with

traditional methods (Hashweh, 2006). Therefore, using appropriate methods such as lesson study methods that lend themselves to gaining experience by teaching repeatedly is effective in terms of development of these knowledge types (Ni Shuilleabhain, 2016). When studies conducted on this issue were examined, it was found that regarding the pedagogical content knowledge, mostly teaching strategies knowledge, understanding student learning knowledge, and subject/content knowledge were emphasized (Csikos & Sztányi, 2020; Cumhuriyet & Korkmaz, 2020; Delgado-Rebolledo & Zakaryan, 2020; Didiş Kabar & Amaç, 2018; Güven & Gökdağ Baltaoğlu, 2017; Gökkurt, Şahin, Soylu, & Doğan, 2015; Kula Ünver, Özaltun Çelik, & Bukova Güzel, 2020), and that studies including measurement and evaluation knowledge and curriculum knowledge were limited and neglected (Alvunger, 2018; Deng, 2018; Koçak, Gökkurt, & Soylu, 2017; Remillard & Kim, 2017; Şahin & Soylu, 2017).

Measurement-evaluation knowledge is defined as the teachers' knowledge of the purposes and functioning of measurement-evaluation methods, and their skill to create and implement them (Baştürk & Dönmez, 2011). Measurement and evaluation is important in the constructivist learning approach as it is a part of the teaching process (Gelbal & Kelecioğlu, 2007), and all evaluations that adopt aims such as evaluation of the curriculum, determining learning gaps, determining the effectiveness of teaching, analysing students' development, guidance, and evaluation of students' achievements are obtained from measurement results (Baykul, 2014). It is obvious that in order for teachers to make effective measurement and evaluation, their knowledge of this issue must be sufficient and rich, but when the literature is examined in this context, it is seen that measurement and evaluation knowledge is not attached the importance it deserves (Şahin & Soylu, 2019). Curriculum knowledge, which similarly did not receive the importance it deserves, was defined by Shulman (1986) as the capability of dealing with the association of the subject the teacher is teaching with the other subjects of mathematics and handling the subjects of mathematics in a holistic framework. In this context, curriculum knowledge is important in terms of the appropriate management of the teaching process, as it includes the teacher's strong knowledge of curriculum and concept (Akkuş, Akkaş, & Yıldırım, 2018). Accordingly, prospective teachers' knowledge of curriculum can be regarded as important and necessary in terms of achieving the outcomes targeted in the curriculum and implementing effective teaching.

Teaching practices play a key role in prospective teachers' attainment of these competences and in the process of educating qualified teachers. This is because prospective teachers can assume the teacher's role and responsibility in a real classroom environment within the scope of teaching practices (Gökçe & Demirhan, 2005). However, the lecturers' observing the lessons of prospective teachers 1 or 2 times in a 14-week semester and giving them feedback within the scope of teaching practice course is not sufficient for the development of the prospective teachers' pedagogical knowledge (Baki & Arslan, 2015). At this point, the lecturers' being on the content more frequently, having a stronger communication with the teaching practice teachers at schools (Bay, Şeker, & Alisinanoğlu, 2020; Saka, 2019), assisting prospective teachers more in the lesson planning process (Paker, 2008), and giving feedback on the practices will significantly contribute to the development of prospective teachers' pedagogical knowledge (Baki & Arslan, 2015). This method is seen as a method that enables the lecturer to be in the content and to cooperate with the teacher and the prospective teacher. Thus, in the study, it was aimed to examine the development of the prospective teachers' knowledge of measurement-evaluation and curriculum, which are among the components of pedagogical content knowledge that are usually neglected in the literature, through lesson study method within the scope of teaching practice course. It is important for the study to achieve its aims in terms of getting the prospective teachers to gain the skills required to realize teaching in accordance with the learning outcomes specified in the curriculum prior to starting the teaching profession, and the skills to make measurement and evaluation as specified in the curriculum. Considering pedagogical content knowledge as a whole, it is believed that measurement-evaluation knowledge and curriculum knowledge are as important as other components and should not be neglected.

Sub-problems of the research:

1. How is the impact of lesson study method on the development of mathematics prospective teachers' measurement and evaluation knowledge?
2. How is the impact of lesson study method on the development of mathematics prospective teachers' curriculum knowledge?

METHOD

In this study which adopted the qualitative research approach, the case study method was used. Qualitative research is a research approach in which the research process is flexible, the data are analysed in-depth in this process and explicitly expressed at the end of the research (Kohlbacher, 2006). The case study method is defined as the examination of a current phenomenon within its real life framework without interfering with the circumstances by directing the questions of "how" and "why", and it is stated that the data in a case study can be collected through interviews with the individuals involved in a directly observed event or events (Yin, 2014). In the current study, case study method was used as "how" the knowledge levels of the prospective teachers about measurement-evaluation and curriculum were analysed in a real classroom environment as the natural environment without interfering with the circumstances. In this process, in line with the logic of case study, the data of the study were collected through observation technique, and at the end of the process, semi-structured interviews on the lesson study method used were held.

Participants

Criterion sampling, one of the purposeful sampling methods, was used in selecting the participants of the study. The main principle in this sampling method is studying all cases that meet a series of predetermined criteria (Yıldırım & Şimşek, 2011). The criteria that were studied in this research were determined as the prospective teachers being senior students in the department of primary school mathematics teaching and currently taking teaching practice course. Within this context, the participants of the study consisted of 5 prospective teachers who were in the fourth year of the primary school mathematics teaching department of the faculty of education at a state university in Turkey and currently taking teaching practice course. Accordingly, the students taking teaching practice course were randomly distributed into groups of five, and the group that came across the researcher was included in the study. The reason why the fourth year prospective teachers were included in the study was that they had taken most of the education courses (Measurement and Evaluation, Principles and Methods of Teaching) and content education courses (Special Teaching Methods I-II, School Experience, Educational Technologies and Material Design), and therefore, they were deemed appropriate for the purpose of the study. Besides, these prospective teachers were chosen in order to ensure a real classroom environment so that the curriculum that was prepared in accordance with the logic of lesson study method could be applied, as they had already taken the teaching practice course.

While reporting the findings of the research, instead of the real names of the students, codes such as S1, S2, S3, S4, S5 were used in line with ethical principles.

Data Collection Tools and Data Collection Process

The data of the study were collected through semi-structured observation techniques. In the study, the observation technique was preferred, because it provided the opportunity to do direct observation of the prospective teachers' teaching the subject of geometric objects as well as enabling the participants to be thoroughly examined in all aspects and obtaining more realistic information (Yıldırım & Şimşek, 2011). In the observation process regarding measurement-evaluation knowledge, the observation form developed by Gokkurt (2014) was used, while in the observation process regarding curriculum knowledge, the observation form developed by Sahin and Soylu (2017) was employed without making any changes (see Appendix 1). In this process, the prospective teachers were informed about the lesson study method, and it was explained to them that lesson observation would be done in this context, and that they would be a part of this process. One lesson hour (40 mins.) per each prospective teacher was allocated for the observation process.

In this process, it was considered important and necessary to receive opinions and recommendations of the practice teachers related to the lesson study process in terms of contributing to the professional development of the prospective teachers. Accordingly, semi-structured interviews were held with the prospective teachers at the end of the process. These interviews were held in order to take the views of prospective teachers and to understand their perspectives related to the effectiveness of the lesson study method used and its contribution to the prospective teachers (Creswell, 2017, p.126). Prior to the semi-structured interviews, the prospective teachers were informed about the types of questions to be directed to them in the interview, and how long the interview would last. In addition, the prospective teachers were also informed that a voice recorder would be used in the interview so as to prevent loss of data, and their consent was taken. A quiet environment was chosen for the interviews, and the interviews took around 5-10 minutes each. In the interviews, the prospective teachers were asked how lesson study method affected their lesson teaching and what the positive and negative effects of this method were from their own perspectives, and attitudes evaluating and judging the prospective teachers were avoided in the interviews. The data collected through observations and interviews were conveyed clearly and in a detailed manner.

In the data collection process, within the scope of lesson study method, each prospective teacher was asked to prepare an individual lesson plan in accordance with the curriculum applied by the Ministry of National Education (MNE) and to teach a lesson to 7th grade students in line with the plan they had prepared. These lessons taught by the prospective teachers were observed by 2 researchers (expert lecturer, practice teacher) in the real classroom environment within the scope of observation forms, and observation notes were taken.

In the next stage, as required by the lesson study method, the researchers and 5 prospective teachers came together and prepared a common lesson plan under the guidance of the expert lecturer. This common lesson plan was implemented by a prospective teacher who was randomly selected from the group. This lesson taught by the prospective teacher was observed by 2 researchers (expert lecturer, practice teacher) and other prospective teachers in the real classroom environment, and observation notes were taken. The observations done at this stage were aimed at identifying whether the lesson plan worked effectively or not, and observation forms were not used. Using the observation notes taken, the aspects of the plan that worked well, the aspect that worked poorly, what the problems stemming from the plan were, what the problems stemming from the prospective teacher, and the reactions of the students in the classroom were discussed, and the lesson plan was revised. The lesson plan revised according to the observation notes was implemented in another class by another prospective teacher, and 2 researchers (expert lecturer, practice teacher) and the other prospective teachers (4 prospective teachers other than the one teaching the lesson) observed the lesson and took observation notes. The plan was revised again by using the observation notes

taken and was given its final form. The prospective teachers were allowed to benefit from various resources while preparing the lesson plan so as to ensure that they would develop the most effective plan.

In the last stage, each prospective teacher was asked again to prepare an individual lesson plan in accordance with the curriculum applied by the Ministry of National Education (MNE) and to teach a lesson to 7th grade students in line with the plan they had prepared. These revised lessons taught by the prospective teachers were observed by 2 researchers (expert lecturer, practice teacher) in the real classroom environment within the scope of observation forms, and observation notes were taken.

By evaluating the observation notes taken before and after the implementation of the lesson study method, it was determined whether the prospective teachers showed any development in terms of their measurement-evaluation knowledge and curriculum knowledge. A brief summary of the data collection process is presented in Figure 1.

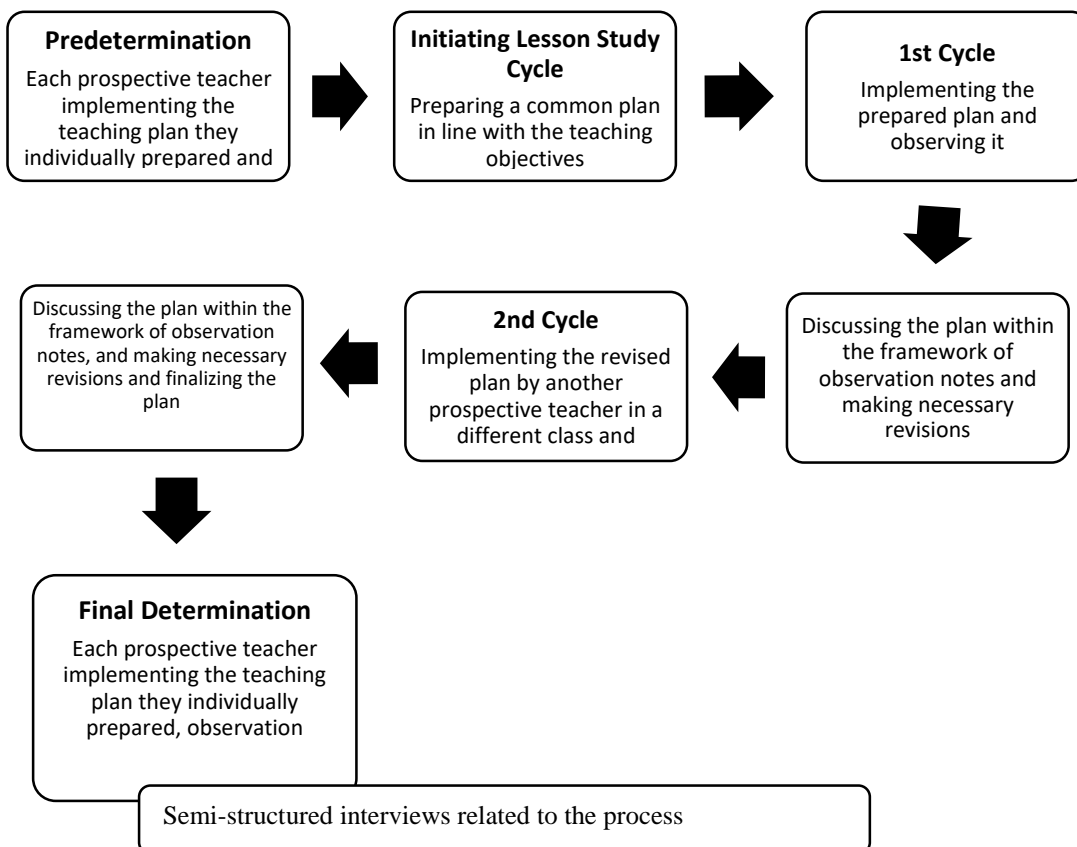


Figure 1. Data collection process

Data Analysis

The data were analyzed by using the descriptive analysis technique. In a descriptive analysis, the data are presented and evaluated according to predetermined conceptual frameworks and themes (Bogdan & Biklen, 2007; Creswell, 2019, p.319). Accordingly, in the present study, codes were formed out of the data included in the prearranged observation form and observed during the lesson teaching of the prospective teachers. In this process, the data were analysed, identified and interpreted within the framework of the codes determined for the descriptive analysis. At the end of the process, the obtained data were presented to the reader in an arranged and interpreted manner. In this context, the items included in the observation form were evaluated under the codes of "*Insufficient*", "*Partially Sufficient*", and "*Sufficient*", and it was determined whether there was any development or not. Accordingly, it was assumed that the prospective teachers who displayed development from "*Insufficient*" code to "*Partially Sufficient*" or "*Sufficient*" code in any observation item showed development within the scope of that item. Similarly, it was also assumed that the prospective teachers who showed development from "*Partially Sufficient*" code to "*Sufficient*" code displayed development within the scope of the relevant item. The observation process was carried out by one expert and one practice teacher, and the observation forms were filled in by these observers independently from each other. Consistency between the researchers in the observation forms was examined, the points that were evaluated differently were discussed, and a common ground was established.

In this process, direct quotations can be given to strikingly reflect the views of the individuals interviewed or observed. The data can be presented in consideration of the questions asked or dimensions used in the observation or interview processes (Yıldırım & Şimşek, 2011). Accordingly, direct quotations from the interview data were presented in the study so that the prospective teachers' measurement-evaluation knowledge and curriculum knowledge could be described and presented in more detail.

In order to ensure the validity of the study, the data were independently processed, interpreted and reported in detail by the researchers. In order to ensure the reliability of the study, the characteristics of the participants as the data source of the research, research process, data collection and analysis methods, how the data obtained were compiled and presented were explained in detail.

FINDINGS

In the present study, in which it was aimed to develop the measurement-evaluation and curriculum knowledge of prospective teachers through lesson study method, the teaching of a lesson by the prospective teachers was observed before and after the application of lesson study method, and semi-structured interviews were held. The data were described in detail by presenting the analysis of the observation data obtained in this scope and direct quotations from the semi-structured interviews below. Within the scope of the first sub-problem of the research, the observation data for the prospective teachers' measurement-evaluation knowledge before and after the application of lesson study method are presented in Table 2.

Table 2. The distribution of the prospective teachers' measurement and evaluation knowledge according to codes and categories

Category	Codes	Before the Application Criteria			After the Application Criteria		
		Insufficient	Partially Sufficient	Sufficient	Insufficient	Partially Sufficient	Sufficient
Measurement and Evaluation Knowledge	The prospective teacher gave feedback and made corrections in order for the students to notice their mistakes and misconceptions.	S _{1,2,3,4}	S ₅			S _{1*,4*,5}	S _{2*,3*}
	The prospective teacher was able to determine the mistakes and misconceptions of students through in-class dialogues and written documents.	S _{1,2,3,4,5}				S _{2*,3*,4*,5*}	S _{1*}
	The questions and problems that the prospective teacher used in class were appropriate for the level of students.		S _{1,2,3,5}	S ₄		S _{2,3}	S _{1*,4,5*}
	The questions and problems that the prospective teacher used in class were at a level that could assess the targeted concepts.		S _{1,2,3,4,5}			S _{1,3,5}	S _{2*,4*}
	The prospective teacher did enough measurement activities to measure the students' prior knowledge of the concepts.	S _{1,2,3,4,5}			S ₃	S _{2*,4*,5*}	S _{1*}
	The prospective teacher did enough measurement activities to measure the students' levels of understanding the concepts.	S _{3,5}	S _{1,2,4}			S _{2,3*,4,5*}	S _{1*}
	The prospective teacher made measurement and evaluation in line with the contemporary approaches.	S _{1,2,3,4,5}				S _{1*,2*,3*,4*,5*}	

Sx* represents a prospective teacher who showed development.

When Table 2 was examined, it was seen that the prospective teachers mostly displayed development in their measurement and evaluation knowledge as a result of the observations carried out. In this context, when the observation data of the prospective teachers coded as S₁, S₂, S₃, S₄ before the application were examined, it was determined that they were not sufficient in terms of their skills "to give feedback and make evaluations in order for the students to notice their mistakes and misconceptions", which play an important role in measurement-evaluation. In the lesson study process carried out together with the prospective teachers while preparing a lesson plan for each subject, ideas were exchanged on topics such as what the mistakes and misconceptions of students related to the subject might be, how to determine their mistakes and misconceptions, and what precautions could be

taken in order for the mistakes and misconceptions not to occur. For this reason, the prospective teachers came to the meetings for lesson plan preparation by preparing from various sources. At this point, by using the experiences of the practice teacher, it was discussed how the process in the mistakes and misconceptions dimension should be managed, and a consensus was reached. Hence, when the observation data related to the prospective teachers following the application of the lesson study method were examined, it was seen that they developed in the mistakes and misconception dimension in a general sense. Accordingly, it was determined that regarding the skill *"to give feedback and make corrections in order for the students to notice their mistakes and misconceptions"*, S₁ and S₄ showed partially sufficient development, S₂ and S₃ showed sufficient development, and S₅ was evaluated as partially sufficient both before and after the application and therefore did not show any development at all. Similarly, it was determined that the prospective teachers' skills *"to be able to determine the mistakes and misconceptions of students through in-class dialogues and written documents of students"* developed after the application of the lesson study method. In this context, while all of the prospective teachers were evaluated to be insufficient in terms of displaying these skills in their first applications, after the application, it was seen that S₁ developed to the sufficient level, and that S₂, S₃, S₄, and S₅ showed development to be partially sufficient. This situation may have resulted from the prospective teachers' being prepared in accordance with the lesson study method, as explained above. This is because when the prospective teachers prepare for the lesson, their content knowledge related to the subject also develops, and therefore, they have knowledge about the potential mistakes and misconceptions of students in relation to the subject. In this respect, the explanation made by S₂ is quoted below.

"When I have to attend lesson plan preparation, I feel obliged to do research about the subject at least for 1-2 hours. This is because I have to make a contribution to the group. And this contributes to my development in the teaching profession. Observing a lesson is also effective in this sense."

When the explanation made above is examined, it is seen that prospective teachers feel obliged to make some preparations while coming to prepare a lesson plan so as to make a contribution, and that lesson observations are expressed to be effective in this process. Another observation item in which lesson observation comes to the foreground can be said to be about the skill of *"the appropriateness of the questions and problems that the prospective teacher uses in the lesson for the levels of students"*. Regarding this observation item, it was determined that S₁, S₂, S₃, S₅ were at the partially sufficient level prior to the application, while S₄ was at the sufficient level. After the application, it was seen that S₁ and S₅ showed some development and were evaluated to be at the sufficient level, but that the other prospective teachers could not display any development. Similarly, another skill in which all prospective teachers were found to be partially sufficient before the application is *"the questions and problems used in class being at a level that can assess the targeted concepts."* Regarding this observation item, it was determined that S₂ and S₄ showed some development after the application and reached the sufficient level. It is believed that the reason why the prospective teachers were not at the insufficient level before the application regarding the observation item *"the questions and problems used in class being at a level that can assess the targeted concepts"* could be that the content specific education courses such as Special Teaching Methods I-II and Educational Technologies and Material Design that they had taken in their undergraduate studies had an effect in this matter. This is because in these education courses, measurement and evaluation approaches included especially in the teaching of the subjects in the secondary school mathematics curriculum are carried out in an applied manner. Therefore, lesson teaching and problem solutions at the secondary school student level are especially emphasized for each subject. All prospective teachers not being able to reach the sufficient level regarding these observation items after the application may have stemmed from the fact that the prospective teachers had to teach lessons to different classes as required by lesson study method. This is because the levels of the students and their interests vary in each class. Similarly, when the observation data of the prospective teachers regarding the observation item of *"doing enough measurement activities in order to measure the students' levels of understanding the concepts"* before the application were examined, it was seen that S₁, S₂ and S₄ were at the partially sufficient level, while S₃ and S₅ were at the insufficient level. When the observation data of the prospective teachers were examined again after the application, it was determined that S₃ and S₅ developed to the partially sufficient level, and S₁ displayed development to the sufficient level.

On the other hand, it was also observed that there were observation items in which all prospective teachers were evaluated as insufficient before the application. One of these observation items was *"doing enough measurement activities to measure the students' prior knowledge of the concepts."* It was determined that after the application of the lesson study method, S₂, S₄ and S₅ developed to the partially sufficient level within the scope of this observation item, S₁ showed development to the sufficient level, and S₃ did not show any development. Similarly, in the observation item *"prospective teachers making measurement and evaluation in accordance with contemporary approaches"*, all prospective teachers were evaluated as insufficient before the application, and when the observation data after the application were examined, all prospective teachers showed development to the partially sufficient level. In addition to the great effect of the prospective teachers coming to lesson planning session in a prepared manner as required by the logic of lesson study method on their being insufficient before the application regarding these observation items and developing to the levels of partially sufficient and sufficient, it is believed that the experiences and ideas of the expert and the practice teacher significantly contributed to this development. Because both the measurement and evaluation information of prospective teachers about measuring the preliminary knowledge of students and the measurement and evaluation information in accordance with modern approaches were supported by experts in the theoretical and practical field, and the course process was advanced.

To summarize, it was seen that the measurement-evaluation knowledge of prospective teachers positively developed in a general sense after the application of lesson study, and when the interviews held with the prospective teachers were analysed, it was determined that they expressed they were also aware of this development. In this regard, it was seen that as the prospective teachers came prepared to the lesson planning session as required by lesson study method, they were involved in the discussion by listening to the expert views while preparing the lesson plan, and they followed the application process of the prepared lesson plan in the real classroom environment from the perspective of a researcher, there were some developments in their professional knowledge, and that they noticed these developments. Regarding this issue, the dialogue between S₁ and the researcher is given below as it is.

R: *What contributions did the use of the lesson study method make to you in terms of teaching practice?*

S₁: *Especially in the process of the plans we prepared with you and my peers by discussing before the teaching of the lesson, I learned many new things. Also, while the notes taken by my peers while observing my lesson were being discussed after the lesson, we could make up for our lacking points. Particularly preparing a lesson plan and discussing this plan with my peers were very effective in my development. In addition, they were very effective in my adjustment to time and my experience.*

When the statements of the prospective teachers were examined, it was seen that the discussions made and the exchange of ideas in the process of making the lesson plan, evaluating the plan after application, and revising it as a part of the lesson study method contributed to their pedagogical content knowledge. In this regard, it was determined that S₁ showed development in six of the items consisting of measurement and evaluation knowledge, that S₂, S₄ and S₅ displayed development in five items, and that S₃ developed in four items.

The data related to the development in the curriculum knowledge of prospective teachers as a result of the observations done before and after the application of lesson study method within the scope of the second sub-problem of the research are presented in Table 3.

Table 3. The distribution of the curriculum knowledge of prospective teachers according to codes and categories

Category	Codes	Before the Application			After the Application		
		Criteria			Criteria		
		Insufficient	Partially Sufficient	Sufficient	Insufficient	Partially Sufficient	Sufficient
Curriculum Knowledge	He/she taught in line with the philosophy of the primary school mathematics curriculum.	S _{4,5}	S _{1,2,3}			S _{2,3,4*,5*}	S _{1*}
	He/she used activities appropriate for the basic skills that the primary school mathematics curriculum targeted for the students to gain.	S _{1,2,4,5}	S ₃		S _{3,5}	S _{1*,2*,4*}	
	He/she made measurement and evaluation in line with the philosophy of the primary school mathematics curriculum.	S _{1,2,5}	S _{3,4}		S ₃	S _{1*,2*,3,5*}	S _{4*}
	He/she managed the time effectively.		S _{1,5}	S _{2,4,3}		S _{1,2,4}	S _{3,5*}
	He/she effectively implemented the teaching activities that were targeted in the lesson plan.	S ₅	S _{2,3,4}	S ₁		S _{2,3,5*}	S _{1,4*}
	He/she stayed within the boundaries of the learning outcomes specified in the primary school mathematics curriculum.	S ₃	S _{1,4,5}	S ₂		S _{2,3*,5}	S _{1*,4*}
	He/she used content appropriate for the learning outcomes targeted in the primary school mathematics curriculum.	S _{2,4,5}	S _{1,3}		S ₃	S _{1,4*,5*}	S _{2*}
	His/her teaching was appropriate for the levels of students .	S _{2,5}	S _{1,4}	S ₃		S _{1,2*,3,4}	S _{5*}
	He/she created an appropriate classroom atmosphere in line with the philosophy of the primary school mathematics curriculum and enabled the roles of teacher and students to be realized.	S _{1,2,4,5}	S ₃		S ₃	S _{1*,2*,4*,5*}	

Sx* represents a prospective teacher who showed development.

When Table 3 was examined, it was seen that the observation item in which the prospective teachers showed the least development was *"managing the time effectively"*. When the competence of the prospective teachers regarding this observation item was examined, it was determined that S₁ and S₅ were partially sufficient before the application of the lesson study method, while S₂, S₃ and S₄ were at the sufficient level. When the developments of the prospective teachers were examined after the application of the lesson study method, it was determined that S₅ developed in this regard and was evaluated to be sufficient, S₁ and S₃ showed no development, and S₄ displayed development in a negative direction. Another observation item in which the prospective teachers did not show development at a desired level was *"effective implementation of the teaching activities targeted in the lesson plan"*. In this regard, it was observed that before the implementation of the lesson study method, S₅ was insufficient, S₂, S₃ and S₄ were partially sufficient, and S₁ was sufficient. After the application of the lesson study method, it was seen that S₅ developed to be partially sufficient, and S₄ developed to the level of sufficient. It was determined that S₁, S₂ and S₃ did not show any development and were at the same level before and after the application. In a similar way to this observation item, regarding the observation item *"teaching at a level appropriate for the students' levels"*, S₂ and S₅ were insufficient before the application, S₁ and S₄ were partially sufficient, and S₃ was found to be sufficient. When the observation data of the prospective teachers were examined after the application, it was determined that S₂ developed to the partially sufficient level, and S₅ displayed development to the level of sufficient. In this regard, it was determined that S₁ and S₄ did not show any development, while S₃ developed in a negative direction. The lack of development at the desired level in these observation items may have resulted from the prospective teachers being insufficient as well before the application. This is because the prospective teachers had adopted a teaching approach that emphasized these points during their teaching that was carried out for predetermination purposes.

It was seen that one of the observation items in which the prospective teachers showed relatively better development in their curriculum knowledge compared to the observation items above was *"teaching in line with the philosophy of the primary school mathematics curriculum"*. In this context, it was observed that regarding this item, while S₄ and S₅ were at an insufficient level of knowledge before the application of lesson study method, they developed to the partially sufficient level, S₁ developed from partially sufficient level before the application to the sufficient level after the application, and S₂ and S₃ were at the same level of partially sufficient before and after the application, showing no development. In the observation item *"using appropriate activities for the basic skills targeted in the primary school mathematics curriculum"*, it was seen that S₁, S₂, S₄ and S₅ were insufficient before the application, and that S₃ was partially sufficient. After the application, it was determined that S₁, S₂ and S₄ developed to the partially sufficient level, while S₅ did not show any development, and S₃ showed development in a negative direction. Similar to these observation items, the prospective teachers showed development at similar levels in the observation items *"staying within the boundaries of the learning outcomes specified in the primary school mathematics curriculum"* and *"using appropriate content for the learning outcomes specified in the primary school mathematics curriculum."* In this regard, in the observation item *"staying within the boundaries of the learning outcomes specified in the primary school mathematics curriculum"*, it was seen that before the application, S₃ was insufficient, S₁, S₄ and S₅ were partially sufficient, and S₂ was sufficient. After the application, it was determined that S₃ developed to the partially sufficient level, and S₁ and S₄ displayed development to the sufficient level. It was seen that S₅ did not show any development, while S₂ displayed development in a negative direction. In the observation item *"using appropriate content for the learning outcomes targeted in the primary school mathematics curriculum"*, it was seen that S₂, S₄ and S₅ were insufficient before the application, and S₁ and S₃ were partially sufficient. When the prospective teachers were examined after the application, it was seen that S₄ and S₅ developed to the partially sufficient level, and S₂ displayed development to the sufficient level. In this regard, it was determined that S₁ did not show any development, while S₃ developed in a negative direction.

It was seen that the observation items in which the prospective teachers showed the most development in their curriculum knowledge were *"doing measurement and evaluation activities in line with the philosophy of the primary school mathematics curriculum"* and *"creating a classroom atmosphere appropriate for the philosophy of the primary school mathematics curriculum, and enabling the teacher and student roles to be realized"*. In this context, it was determined that S₁, S₂ and S₅ were insufficient before the application of the lesson study method, while S₃ and S₄ were at the partially sufficient level of knowledge. It was determined that after the application of the lesson study method, S₁, S₂ and S₅ developed to the level of partially sufficient, S₄ showed development to the level of sufficient, and S₃ regressed to the insufficient level. In the observation item *"creating an appropriate classroom environment in line with the philosophy of the primary school mathematics curriculum and enabling the teacher and student roles to be realized"*, it was seen that S₃ was at the partially sufficient level before the application, and all prospective teachers other than S₃ were at the insufficient level. When the observation data of the prospective teachers were examined again after the application, it was determined that all prospective teachers other than S₃ developed to the partially sufficient level, but that and S₃ again regressed to the insufficient level.

It should be noted that S₃ regressed in 4 observation items within the scope of curriculum knowledge after the application of lesson study method. When the interview data of the prospective teacher were examined, it was seen that in contrast to the observation data, the prospective teacher himself/herself expressed that s/he developed. The dialogue between S₃ and the researcher in this regard is given below.

R: *What contributions did the use of the lesson study method make to you in terms of teaching practice?*

S₃: You prepare a lesson plan together, and it becomes an excellent plan. After this stage, the work of the teacher becomes easier. These processes contribute to knowledge and experience. I felt more comfortable compared to previous applications. You have a guide at your disposal, and you teach the lesson according to it.

When the statements of the prospective teacher were examined, it was seen that the lesson study method contributed to the development of his/her knowledge, and that it facilitated his/her teaching significantly. When the observation data of the prospective teacher were examined, it was seen that s/he showed development in terms of measurement and evaluation knowledge, as s/he expressed during the interview, but that s/he could not display any development in terms of curriculum knowledge. In this context, the observation data of the prospective teacher regarding curriculum knowledge and the data from the interview are not consistent. On the other hand, it was seen that there were four prospective teachers who showed development in the process and whose observation data and interview data were consistent. In this regard, the dialogue between S₄ and the researcher is given below as it is.

R: *What contributions did the use of the lesson study method make to you in terms of teaching practice?*

S₄: *Since I had to come prepared to prepare the lesson plan, I checked the curriculum and the materials; therefore, I may have developed in this regard.*

When the statements of the prospective teachers were examined, it was seen that they expressed they had to come prepared due to the lesson plans and discussions made in accordance with lesson study method, and therefore, they gained experience after some time when they had to research questions such as "what is in the curriculum?", "what kind of teaching is recommended?", and "what philosophies are adopted?" In this regard, it was determined that S₄ and S₅ showed development in seven of the items consisting of curriculum knowledge, that S₁ and S₂ displayed development in five items, and that S₃ showed development only in one item. Hence, it can be claimed that the curriculum knowledge levels of prospective teachers were mostly developed through lesson study methods.

DISCUSSION, CONCLUSION AND SUGGESTIONS

In the light of the study findings, it was concluded that the measurement-evaluation knowledge and curriculum knowledge of prospective teachers were enriched and developed through lesson study methods. In this context, it can be said that success was achieved in all prospective teachers in terms of developing, especially their measurement and evaluation knowledge. Within the scope of the measurement and evaluation knowledge of prospective teachers, it was determined that the lesson study method had the prospective teachers study on what they should consider while preparing for the lesson, choosing questions, evaluating students, etc. and created the need for preparing before the lesson. This result is similar to the result obtained in the study conducted by Budak, Budak, Bozkurt and Kaygin (2011), in which they reported that lesson study method got the prospective teachers to believe more in the necessity to come to the lesson in a prepared manner, to learn to make objective comments and think critically, and to develop their empathy skills. At this point, it was seen that the lesson study method caused the prospective teachers to study on the issues of checking the curriculum, and preparing materials and doing activities in line with the objectives of the curriculum, which is evaluated within the scope of the curriculum knowledge of prospective teachers. As a matter of fact, it was seen that this preparation process carried out through the lesson study method significantly contributed to the development of the curriculum knowledge of prospective teachers. In this context, the results of the study are similar to the results obtained in the studies conducted by Baki and Arslan (2015), and Butun (2012) in terms of lesson study method guiding the practitioners to teach by studying and researching and developing their lesson plan preparation skills, and similar to the study of Ozaltuncelik and Bukova Guzel in terms of lesson study method improving the skill of asking questions. In addition, it was seen that the discussion of the ideas and observation data of prospective teachers in the discussion environments created in accordance with the lesson study method contributed to the development of their professional knowledge. In this regard, many studies have been encountered in the literature which reported that the pedagogical content knowledge of prospective teachers within the scope of professional knowledge developed (Budak, Budak, Bozkurt & Kaygin, 2011; Fernandez & Yoshida, 2012; Leavy & Hourigan, 2016; Serbest, 2014).

When the results of the study were examined in this context, it was seen that the prospective teachers were aware of their own professional development, and that in regard to lesson study method, they stated that especially the evaluations of their teaching by prospective teachers with the same status significantly contributed to their development. The results of the current study are in parallel with the results obtained in the study conducted by Eriyanti (2018), in which it was reported that professionalism of teachers in terms of performing real evaluations was increased through collaborative lesson study, and that from a pedagogical point of view, teachers' ability to evaluate the learning processes and results and to use the results of the evaluation for learning contributed to the realization of reflective activities in order to improve quality learning. Furthermore, the results are similar to those of the study conducted by Boran and Tarim (2016) in terms of lesson study method enabling peer evaluation, teachers and prospective teachers benefiting from each other's experiences and forming new ideas together, creating the lesson plan by which the student can learn in the best way, gaining the skill to analyze a subject in a multidimensional way, and developing skills to form common emotions.

In line with the logic of the lesson study method, prospective teachers' participating in consecutive cycles enabled them to focus on the pedagogical content such as teaching and learning mathematical content and therefore the professional knowledge of the prospective teachers to develop. In this regard, Ni Shuilleabhain (2016) stated that along the cycles of lesson study, the teachers started to predict, notice and think about the mathematical strategies of students more frequently, to clearly develop learning series for the students, and to develop content based on the content related to the prior knowledge of students.

In the light of these results, it can be suggested that such methods can be used in order to develop other pedagogical content knowledge of prospective teachers. Besides, it is believed that running practice-based courses such as teaching practice and school experience through methods such as lesson study would be appropriate in that this method involves many processes such as students making preparations, coming together with students, discussion, preparing lesson plans, implementation of the plan, and revision of the plan, and doing practice collaboratively in groups. In studies conducted in this regard, the lesson study method was evaluated as an encouraging method for developing teaching practices based on collaborative lesson planning, lesson observation and evaluation (Schols, 2018). In this context, it is believed that in courses whose structure is suitable for lesson study method such as teaching practice, the lecturers being more on the practice content, carrying out studies in groups, supporting the prospective teachers in the planning stage, doing reflections on the practices of the prospective teachers, and giving feedback on the practices (Baki & Arslan, 2015) would increase pedagogical knowledge of the prospective teachers based on their professional development, and the effectiveness and efficiency of the course.

As this study was limited to teaching practice courses, time related problems regarding practices were encountered. Therefore, in order for methods such as lesson study to be used more effectively in practice courses, the duration of practice courses can be increased, and thus time related problems can be overcome. In addition, a similar study can be conducted with the participation of teachers, and the effects of lesson study method on teacher learning can be examined through different or the same variables, and research processes can be compared. In this way, advantages and disadvantages can be revealed, and a guide can be provided for other studies.

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We hereby declare that the study has no unethical issues and that research and publication ethics have been observed carefully.

Examples of author contribution statements

M.K., Y.S., and F.H. conceived of the presented idea and developed the theory. All authors were encouraged to investigate the background of the study and the literature review of the studies. And all authors who contributed to the data collection and analysis process discussed the results and final manuscript together.

Researchers' contribution rate

The study was conducted and reported with equal collaboration of the researchers.

Ethics Committee Approval Information

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ÖLÇME-DEĞERLENDİRME BİLGİSİ GÖZLEM FORMU

Gözlem Okulu: Gözlemin başlama zamanı:.....Bitiş zamanı:.....
 Gözlenen Öğretmen: Gözlem yapılan sınıf:
 Gözlemci:..... Öğrenci Sayısı:
 İşlenen Konu: Gözlem Tarihi:.....

ALT BİLEŞEN	No	HEDEF DAVRANIŞLAR	E	K	H	Açıklamalar ve Yorumlar
ÖLÇME-DEĞERLENDİRME BİLGİSİ	1	Öğrencilerin sahip olduğu hata ve kavram yanlışlarının farkına varmalarını sağlayacak şekilde dönüt ve düzeltmeler yaptı.				
	2	Öğrencilerin sahip olduğu hata ve kavram yanlışlarını sınıf içi diyaloglardan veya öğrencilerin yazılı dokümanlarından tespit edebildi.				
	3	Derste kullandığı sorular ve problemler öğrenci seviyesine uygundu.				
	4	Derste kullandığı sorular ve problemler hedeflenen kavramları ölçebilecek düzeydeydi.				
	5	Öğrencilerin kavramlarla ilgili ön bilgilerini ölçmeye yönelik yeterince ölçme faaliyetlerinde bulundu.				
	6	Öğrencilerin kavramları anlayabilme düzeylerini ölçmeye yönelik yeterince ölçme faaliyetlerinde bulundu.				
	7	Çağdaş yaklaşımlara uygun bir şekilde ölçme ve değerlendirme faaliyetleri gerçekleştirildi.				

PROGRAM(MÜFREDAT) BİLGİSİ GÖZLEM FORMU

No	DAVRANIŞLAR	Gözlemlenmedi	Yetersiz	Kısmen Yeterli	Yeterli
1	İlköğretim matematik programının dayandığı felsefi yaklaşıma uygun bir öğretim gerçekleştirdi.				
	İlköğretim matematik programının kazandırmayı hedeflediği temel becerilere uygun etkinlikler kullandı.				
2	İlköğretim matematik programının dayandığı felsefi yaklaşıma uygun ölçme ve değerlendirme faaliyetlerinde bulundu.				
3	Zamanı etkili kullandı.				

4	Ders planında hedeflediği öğretim faaliyetlerini etkili bir şekilde gerçekleştirdi.				
5	İlköğretim matematik programının hedeflediği kazanımların dışına çıkmadı.				
6	İlköğretim matematik programının hedeflediği kazanımlara uygun bir içerik kullandı.				
7	Öğrencilerin seviyesine uygun bir öğretim gerçekleştirdi.				
8	İlköğretim matematik programının dayandığı felsefi yaklaşıma uygun bir sınıf iklimi oluşturarak, öğretmen ve öğrenci rollerinin gerçekleşmesini sağladı.				



Examining for The Situations That Negatively Affect Middle School Students Experiences in Turkish Lessons Through The Opinions of Students and Teachers

Ortaokul Öğrencilerinin Türkçe Dersinde Karşılaştıkları Öğrenmeyi Olumsuz Etkileyen Durumların Öğrenci-Öğretmen Görüşleri Vasıtasıyla İncelenmesi¹

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Keywords

- 1.Turkish education
- 2.Language skills
- 3.Learning difficulties

Anahtar Kelimeler

- 1.Türkçe eğitimi
- 2.Dil becerileri
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Abstract

Purpose: Turkish teaching processes directly affect students' cognitive, affective and communication skills. In addition to these qualities, Turkish teaching processes also contribute to the academic and social development of students in other fields. In providing this situation, it is necessary to determine the situations that negatively affect learning in the lessons and to find solutions for these situations. In this study, it was aimed to determine the situations that negatively affect learning that students experience in Turkish lessons.

Design/Methodology/Approach: During the research process, case study, one of the qualitative data analysis methods, was used. A total of 104 students and 10 Turkish lesson teachers participated in the study. The principle of volunteering was observed in the participation in the research process. In the study, standardized open-ended interview forms were used in the process of obtaining data. Content analysis was used to evaluate the data obtained through these forms.

Findings: According to the results of the research, it was determined that the number of students who did not experience a situation that negatively affected learning in all of the question areas (listening, reading, speaking, writing, grammar) included in the interview forms was higher than the number of students who experienced them. It was observed that the most attention-grabbing area of the students, who reported that there was a situation that negatively affected learning during their Turkish teaching process, was listening education. Most of the Turkish teachers stated that there are various difficulties in the teaching processes in general in the language skills fields. It has been determined to be the area with the most learning-teaching difficulties in reading education.

Highlights: According to the data obtained in the study, the topics that students mostly mention in areas where they have learning difficulties are situations arising from the classroom environment in listening education; It has been observed that there are situations caused by the internal features of the text in reading education. In other areas, the results were found to be situations caused by the inability to fully express oneself in speech and writing education and situations caused by the content of subjects in grammar education.

Öz

Çalışmanın amacı: Türkçe öğretimi süreçleri öğrencilerin bilişsel, duyuşsal, iletişim becerilerine doğrudan etkiye bulunmaktadır. Türkçe öğretim süreçleri, bu niteliklerinin yanında öğrencilerin diğer alanlardaki akademik ve sosyal gelişimlerine de katkı sağlamaktadır. Bu durumun sağlanmasında derslerde öğrenmeyi olumsuz etkileyen durumların belirlenmesi ve bu durumlara yönelik çözümlerin bulunması gerekmektedir. Bu çalışmada öğrencilerin Türkçe derslerinde karşılaştıkları öğrenmeyi olumsuz etkileyen durumların belirlenmesi amaçlanmıştır.

Materyal ve Yöntem: Araştırma sürecinde nitel veri analizi yöntemlerinden durum çalışmasından yararlanılmıştır. Araştırmaya toplamda 104 öğrenci ve 10 Türkçe öğretmeni katılmıştır. Araştırma sürecine katılımda gönüllülük ilkesi gözetilmiştir. Araştırmada verilerin elde edilmesi sürecinde standartlaştırılmış açık uçlu görüşme formlarından yararlanılmıştır. Bu formlar vasıtasıyla elde edilen verilerin değerlendirilmesinde içerik analizi kullanılmıştır.

Bulgular: Araştırma bulgularına göre görüşme formlarında yer alan soru alanlarının (dinleme, okuma, konuşma, yazma, dil bilgisi) tamamında öğrenmeyi olumsuz etkileyen durumla karşılaşmayan öğrenci sayısının, karşılaşan öğrenci sayısından daha fazla olduğu tespit edilmiştir. Türkçe öğretimi süreçlerinde öğrenmeyi olumsuz etkileyen durum olduğunu bildiren öğrencilerin en çok dikkat çektikleri alanın dinleme eğitimi olduğu görülmüştür. Türkçe öğretmenlerinin çoğunluğu ise dil becerisi alanlarının genelinde öğretim süreçlerinde çeşitli güçlüklerin bulunduğunu belirtmişlerdir. Bu konuda en çok öğrenme-öğretme güçlüğüne bulunduğu alanın okuma eğitimi olduğu tespit edilmiştir.

Önemli Vurgular: Araştırmada elde edilen verilere göre öğrencilerin öğrenme gücünü yaşadığı alanlarda en çok değindikleri konuların dinleme eğitiminde "sınıf ortamından kaynaklanan durumlar", okuma eğitiminde "metnin iç özelliklerinden kaynaklanan durumlar", konuşma ve yazma eğitiminde "kendini tam olarak ifade edememekten kaynaklanan durumlar", dil bilgisi eğitiminde ise "konuların içeriğinden kaynaklanan durumlar" olduğu tespit edilmiştir.

¹ This research was carried out with the approval of Kayseri Provincial Directorate of National Education, dated 20.07.2020 and numbered 9598893.

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INTRODUCTION

The role of basic language skills in mother tongue education processes

Developing language skills (listening, speaking, reading, writing) is among the main objectives of Turkish lessons, which are at the center of mother tongue education (MEB, 2019). Listening, which is the first language skill acquired by individuals, is at the basis of communication processes. For this reason, it is aimed to improve students' cognitive abilities such as "sorting, classifying, questioning, relating, making inferences" through activities aimed at improving listening skills (MEB, 2006). According to Aktaş and Gündüz (2017), listening skill is used more than other language skills and in the development of this skill, interest in the subject, sufficiency of vocabulary, environmental and individual stimuli, and obeying listening rules are important. This situation is an indicator of the multidimensionality of the educational processes of listening, which is an understanding skill.

Speaking is another important area besides listening skills in the realization of correct mutual communication. Transferring these skills to daily life has an important role in the development of students' language skills. It is seen that these acquisitions (T.5.4.2., T.5.4.3, T.6.4.2., T.7.4.2, T.8.4.2., T.8.4.3.) emphasize skills in this field (MEB, 2019). In terms of achieving achievements in speech training processes, some factors should be taken into account in order to ensure efficiency. Karadoğan (2020) states that the factors affecting speech generally consist of situations originating from the speaker, from the environment, and from the listener. These situations that affect each other are especially important for students to express themselves correctly and to develop students' self-confidence.

Reading, which is another comprehension skill along with listening, has a direct effect on both the development of vocabulary and comprehension of the information acquired through various means. This situation requires the consideration of various factors in the design of reading education processes. Among these elements, the necessity of analyzing the obstacles to effective reading skills is emphasized by the researchers. These factors, which are grouped physically and psychologically by Aktaş and Gündüz (2017), *include the ability to see, the way of sitting, the nature of the material read, environment; inability to concentrate on the subject, passive reading, lack of vocabulary, inattention, emotional problems, barriers arising from personality, etc.* it is possible to be listed as.

Writing skill is important in terms of aesthetic value as well as self-expression (Aktaş & Gündüz, 2017). In order for individuals to be successful in written expression, it should be aware that writing has an aesthetic aspect as well as a communication tool. The development of individuals' ability to use their mother tongue, the development of their styles that allow the transfer of feelings and thoughts correctly, and a good observation skill are important. In addition, individuals' regular reading habits also have an important effect (Aktaş & Gündüz, 2017).

The methods and techniques used in the development of language skills are in an effective position in reaching the outcomes of the course. For this reason, it is important that teachers provide variety in terms of method and technique in lessons in terms of taking into account the individual differences of students. As a matter of fact, when diversity is provided in terms of methods and techniques in this respect, it contributes to the principle of equal opportunity in educational processes (Göçer, 2018). The methods and techniques for basic language skills in the Primary Turkish Course (6, 7, 8th Grade) Curriculum (MEB, 2006) are listed as follows:

Methods and techniques used in listening / watching training processes: Participatory listening, unattended listening, note-taking, listening with empathy, creative listening, selective listening, critical listening (MEB, 2006).

Methods and techniques used in speaking education processes: Persuasive speaking, critical speaking, participatory speaking, discussion, empathetic speaking, guided speaking, choosing from a pool of words and concepts, speaking on a free topic, creative speaking, memorizing technique (MEB, 2006).

Methods and techniques used in reading education processes: Silent reading, reading aloud, reading text with a glance, reading in summarizing, note taking, reading by marking method, guessing read of while the text, reading by asking questions, word choir, reading theater, memorization, associating with texts, reading by discussion, critical reading (MEB, 2006).

Methods and techniques used in writing education processes: Taking notes, summarizing, filling the gaps in text, writing by selecting from the word and concept pool, free writing, controlled writing, guided writing, creative writing, text completion, guessing, reconstructing a text with its own words, creating a new text from a text, writing using the senses, writing as a group, critical writing (MEB, 2006).

Problems encountered in mother tongue education processes

Turkish lessons, which are the basis of mother tongue education, are in an active position in shaping students' cognitive development, affective development and communication skills with their multidimensional structure. The ability of students to use their mother tongue has an important role in understanding the expressions they listen / watch, read, express themselves correctly, and carry out their thinking processes. For this reason, it is seen that researchers focus on both the theoretical and practical phases of Turkish lessons. When the research is evaluated in general, it is seen that Turkish lessons focus on issues such as identifying the learning difficulties faced by students, diversifying learning environments, and how to benefit from the lessons more effectively. In this direction, the general situation of the field was tried to be determined based on the related research.

When the studies conducted are examined, it is seen that the learning difficulties experienced by students in Turkish lessons stem from individual factors, learning environment and learning materials. It is possible to list some research results regarding these problems in education processes as follows:

Erdem (2008) includes teacher and student-oriented results in his research, which examines the difficulties encountered in teaching grammar subjects. According to his research results, teachers stated that students had difficulty in learning subjects such as verb frameworks and verbs; on the other hand, it is observed that students who evaluated their own situation stated that they had difficulties in phonics such as inclusion letters and consonants (Erdem, 2008). In her research on students with reading difficulties, Baydık (2011) found that finding the main idea of a text is among the learning difficulties students experience most frequently. Gün (2012), on the other hand, found that most of the teachers think that reading activities are “insufficient in developing the critical and creative thinking power of the student”. Arslan and Babadoğan (2005) found in their research that there is a direct proportion between using concrete life learning style and age. However, in this study, Arslan and Babadoğan (2005) concluded that students who use concrete life learning style have low scores in Turkish lessons as well as some lessons. Güney, Aytan, and Özer (2012) state that when exam-oriented lessons are taught, the focus is on the right number rather than the learning areas, and this situation can be considered negative in terms of Turkish education.

Studies on the effectiveness of methods used in mother tongue teaching processes

When the studies on the use of Turkish lessons are more effectively carried out, it can be said that it is generally aimed to develop students' cognitive thinking skills and emotional approaches to the lesson. In this regard, Kuzu (2004) found that interactional reading was more effective in developing students' reading comprehension, understanding, and application skills than traditional methods. Temizyürek and Türktan (2015) found that the structural grid test, which is an alternative assessment and evaluation technique, has positive effects on students' academic success.

Fidan (2019) states in his research that students use critical listening strategies, which are generally an effective learning strategy, in Turkish lessons. In his research, Kılınc (2008) concluded that students in lessons in which note-taking and concept mapping techniques were used were more successful in areas such as reading comprehension and written expression compared to students in lessons where traditional teaching methods-techniques were used. Similarly, Kapar Kuvanç (2008) found that creative writing, which is also an innovative approach, is more effective in developing positive attitudes towards Turkish lessons compared to traditional methods. Gümüş and Buluç (2007), on the other hand, state that the collaborative learning approaches used in Turkish lessons provide benefits for students in permanent and effective learning.

METHOD/MATERIALS

The aim of this study is to determine the situations that negatively affect the learning that middle school students encounter in Turkish lessons. For this purpose, it was tried to obtain data on the subject through interview questions directed to students and teachers. In this study, it is aimed to address the reasons of the situations that affect learning that students encounter in Turkish lessons in a holistic manner in line with basic language skills and grammar.

Research model

In this study, the situation study, which is one of the qualitative research methods, was used. The case study provides the researcher with data on issues such as how factors such as environment, individuals, events affect the situation, as well as providing integrity and in-depth research (Yıldırım & Şimşek, 2008). Through this study, the learning difficulties experienced by students in Turkish lessons were emphasized and the reasons for these learning difficulties were tried to be determined.

Working group

This research was conducted with the permission of Kayseri Provincial Directorate of National Education, dated 20.07.2020 and numbered 9598893. The study universe of this research consists of secondary school students and Turkish lesson teachers in Kayseri in the 2020-2021 academic year. Purposeful sampling method was used in this study. It was aimed to provide equivalence in terms of number during the selection of male and female students to participate in the interview. In the selection of students as a sample, the class variable could not be taken into account since the student group studying at the school was 8th grade at the time of the study. (At the time of the study, due to the Covid-19 disease, the 5th, 6th and 7th grades continue their education with distance education.) This is the limitation of the research. 8th grade students, who were educated face to face during this period, participated in the study. In this direction, samples were selected from students from two secondary schools in Kayseri. No socioeconomic criteria have been taken into account in the selection of schools. Issues such as accessibility, applicability, and volunteering have been effective in school selection. The table created as a result of the sample selection is as follows:

Table 1. Characteristics of samples

Schools	8th grade	Female	Male
School 1	26	13	13
School 2	78	39	39
Total	104	52	52

During the interview with Turkish teachers, the random sampling method was preferred. In this direction, the opinions of 10 Turkish teachers in total were taken. At this stage, it was deemed important to take the opinions of Turkish teachers who attended the lessons of the students who participated in the research process in order to evaluate the similarity and difference of the data obtained from students and teachers.

Data collection tools

Standardized open-ended interview forms were used in this study. According to Yıldırım and Şimşek (2008), this interview method "significantly increases the probability of a research being repeated by others." In this study, first of all, in order to ensure the validity of the research in terms of scope, a literature review was conducted in the related field at the stage of determining the questions. Later, in the formation of the research questions, the subject areas (listening, reading, speaking, writing, grammar) that were emphasized in the direction of pre-interviews with 5 Turkish teachers were also determinant. In this regard, basic language skills were primarily used in determining the questions in the interview form used in the study. In addition to these questions, questions were prepared for the area of grammar, which is one of the topics that the pre-interviewed teachers draw attention to. The last question in the interview form contains the general evaluations of the students regarding the Turkish course. Teacher interview forms are also similar to those prepared for students in terms of question areas. It is stated by the researchers that expert opinion should be consulted to ensure the content validity of the study (Büyükoztürk, Kılıç Çakmak, Akgün, Karadeniz & Demirel, 2019). The interview forms prepared in this direction were presented to the opinions of 3 field experts (MEB, Aksaray University). Expert opinions were calculated with the reliability formula ($\text{Reliability} = \frac{\text{consensus}}{\text{consensus} + \text{disagreement}}$) of Miles and Huberman (1994; as cited in Saban, 2009) (Miles & Huberman, 1994; as cited in Saban, 2009). As a result of these calculations, the forms were included in the research process in line with the opinions of the field experts (100%) that all questions were appropriate. The questions in the interview forms are as follows:

Student Interview Form

1. Do you encounter any situation that negatively affects your learning during the listening activities in Turkish lessons? (If so) What could be the reasons for this situation in your opinion? You can write your answers in the blank space below.
2. Do you encounter any situation that negatively affects your learning in reading comprehension activities in Turkish lessons? (If so) What could be the reasons for this situation in your opinion? You can write your answers in the blank space below.
3. Do you encounter any situations that negatively affect your learning in speaking activities in Turkish lessons? (If so) What could be the reasons for this situation in your opinion? You can write your answers in the blank space below.
4. Do you encounter any situations that negatively affect your learning in Turkish lessons in writing (composition, poetry, etc.)? (If so) What could be the reasons for this situation in your opinion? You can write your answers in the blank space below.
5. Do you encounter any situations that negatively affect your learning in grammar activities in Turkish lessons? (If so) What could be the reasons for this situation in your opinion? You can write your answers in the blank space below.
6. Finally, when you evaluate the Turkish lessons in general, do you have any solution suggestions for the issues and situations you have difficulty learning? You can write your opinion on this subject below.

Teacher Interview Form

1. Are there situations where your students have learning difficulties during the listening activities in Turkish lessons? If so, can you explain the situations in which learning difficulties students experience and the reasons?
2. Are there situations in which your students have learning difficulties in reading comprehension activities in Turkish lessons? If so, can you explain the situations in which learning difficulties students experience and the reasons?
3. Are there situations in which your students have learning difficulties during speaking activities in Turkish lessons? If so, can you explain the situations in which learning difficulties students experience and the reasons?
4. Are there situations in which your students have learning difficulties during the writing activities in Turkish lessons? If so, can you explain the situations in which learning difficulties students experience and the reasons?
5. Are there situations where your students have learning difficulties during grammar activities in Turkish lessons? If so, can you explain the situations in which learning difficulties students experience and the reasons?
6. When you evaluate the Turkish lessons in general, do you have any solution suggestions for the learning difficulties your students experience? You can write your answer in the blank space below.

Analysis of data

During this research process, the data obtained from the interview forms were evaluated using the content analysis method. Büyüköztürk, Kılıç Çakmak, Akgün, Karadeniz, and Demirel (2019) state that content analysis is "used in the analysis of data obtained from observations and interviews." In this direction, basic language skills and grammar in Turkish education have been determined as the main themes. Research questions are in line with the theme areas in the interview form. Data suitable for these subject areas were obtained from the interview forms and the obtained data were analyzed. Based on the answers given by the students, frequency and percentage data were interpreted in order to make a comparison between male and female students. SPSS 19 program was used in this calculation. In the study, subject areas (titles of negative situations affecting learning) were created in line with the answers of the participants. At the stage of creating subject areas, the participants' answers showed that there was a situation, as well as an answer to more than one situation, and this situation was reflected in the tables. For this reason, there may be numerical differences between the number of students / teachers who encounter any situation that negatively affects learning in lessons and the situations encountered.

The information obtained by analyzing interview forms in the study was expressed in the form of tables and interpretation of these tables. In the context of the research questions, headings of the findings were created. The information under the same question heading obtained from the students through the interview forms were evaluated together. The information obtained from the teachers through the interview forms was evaluated under a separate heading in order to make a comparison with the information of the students.

FINDINGS

Evaluation of interviews with students

The first question in the interview form used in the study is "Do you come across any situation that negatively affects your learning during the listening activities in Turkish lessons? (If so) What could be the reasons for this situation in your opinion?" in the form. The answers given by the students to this question were analyzed and the findings were presented in the form of a table:

Table 2. Listening activities

Listening activities	Female (n)	Male (n)	Total (n)
There is a negative situation affecting learning	18	17	35
No negative situation affecting learning	34	35	69
Adverse situations encountered			
Caused by the hearing-sound system	5	4	9
Caused by the classroom environment	6	8	14
Caused by not taking notes	1	2	3
Caused by the time devoted to the listening activity		1	1
Caused by fast reading of text	3	1	4
Caused by not being able to focus on the lesson	4	3	7

The first question directed to the students participating in the research is for the activities involving listening skill. 33.65% (F:35) of the students participating in the research answered this question as yes, 66.34% (F:69) of them answered that no. When these results regarding the listening activities were examined in terms of male and female students, the percentage and frequency information of the female students who stated that there was a situation affecting learning was 51.42% (F: 18), the percentage and frequency information of the male students were 48.57% (F: 17). The percentage and frequency information of the female students who stated that there was no situation that negatively affected the learning was 49.27% (F: 34), and the percentage and frequency information of the male students' results were 50.72% (F: 35). These results show that there is no significant difference between the answers of the male and female students.

When Table 2 is interpreted in terms of the negative situations encountered, it is seen that the negativity that the students participating in the research draw the most attention to the listening activities is the situations that are "caused by the classroom environment" (F: 14). When the explanations of the students on this subject were examined, it was determined that the other students making noise while talking in the classroom was seen as the main factor. In their explanations about the situations "caused by the hearing-sound system" (F: 9), the students stated that they could not hear the listening texts clearly from the sound sources in some cases. In cases "caused by not being able to focus on the lesson" (F: 7), it was observed that the subjects were not interesting, attention was not paid to the text, and therefore the lesson was not followed. Other areas stated by the students can be listed as "caused by not taking notes" (F: 3), "caused by the time allocated to listening activity" (F: 1), "caused by fast reading of the text" (F: 4).

The second question in the interview form used in the study is "Do you encounter any situation that negatively affects your learning in reading comprehension activities in Turkish lessons? (If so) What could be the reasons for this situation in your opinion? You can write your answers in the blank space below." in the form. The answers given by the students to this question were analyzed and the findings were presented in the form of a table:

Table 3. Reading activities

Reading activities	Female (n)	Male (n)	Total (n)
There is a negative situation affecting learning	11	17	28
No negative situation affecting learning	41	35	76
Adverse situations encountered			
Caused by not being able to focus on the lesson	3	3	6
Caused by the internal features of the text	4	8	12
Caused by the external features of the text	3	1	4
Caused by the classroom environment	1	5	6
Caused by the time devoted to reading activity		1	1

The second question directed to the students participating in the study is for the activities involving reading skills. 26.92% (F:28) of the students participating in the research answered this question as yes, 73.07% (F:76) of them answered that no. When these results regarding reading / reading comprehension activities are examined in terms of female and male students, the percentage and frequency information of female students who reported that there is a situation that negatively affects learning, 39.28% (F: 11), the percentage and frequency information of the male students' results are 60.71% (F: 17). Percentage and frequency information of female students who stated that there was no situation affecting learning was 53.94% (F: 41), and percentage and frequency information of male students' results were 46.05% (F: 35).

When Table 3 is interpreted in terms of the negative situations encountered, it is seen that the negativity that the students participating in the research draw the most attention to reading activities is the situations that are "caused by the internal features of the text" (F: 12). When the explanations of the students regarding this subject were examined, it was seen that issues such as the excess of unknown words in the texts and the difficulty of the questions about the text were noted. It is seen that the rate of male students (F: 8) in this area is significantly higher than that of female students (F: 4). In their explanations about the situations "caused by not being able to focus on the lesson" (F: 6), the students stated that they could not focus on the lesson when the reading texts were long and that they did not have regular book reading habits. Students stated that in cases "caused by the classroom environment" (F: 6), they could be distracted by the noise generated in the classroom. In this area, it is seen that the rate of male students (F: 5) is significantly higher than that of female students (F: 1). The other fields that the students stated can be listed as the situations that they explain with expressions such as the small font size of the texts, the length of the texts "caused by the external features of the text" (F: 4) and the situations "caused by the time allocated to reading activity" (F: 1).

The third question in the interview form used in the study is "Do you encounter any situations that negatively affect your learning in speaking activities in Turkish lessons? (If so) What could be the reasons for this situation in your opinion? You can write your answers in the blank space below." in the form. The answers given by the students to this question were analyzed and the findings were presented in the form of a table:

Table 4. Speaking activities

Speaking activities	Female (n)	Male (n)	Total (n)
There is a negative situation affecting learning	12	13	25
No negative situation affecting learning	40	39	79
Adverse situations encountered			
Caused by the classroom environment	1	7	8
Caused by the time allocated to speaking activity		2	2
Caused by the speaking subject		1	1
Caused by not having the right to speak	2	2	4
Caused by inability to express yourself correctly	7	2	9
Caused by not being able to focus on the lesson	2	1	3

The third question directed to the students participating in the study is about activities involving speaking skills. 24.03% of the students participating in the research answered this question as yes (F: 25) and 75.96% of them answered as no (F: 79). When these results for speaking activities are examined in terms of male and female students, the percentage and frequency information of the female students who stated that there is a situation that negatively affects learning 48% (F: 12), the percentage and

frequency information of the male students' results are 52% (F: 13) in the form. Percentage and frequency information of female students who stated that there was no situation affecting learning was 50.63% (F: 40), and percentage and frequency information of male students' results were 49.36% (F: 39).

When Table 4 is interpreted in terms of the negative situations encountered, it is seen that the negativity that the students participating in the research draw the most attention to their speaking activities is the situations caused by "caused by inability to express yourself correctly" (F: 9). When the explanations of the students regarding this subject were examined, it was determined that there were situations such as excitement, the thought that I could not make a good speech, forgetting what to say while speaking, and not being able to find suitable words to express yourself. In this area, the rate of female students (F: 7) is significantly higher than male students. In their explanations about the situations "caused by the classroom environment" (F: 8), the students stated the issues such as noise and not respecting the right to speak. It is seen that the frequency of male students (F: 7) in this area is significantly higher than that of female students (F: 1). Other areas stated by the students are "caused by not having the right to speak" (F: 4), "caused by not being able to focus on the lesson" (F: 3), "caused by the time allocated to the speaking activity" (F: 2) "caused by the speaking subject" (F: 1) can be listed as situations.

The fourth question in the interview form used in the study is "Do you encounter any situations that negatively affect your learning in Turkish lessons in writing (composition, poetry, etc.)? (If so) What could be the reasons for this situation in your opinion? You can write your answers in the blank space below." in the form. The answers given by the students to this question were analyzed and the findings were presented in the form of a table:

Table 5. Writing activities

Writing activities	Female (n)	Male (n)	Total (n)
There is a negative situation affecting learning	8	14	22
No negative situation affecting learning	44	38	82
Adverse situations encountered			
Caused by the classroom environment	1	3	4
Caused by the inability to provide textuality	1	1	2
Caused by the writing topic	2	1	3
Caused by the limited writing area in the textbook	2		2
Caused by inability to express yourself correctly	2	7	9
Caused by not being able to focus on the lesson	1	1	2
Caused by the time allocated to writing		1	1

The fourth question directed to the students participating in the research is for the activities involving the writing skill. 21.15% of the students participating in the research answered this question as yes (F: 22) and 78.84% of them answered as no (F: 82). When these results for writing activities were examined in terms of male and female students, the percentage and frequency information of the female students who stated that there was a situation affecting learning was 36.36% (F: 8), and the percentage and frequency information of the male students' results were 63.63% (F: 14). It is seen that the frequency of the data of male students on this subject (F: 14) is significantly higher than that of female students (F: 8). Percentage and frequency information of female students who stated that there was no situation affecting learning was 53.65% (F: 44), and percentage and frequency information of male students' results were 46.34% (F: 38).

When Table 5 is interpreted in terms of the negative situations encountered, it is seen that the negativity that the students participating in the research draw the most attention to their speaking activities is the situations "caused by inability to express yourself correctly" (F: 9). The difference arising from the situation under the same title in speaking activities on this subject draws attention. It is seen that the frequency of male students (F: 7) in this area is significantly higher than that of female students (F: 2). When the explanations of the students on this subject are examined, it is seen that there are expressions such as not being able to find the appropriate word in the writing process, the thought that I cannot do it, the thought that I am not creative, I cannot write because I do not read books regularly. In their explanations for the situations "caused by the classroom environment" (F: 4), the students mentioned issues such as noise, the teacher not having time to check the texts of the whole class. Other areas that the students mentioned are "caused by the inability to provide textuality" (F: 2), "caused by the writing topic" (F: 3), "caused by the limitation of the writing area in the textbook" (F: 2), "caused by the inability to focus on the lesson" (F: 2) and "caused by the time allocated to writing" (F: 1).

The fifth question in the interview form used in the study is "Do you encounter any situations that negatively affect your learning in grammar activities in Turkish lessons? (If so) What could be the reasons for this situation in your opinion? You can write your answers in the blank space below." in the form. The answers given by the students to this question were analyzed and the findings were presented in the form of a table:

Table 6. Grammar activities

Grammar activities	Female (n)	Male (n)	Total (n)
There is a negative situation affecting learning	10	13	23
No negative situation affecting learning	42	39	81
Adverse situations encountered			
Caused by the content of grammar subjects	8	8	16
Caused by the classroom environment	1	2	3
Caused by the time allocated to grammar	3	2	5

The fifth question directed to the students participating in the research is about activities involving the field of grammar. 22.11% of the students participating in the study answered this question as yes (F: 23), and 77.88% answered that no (F: 81). When these results regarding grammar activities were examined in terms of male and female students, the percentage and frequency information of the female students who reported that there was a situation affecting learning was 43.47% (F: 10), the percentage and frequency information of the male students were 56.52% (F: 13). Percentage and frequency information of female students who stated that there was no situation affecting learning was 51.85% (F: 42), and percentage and frequency information of male students' results were 48.14% (F: 39).

When Table 6 is interpreted in terms of the negative situations encountered, it is seen that the negativity that the students participating in the study draws the most attention to their grammar activities is the situations that are "caused by the content of grammar subjects" (F: 16). When the explanations of the students on this subject were examined, it was observed that the grammar subjects were not interesting, grammar rules were difficult to memorize, the subjects learned were quickly forgotten after a while, and the activities related to these subjects were insufficient in the textbooks. Other areas that the students mentioned are the situations that arise from the "caused by the time allocated to grammar" (F: 5) and "caused by the classroom environment" (F: 3).

The sixth question in the interview form used in the study is "Finally, when you evaluate the Turkish lessons in general, do you have any solution suggestions for the issues and situations you have difficulty learning? You can write your opinion on this subject below." in the form. The answers given by the students to this question were analyzed and the findings were presented in the form of a table:

Table 7. Solution suggestions for issues and situations that are difficult to learn

Solution suggestion	Female (n)	Male (n)	Total (n)
Test-question solving	9	12	21
Reading books	4	5	9
Getting help from the teacher	4	2	6
Teaching subjects through games	2	1	3
Making arrangements in textbooks	4		4
Presenting the subjects in the form of a diagram, table, concept map	1	1	2
Summing up the subjects	2	2	4
Increasing the number of texts in listening activities	1		1
Adjusting the sound system at listening activities	2	2	4
Adjusting the time for writing activities		1	1
Adjusting the style of expression	2		2
Organizing the class	1	2	3
Simplifying the subjects		2	2
Learning note-taking methods		3	3

When Table 7 is examined, it is seen that the suggestion that the students participating in the research draw the most attention is "Test-question solving" (F: 21). Among the suggestions of the students, "reading book" (F: 9) and "getting help from the teacher" (F: 6) are the other most stated ones. "Making arrangements in textbooks", "summing up the subjects", "adjusting the sound system at listening activities" (F: 4) were suggested by four students each. It was observed that the subjects of "teaching subjects through games", "organizing the class", "learning note-taking methods" (F: 3) were suggested by three students each. Other suggestions of the students are "presenting the subjects in the form of a diagram, table, concept map" (F: 2), "adjusting the style of expression" (F: 2), "simplifying the subjects" (F: 2), "increasing the number of texts in listening activities." (F: 1) and "adjusting the time for writing activities" (F: 1). It can be seen through the explanations that the students' explanations about the situations that negatively affect their learning that they encounter in the lessons are directed to the problems they stated.

Evaluation of interviews with teachers

Interviews were also conducted with 10 Turkish teachers working at the same schools as the students participating in this study. The aim here is to compare the answers given by the students with the answers of the teachers who have the opportunity to observe them. In this direction, the findings obtained from the interviews with the teachers are explained as follows:

The first question in the teacher interview form used in the study is "Are there situations where your students have learning difficulties during the listening activities in Turkish lessons? If so, can you explain the situations in which learning difficulties students experience and the reasons?" in the form. 80% of the teachers participating in the research answered this question as yes (F: 8), and 20% replied no (F: 2). The factors that teachers think cause learning difficulties in this subject are "caused by the type of the text listened to" (F: 6) and "caused by the listening activities" (F: 3). In their explanations about the type of the text listened to, the teachers who participated in the study stated that the writing texts did not attract the attention of the students, the listening texts could be long in places and this situation caused the student to be distracted. In the explanations about listening activities, teachers draw attention to the fact that the sound system may be insufficient and there may be difficulties in accessing the listening files.

The second question in the teacher interview form used in the study is "Are there situations in which your students have learning difficulties in reading comprehension activities in Turkish lessons? If so, can you explain the situations in which learning difficulties students experience and the reasons?" in the form. All of the teachers who participated in the study answered this question as yes (F: 10). The factors that teachers think cause learning difficulties in this subject are "caused by the type of reading text" (F: 4) and "caused by the lack of reading habit" (F: 6). Teachers participating in the study indicate that students have difficulty and their attention is distracted when there are many unknown words in the reading texts. In addition, teachers state that they may encounter situations where the texts are long and above the students' level. It is also stated by teachers that students who do not have the habit of reading books regularly have difficulties in analyzing texts, identifying main ideas and supporting ideas.

The third question in the teacher interview form used in the study is "Are there situations in which your students have learning difficulties during speaking activities in Turkish lessons? If so, can you explain the situations in which learning difficulties students experience and the reasons?" in the form. 80% of the teachers participating in the research answered this question as yes (F: 8), and 20% replied no (F: 2). The factors that teachers think cause learning difficulties in this subject are "caused by the speaking activities" (F: 5) and "caused by the inadequate self-expression" (F: 3). The teachers who participated in the study stated that the reading habit directly affects the speaking and this situation is important for the development of the student's vocabulary. Teachers draw attention to the fact that students with insufficient vocabulary become more excited in speaking activities and forget what they will say. Participants state that the most difficult speaking activities for students are unprepared speeches.

The fourth question in the teacher interview form used in the study is "Are there situations in which your students have learning difficulties during the writing activities in Turkish lessons? If so, can you explain the situations in which learning difficulties students experience and the reasons?" in the form. 90% of the teachers participating in the research answered this question as yes (F: 9) and 10% of them no (F: 1). The subjects that teachers think cause learning difficulties in this subject are "caused by the inability to express themselves fully" (F: 8) and "caused by the writing activities" (F: 2). The teachers who participated in the study stated that regular reading habits affect the vocabulary and therefore the writing skills of the students. In addition, another issue that teachers draw attention to is prejudice against writing. In addition to this situation, it is stated by teachers that students can write event-based, storytelling texts more easily than situation-based texts.

The fifth question in the teacher interview form used in the study is "Are there situations where your students have learning difficulties during grammar activities in Turkish lessons? If so, can you explain the situations in which learning difficulties students experience and the reasons?" in the form. 50% of the teachers participating in the research answered this question as yes (F: 5), and 50% of them no (F: 5). The subjects that teachers think cause learning difficulties in this subject are "caused by the grammar activities" (F: 2) and "caused by the teaching methods-techniques" (F: 3). Teachers point out that grammar topics are abstract, generally a teaching method based on memorization of rules is followed in lessons and that the content of grammar topics is wider at some grade levels. In addition, it is stated in the textbooks that activities on these subjects are occasionally less.

The sixth question in the teacher interview form used in the study is "When you evaluate the Turkish lessons in general, do you have any solution suggestions for the learning difficulties your students experience? You can specify your answer in the blank space below." in the form. It was observed that most of the teachers (F: 8) mentioned the importance of gaining regular reading habits in students from an early age. In addition, teachers state that regular writing habits should be gained in developing writing skills (F: 2). The teachers who participated in the research draw attention to the fact that these situations will have a positive effect on students' academic and personal lives.

DISCUSSION, CONCLUSION AND RECOMMENDATIONS

In this study, the reasons for the learning difficulties experienced by middle school students (8th grade) in Turkish lessons were tried to be determined through the opinions of students and teachers. In this direction, it is possible to list the results obtained by evaluating the answers to the interview questions as follows:

The majority of the students who participated in the study answered "no" to the question of whether there is any negative situation affecting learning in the listening activities. It is possible to list the problems that students draw the most attention as "caused by the classroom environment", "caused by the hearing-sound system", "caused by not being able to focus on the lesson". The majority of the students who participated in the study answered "no" to the question about whether there is any negative situation affecting learning in reading activities. It has been determined that the problems that students draw the most attention are "caused by the internal features of the text", "caused by not being able to focus on the lesson" and "caused by the classroom environment". It was seen that there were similar rates in the question of whether there were any negative situations affecting learning in speaking and writing activities. The problems that students draw the most attention to in the field of speaking can be listed as "caused by inability to express yourself correctly" and "caused by the classroom environment". In the field of writing, it is possible to list the problems that students draw the most attention as "caused by inability to express yourself correctly" and "caused by the classroom environment". The problems that students draw the most attention to in the field of grammar are the situations "caused by the content of grammar subjects" and "caused by the time allocated to grammar". In the last question in the interview form, the students were asked to indicate their solution suggestions for overcoming their learning difficulties in Turkish lessons. It is possible to list the most suggested solutions by the students participating in the research as "test-question solving", "reading books" and "getting help from teachers".

Most of the Turkish teachers participating in the study stated that they faced difficulties in the teaching processes in other question areas, apart from the subjects about grammar. Difficulties stated by the teachers in the area of listening are "caused by the type of the text listened to" and "caused by listening activities". Difficulties stated by teachers in the field of reading are "caused by the type of reading text" and "caused by the lack of a book reading habit". Difficulties stated by teachers in the field of speaking are "caused by speaking activities" and "caused by the inability to express themselves adequately". Difficulties stated by teachers in the field of writing are in the form of "caused by not being able to express themselves fully" and "caused by the writing activities". The Turkish teachers participating in the study answered equally in the fifth question regarding grammar activities on whether there were any difficulties in the teaching process. Difficulties stated by the teachers on this subject are in the form of "caused by the grammar activities" and "caused by the teaching methods-techniques". It was concluded that the solution suggestions stated in the sixth question by the Turkish teachers participating in the study were to gain students the habit of regular reading and regular writing.

In reading activities, it was observed that the frequency of the responses of male students was significantly higher in cases "caused by the internal features of the text" (F: 8/4) and "caused by the classroom environment" (F: 5/1). In the speaking activities, it was observed that the frequency of the answers of the female students was higher in the cases "caused by the inability to express herself fully" (F: 7/2). It has been determined that the frequency of the answers of male students is significantly higher in cases "caused by the classroom environment" (F: 7/1). In the writing activities, it was concluded that the frequency of male students' responses in cases "caused by not being able to express themselves fully" (F: 7/2) was significantly higher.

In the interviews made with the students participating in the study, it was determined that the number of students who stated that there was no negative situation affecting their learning in all question titles was higher than the number of students who stated that there was any negative situation affecting their learning. The answers given by the students about whether they encounter any situation that negatively affects their learning in Turkish lessons contain some differences with the answers given by the teachers on the same subject. The reason for this situation stems from the students' individual responses to their own learning situations and the application of the research to 8th grade students. It is thought that teachers generally respond to learning difficulties they detect in lessons based on all grade levels (5, 6, 7, 8th grade). Since teachers are responsible for the learning of all students, it is an expected situation to state this situation and its reasons, even if there are very few students who have problems with the specified subjects. What is important here is the similarity between the problems stated by the teachers and the problems expressed by the students. As a matter of fact, another indicator of this determination is the explanations of the students who stated that there was a situation that negatively affected their learning in Turkish lessons and the explanations of the teachers in terms of subject titles.

In this study, the field of listening education was the area where the students participating in the study reported the most problems in terms of encountering a situation that negatively affected learning. When the results of the listening activities were evaluated based on the comments of the students and teachers who participated in the research, it was determined that the situations "caused by the classroom environment" and "caused by the type of the listened text" came to the fore. If the student is not interested in listening texts, this may cause noise in the classroom and students not attending the lesson. Yenen Avcı (2020) found that according to the results of the interviews with the teachers in her research on the problems encountered in listening activities, "speaking without the right to speak" is the most common problem. In this study, it was observed that there were similar results (caused by the classroom environment) and as a result of this situation, the students stated that the noise affects learning negatively.

In the study, it was determined that among the problems encountered in reading activities, more emphasis was placed on "situations caused by the internal features of the text". It is thought that the situations caused by the internal features of the text may affect the students interest towards the text. As a matter of fact, Gün (2012), in his research on this subject, examined the problems faced by the students in reading activities, and found that the activities were not interesting for the student and the lack

of time for the implementation of the activity. Çaycı and Demir (2006) state that in terms of students who need individual teaching practices in activities related to reading skills, teachers emphasize issues such as number of students in the class and duration. It was observed that the teachers who participated in this study specifically stated that it is necessary to gain the habit of regular reading in order to increase the interest in reading activities.

When the results of the speaking activities are evaluated based on the comments of the students and teachers who participated in the study, it is seen that the situations "caused by the inability to express themselves fully", "caused by the classroom environment" and "caused by speaking activities" come to the fore. Here, in cases of not being able to express themselves adequately, especially students' vocabulary and thus their reading habits are emphasized. In addition, excitement behavior when addressing a community is also an important factor in self-expression. Here, it is necessary to ensure the self-confidence of the student during his or their speech. Temizkan (2009) states that self-assessment and peer assessment in speaking activities will be effective in improving speaking skills. It is thought that these practices will be effective in preventing "classroom environment" situations, considering that students will give their attention and interest to their friends who speak during their speaking activities.

When the results of the writing activities were evaluated based on the comments of the students and teachers who participated in the study, the most emphasized "situations caused by the inability to express yourself fully" were emphasized. Similar to these results, Aydın (2014) mentioned learning disabilities in areas such as giving examples, elaborating the subject, creative thinking, vocabulary in his research, which examined the problems faced by students in writing activities. Tağa and Ünlü (2013) identified factors such as students' lack of reading habits, teachers' not following the developments in the field, and insufficient duration of the lesson, in the results of the survey conducted with Turkish lesson teachers regarding the problems encountered in writing education. As a matter of fact, in this study, it was seen that the participants emphasized the necessity of reading habits in expressing oneself. This situation is also among the main objectives of Turkish lessons (MEB, 2019).

It is seen that there is a general opinion on the difficulty of learning and teaching grammar subjects in Turkish lessons. Aydın (1999) states that teachers who participated in his research support grammar teaching and spend more time in this field than other areas of Turkish lessons, but they do not find grammar activities "contemporary" and "practical". In this study, it was not concluded that there are more problems in grammar compared to other skill areas. When the answers for this area were examined, grammar was the second field with the least problems for students and the first field with the least problems for teachers. There are similarities between the two groups of participants in terms of the content of the reported problems. When the results of this study regarding grammar activities are evaluated, it is seen that the students participating in the study mentioned the situations "caused by the content of grammar subjects", and the teachers mentioned the situations "caused by the teaching methods and techniques". In the study, it was determined that issues such as the difficulty of grammar rules and the inability to remember them came to the fore among the situations stated by the students. Various studies have revealed that this situation may be related to the methods and techniques used during the teaching of the course. In this regard, İşcan and Kolukısa (2005) state that students' access to rules through examples and exploring will have a significant effect on overcoming this problem. Erdem and Çelik (2011), on the other hand, emphasize the necessity of text and sentence-based teaching in grammar. It is thought that the use of such activities and the use of various learning strategies, in which the student has active cognitive, psychomotor and affective participation, will help in solving the difficult areas in the learning-teaching process. In line with the relevant results, it is possible to list the recommendations of the research for educators as follows:

The role of the classroom environment is important in ensuring efficiency in listening education processes. For this reason, the classroom environment should be developed in terms of auditory, visual elements, and obeying the listening rules.

It is anticipated that it would be beneficial to design activities such as collaborative learning, drama, case study, role play and debate, which are motivating and interesting methods for students to express themselves effectively and accurately in speaking activities.

Attracting students' attention to reading texts has a direct effect on other processes of the course. For this reason, special attention should be paid to preparatory work. Of course, it should not be forgotten that gaining regular reading habits plays a key role here. It should be taken into consideration that this situation will contribute to the development of students' vocabulary and their better self-expression in their written expression processes. In addition, as stated in the related acquisition (T.6.4.11.) (MEB, 2019) in the Turkish Education Program, it is thought that sharing the texts of the students will contribute to the development of their self-confidence in this direction.

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Statements of publication ethics

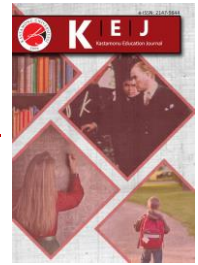
I hereby declare that the study has no unethical issues and that research and publication ethics have been observed carefully.

Ethics Committee Approval Information

This research was carried out with the approval of the Kayseri Provincial Directorate of National Education, dated 20.07.2020 and numbered 9598893.

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| Research Article / Araştırma Makalesi |

Prospective Teachers' Views on Refugee Children's Adaptation

Öğretmen Adaylarının Mülteci Çocukların Uyumuna İlişkin Görüşleri¹

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Keywords

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Abstract

Purpose: Migration is one of the most important events that initiated the social adjustment process for human beings. The problem of adaptation, especially in regions with cultural differences and values, affects refugees as well as the local people living in that region. Considering the social adaptation process of refugees, children who are one of the most affected groups, positive or negative, should get support from their teachers the most in adapting to their new school. They should receive the greatest support from teachers. Hence, it is prospective teachers who should raise awareness. Although studies concerning refugee children's adaptation process are available in the literature, the number of studies concerning the adaptation of native people is small. The aim of this study is to get the opinions of prospective teachers about the effects of refugee students on the social acceptance and adaptation process regarding the migration phenomenon on the refugees and local people

Design/Methodology/Approach: In this study, survey form with open-ended questions was used as a data collection tool. The research was conducted with the participation of 240 final year university students attending a state university. The data were analysed through content analysis and then divided into themes and codes.

Findings: The findings demonstrated that not only refugees but also prospective teachers experienced adaptation problems such as language barrier, information sharing and cultural differences. The participants said that it was mainly elementary school teachers' responsibility to secure that those children are protected, they participate in social life, they are not exposed to discrimination and that they adapt into school environment soon.

Highlights: It is thought that teacher candidates should be informed about the adaptation of refugee children and that refugee children should learn Turkish. In this context, it can be suggested that teacher candidates should be provided with training covering the application of Turkish education programs to refugee children.

Öz

Çalışmanın amacı: Göç, insanoğlu için toplumsal uyum sürecini başlatan en önemli olaylardan biridir. Özellikle kültürel farklılıkların ve değerlerin olduğu bölgelerde yaşanan uyum sorunu mültecileri etkilediği kadar o bölgede yaşayan yerel halkı da etkileyen bir sorundur. Mültecilerin toplumsal uyum sürecini düşünürsek bundan olumlu veya olumsuz en çok etkilenen kitlelerden biri olan çocuklar, yeni okullarına uyum sağlamada en çok öğretmenlerinden destek almalıdırlar. Bu durumda farkındalığı yaratacak olan kişiler geleceğin öğretmenleri olacak öğretmen adaylarıdır. İlgili alanyazına bakıldığında mültecilerin uyum sürecine ilişkin çalışmalara rastlandığı halde yerli halkın uyum sürecine ilişkin çalışmaların yetersiz olduğu görülmektedir. Dolayısıyla bu çalışmanın amacı öğretmen adaylarının, mülteci öğrencilerin göç olgusuna ilişkin toplumsal kabul ve uyum sürecinde yaşadıklarının mülteciler ve yerel halk üzerindeki etkilerine yönelik görüşlerini almaktır.

Materyal ve Yöntem: Nitel tarama araştırması olarak desenlenen bu çalışmada açık uçlu soruların yer aldığı nitel anket formu veri toplama aracı olarak kullanılmıştır. Çalışma grubu amaçlı örneklem yöntemlerinden kolay ulaşılabilir örnekleme tekniği ile belirlenmiştir. Çalışmaya bir devlet üniversitesinde bulunan 240 son sınıf öğretmen adayı katılmıştır. Verilerin analizinde içerik analizi yöntemi kullanılarak tema ve kodlar oluşturulmuştur.

Bulgular: Araştırma bulguları, öğretmen adaylarının dil uyumsuzluğu, bilgi paylaşımında eksiklik, kültür farklılığı gibi uyum sorunlarının mülteciler kadar kendilerinin de yaşadıklarını göstermektedir. Katılımcılar, çocukların korunması, sosyal hayata katılımının sağlanması, ayrımcılığa uğramaması ve okul ortamına uyum sürecinin hızlı bir şekilde gerçekleşmesi özellikle sınıf öğretmenin sorumluluğunda olduğunu da belirtmişlerdir.

Önemli Vurgular: Öğretmen adaylarına mülteci çocukların uyum sağlamaları konusunda bilgi verilmesi ve mülteci çocukların Türkçeyi öğrenmelerinin sağlanması gerektiği düşünülmektedir. Bu bağlamda, öğretmen adaylarına mülteci çocuklara Türkçe eğitim programları uygulamalarını kapsayan eğitimlerin verilmesi önerilebilir.

¹ Summary of this study; It was presented as an oral presentation at the 30. International Creative Drama in Education Congress, October 24-27, 2019, Adana, Turkey.

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INTRODUCTION

It is commonly known that humans have migrated into different places due to various reasons throughout history. Researchers say that people migrate to escape hard conditions of nature, natural disasters, wars, hunger and pressures; to live in safer environments, to create social environments and to keep living in more convenient conditions (Er and Bayındır, 2015; Koç, Görücü ve Akbiyık, 2015; Ünal, 2014). Therefore, migrations have caused serious problems across the world. They also caused similar problems in Turkey. Chaos which started in Syria in March 2011 because of demands for democracy and reform caused Turkey to face one of the greatest movements of migration in its history (Seydi, 2014). Approximately 4 million Syrians were obliged to emigrate out of their country in the process while 6 million of them left their home and had settlement in safe regions within the country (Ağır and Sezik, 2015). Turkey implemented an open door policy during the period, helped the refugees and has been helping them (Akpınar, 2017). "People whose safety of life and property is in danger for a reason and who are out of their country for fears of encountering inequity, who cannot benefit from the protection of the country they are in and who do not want to return to their country are considered as refugees" (Deniz, 2014). The number of Syrian refugees has been increasing in Turkey due to the fact that the war in Syria is continuing.

The refugee problem affects not only individuals who immigrate but also the citizens of the countries they emigrate to. Researchers argue that movements of migration affect the political, economic, and socio-cultural structure of Turkey since they pose a threat to security if such movements from Syria to Turkey occur in an uncontrolled way (Berti, 2015; Deniz, 2014; Sandal, Hançerkıran and Tıraş, 2016). The refugees as well as the citizens of Turkey have employment problems due to unemployment in the country, and thus, they do not know how to survive and as a result, they worry about the future (Çakır, 2017). The problems Syrian refugees encounter include legal, political, social, and cultural problems, problems in meeting basic humanitarian needs, accommodation problems, safety problems, health problems, educational problems, and economic problems (Ehnholt and Yule, 2006; Koç, Görücü and Akbiyık, 2015). The refugee crisis causes problems to arise in all sections of society and to increase. The children of refugees are the ones who are the most influenced by the above-mentioned problems because they are exposed to abuse, violence, negligence, and exploitation of any kind (Aydın, Şahin and Akay, 2017; Odman, 2008). The problems those children experience include communication problems, problems stemming from legislations, problems in parent support and their previous experiences, accommodation problems, nutrition problems, health problems, diseases, and educational problems (Akpınar, 2017; Aydın, Şahin and Akay, 2017; Başar, Akan and Çiftçi, 2018; Devakumar, Birch, Rubenstein, Osrin, Sondorp and Wells, 2015; Levent and Çayak, 2017). Therefore, the strategies to be used in solving the problems should be developed in a way that includes children in addition to adults- in a holistic manner.

Refugee children receive support so that they can survive in daily life, but the fact that they have problems in educational issues can pose threats in the future to them and to the citizens of the country of living. In a similar way, Seydi (2014) also argues that the conflicts in Syria affect children the most in the issue of children's and the youth's education. That children constitute a large part of the refugees (45%) makes it obligatory to attract attention to the education of school age children (Sağlam and Ilksen-Kanbur, 2017). Refugee children cannot continue receiving education due to economic problems. Hence, Paksoy and Karadeniz (2016), in a study conducted in Kilis in Turkey, found that 42 out of 105 Syrian refugees were students. Tarlan (2016) reports that children who are exposed to chemicals and heavy workload at earlier ages suffer from occupational diseases more quickly. Refugee children's involvement in work life influences their physical and personal development beside their education in negative ways (Lordoğlu and Aslan, 2018). Even though children are affected cognitively, affectively, and physically by the situation in negative ways, it is ignored. Thus, Ardiç-Çobaner claims that the lack of emphasis laid by the media on the quality of education offered to refugee children and on the rights of children who cannot access education because of their disability is important. Therefore, solutions to refugee children's problems should be generated by taking the educational problems into consideration.

The main reason for failure to adopt solution-oriented approaches to the problems refugee children have in education is the presupposition that being a guest in Turkey is temporary (Dinçer, Federici, Ferris, Karaca, Kirişçi and Çarmıklı, 2013). Syrian students' participation in formal education leads to different problems from the aspect of Syrian students and Turkish students and teachers. One of the problems is the problem of infrastructure. In this respect, Duruel (2016) claims that physical infrastructure problems in providing convenient building, sufficient number of classrooms and desks cause serious difficulties to arise.

Another problem can be said to arise in the process of adaptation into the school. According to Başar, Akan and Çiftçi (2018), elementary school teachers believe that the reason for refugee students' adaptation problems is their problems in communicating and their isolating themselves from the class. Another problem Syrian students have is the linguistic barrier (Moralı, 2018). The problem of providing teachers and teaching materials for teaching Turkish to Syrian children and adults in and outside accommodation centres also arose (Duruel, 2016). Another study conducted by Mercan-Uzun and Bütün (2016) concerning the Syrian students in pre-school institutions found that the children who could not speak Turkish could not communicate with their teachers or peers and therefore they were deprived of the knowledge and skills that schools aimed to inculcate in them. In a study performed with the participation of foreign students attending primary schools in Turkey and of their teachers Sarıtaş, Şahin and Çatalbaş (2016) also reported based on teachers' statements that those students had communication and behavioural problems since they were illiterate. Moralı (2018) found that problems stemming from affective status, target language, materials, classroom management and classroom environment and from families' cooperation arose in teaching Turkish to Syrian children.

It becomes difficult to attain the desired achievement in schools where refugee children exist due to such problems as infrastructure and linguistic and communicative problems.

The teachers who had refugee students in their classes also stated that they felt incompetent in educating those students (Çeltik, 2019). The studies conducted with the participation of teachers who had Syrian students in their classes found that teachers generally ignored such students in solving the problems, that they felt incompetent in educating them and that they could not contribute to those children's development or adaptation. They also found that the teachers did not know how to solve the students' language problems because they had not been trained in refugee children's education and that they had serious problems since they had not been trained in teaching Turkish to foreigners. The studies also found that teachers did not use any different teaching methods or materials in the classroom in teaching the refugee children (Bulut, Kanat-Soysal and Gülçiçek, 2018; Er and Bayındır, 2015; Erdem, 2017; Mercan-Uzun and Bütün, 2016). Yavuz and Mızrak (2016), on the other hand, contend that issues related to children's access to school generally had the priority but that the issues related to the quality of education were considered sufficiently. The ability of those students- who have gone through difficult situations- to hold on to life and to cherish love for the country closely depends on teachers' approach in that period when basic knowledge and skills are learnt and the foundation for complicated learning is laid (Ilksen-Kanbur, 2017). Refugee children should receive the greatest support in adapting into their new school from the teachers.

In that case, it is prospective teachers who are going to raise awareness and generate solutions to problems. Therefore, prospective teachers' pedagogical knowledge in relation to strategies to be developed in classes with foreign students and in relation to suitable teaching methods and techniques should be developed. On the other hand, although the number of studies concerning teachers' views on Syrian refugees is limited (Bulut, Kanat-Soysal and Gülçiçek, 2018; Er and Bayındır, 2015; Erdem, 2017; Mercan-Uzun and Bütün, 2016), studies conducted with the participation of prospective teachers are scarcely available (Topkaya and Akdağ, 2016). Hence, this current study is significant in that it obtains prospective teachers' views on refugee students and in that it supports them in generating solutions to problems to be encountered in the adaptation process.

This study aims to obtain prospective teachers' views on the effects of refugee students' experiences in the process of social acceptance and adaptation in relation to the phenomenon of migration on refugees and on local people. Accordingly, it seeks answers to the questions:

1. What do you think of the concept of adaptation?
2. What adaptation problems do the refugee children living in your neighbourhood have?
3. What do you think of the precautions that can be taken against refugee children's adaptation problems?
4. What methods and techniques should be used in classes where refugee children exist?
5. What amenities and difficulties do refugees have in terms of adaptation into areas in which they settle?
6. Do you think it is immigrants who experience difficulty in the process of social acceptance and adaptation, or it is those who receive immigration?

METHOD

Research Model

This study, which aims to analyse prospective teachers' perceptions of the concept of adaptation, was conducted in a qualitative approach. It is the approach in which researchers collect qualitative data to be able to understand a problem, they combine the data, and they make inferences from the data. A qualitative study is the approach which prioritises researching and understanding social phenomena in the environment where they are available (Yıldırım, 1999). Qualitative studies set out from constructivism, phenomenology, and interactionism, and are concerned with how individuals interpret their experiences, how they shape their world and what meaning they attach to their experiences (Merriam, 2017). Review studies, however, are the studies which aim to describe an existing situation in depth. Efforts are made to describe the subject of research within the natural conditions in which the subject exists. Records kept about an individual or an object as well as the individual or object can be investigated in reviews (Karasar, 2012). The primary goal is to make an in-depth description and explanation about the situation or person analysed (Bal, 2013). Qualitative review studies, on the other hand, describe the diversity of the properties of a population instead of describing the properties quantitatively. The interview data for each question are generally compared during the analysis, and the properties of participants are diversified and divided into categories. Two methods called induction and deduction are used in qualitative review studies (Jansen, 2010). Categories, subjects, and themes are distinguished by interpreting the data in inductive studies. Categories are distinguished beforehand, and they are placed after interpreting the data in deductive or pre-structured studies. The data were collected in this current study with the purpose of obtaining data from a larger sample so as to analyse prospective teachers' views on the effects of refugee students' experiences in the process of social acceptance and adaptation on refugees and on local people; and then the data were interpreted, and the joint views were divided into categories.

Study Group

The study group was chosen in a convenience sampling method- one of the purposeful sampling methods. Here, researchers begin to compose their sampling by starting with the most reachable responders until they reach the group that is the size they need; or they work with a situation or sample which is the most reachable and which is the most economic (Büyüköztürk, Kılıç-Çakmak, Akgün, Karadeniz and Demirel, 2016). 240 fourth year students who attended various undergraduate programmes of the educational faculty of a state university in the Spring semester of 2018-2019 academic year participated in the research of the study based on volunteering. 188 (78%) female and 52 (22%) male prospective teachers completed the survey form of qualitative survey questions, and no data loss occurred. Prospective teachers who were the final year students in elementary school teaching, preschool teaching, science teaching, mathematics teaching and English Language teaching departments were included in the research.

Data Collection Tools

The semi-structured survey form of open-ended questions which was prepared by the researchers to reveal the perceptions about adaptation and the sub-problems of adaptation was used as the tool of data collection. After determining the questions for inclusion in the survey form, the lecturers in the elementary school teaching and social studies teaching departments were consulted for expert opinion, and thus the decision was made for the suitability of the questions. Totally 6 questions were included in the survey form and the participants were given 15-20 minutes to complete the form. Thus, they stated their views about the effects of what refugee students experienced in relation to the phenomenon of migration in the process of social acceptance and adaptation on refugees and on local people. All the participants completed the form in the length of time allowed, and nobody asked for additional time.

Data Analysis

The data collected were then put to content analysis. Content analysis is a method used in describing the meaning of the qualitative data systematically. The data can be collected through interviews and open-ended surveys by researchers as well as from other sources such as newspapers, books, and the internet (Schreier, 2012). First, the data coming from the open-ended questions were organised and the responses were documented. Then, the general meaning of the data was inferred, and reflective thinking was obtained in relation to the meaning. Thus, questions such as “what do the participants in general think?” and “what is the impression about the depth, persuasiveness and feasibility of the thoughts?” were focused on. The frequencies and percentages for the data were found, the prospective teachers’ views on the sub-problems were tabulated and groups were divided according to properties in common. The data collected from the groups were divided into categories at the stage of coding the data, and the categories were labelled. As a result of labelling, the themes were distinguished, and the themes constituted the main findings of the study. The participants’ statements were associated with each other, the ones that had elements in common were considered in the same theme, the ones which were different were placed in different themes and relevant explanations were made. At the final stage, the meanings of the themes were interpreted- that is to say, the personal statements in which the participants described their experiences were evaluated. The prospective teachers’ statements were directly quoted in quotation marks. The quotation beginning with O1, for instance, expresses the views stated by prospective teacher one. The findings obtained were described systematically and clearly and the descriptions were arranged and interpreted.

Validity and Reliability

Ties were set up between prospective teachers’ views, the results of the survey and the researcher’s presuppositions so as to attain descriptive validity in this study. Direct quotations were made from the participants’ statements for hermeneutical validity. Several precautions were taken against potential threats to the internal validity of the study- which were described respectively. The same questions were asked to all the participants in the same period by the same interviewers to avoid the threats stemming from the data collection tools. Besides, the same length of time was given to all the participants. All the data were collected in the same environment so hinder the threats to internal validity stemming from the location. The sampling (representation) effect threatening the external validity of the study was that the study group had limited generalisations.

Even though reliability is perceived as obtaining the same results by conducting studies in the same way, Kirk, and Miller (1986) mention it as misleading and state that measurements and statements scarcely remain as constant and that obtaining consistent results by using different instruments cannot be a criterion (cited by Koç, 2016). The research conducted, its presuppositions, limitations, data collection tools and all the stages followed in the research should be described clearly. Accordingly, the presuppositions of this study, its limitations, data collection tools, the implementation of data collection tools, relations with the participants and all the steps taken in the research were described in detail. Such details increase the reliability of studies. Reliability in qualitative studies is also achieved by sending the themes and codes to experts at the stage of evaluation and by reaching agreement between raters through cross-check. The reliability formula developed by Miles and Huberman was used for it. Accordingly, the reliability coefficient was found as $118/(118+24) \times 100 = 83$. Interrater agreement is expected to be at least 80% according to coding control which yields internal consistency (Miles and Huberman, 1994; cited by Baltacı, 2017).

FINDINGS

Findings for Research Question 1

The participants' views for the question "what do you think of the concept of adaptation?" were divided into 5 themes. The themes distinguished were labelled as "the process of adaptation", "feeling like a part of the whole", "respecting cultural values", "having no differences" and "cooperation". The themes and sub-themes distinguished are shown in Table 1.

Table 1. The Prospective Teachers' Views on the Concept of Adaptation

Themes	f	Sub-themes	f
The process of adaptation	118	The adaptation period	48
		Adaptation	33
		Obeying the rules	15
		Keeping step	11
		The process of familiarisation	7
		Adapting into environment	4
		Consistency between parts	21
Feeling like a part of the whole	66	Integration	14
		The process of acceptance	12
		Balancing	11
		Coalescence	8
Respecting cultural values	12	Having respect	7
		Considering social values important	3
		Keeping social relations well	2
Having no differences	25	Being equal	19
		Meeting in the common point	6
Cooperation	19	Having unity	11
		Living together	8

As is clear from Table 1, the themes of "the process of adaptation" (f=118) and "feeling like a part of the whole" (f=66) comes into prominence the most frequently in the participants' answers in relation to the definition of the concept of adaptation. They are followed by "having no differences" (f=25), "cooperation" (f=19) and "respecting cultural values" (f=12), respectively. The statements such as "adaptation is the process of getting used to a job, a person or a country. It is not a process that a person can go through quickly. People face a lot of positive or negative things in the process. Then, they turn into personal experience" (O1) and "adaptation is the process of keeping step with a place. The process can be challenging. This process of adaptation can differ according to environmental conditions" (O35) were the examples for participants' views in the theme of "the process of adaptation". An example for the theme of "feeling like a part of the whole" was as in the following: "on looking at the concept deeply, we can reach the conclusion that our existence in life and our integration into certain things unconsciously are already made possible by the natural flow of life" (O83). Accordingly, the participants generally described their thoughts about adaptation as the process of getting used to and adapting into a job, a person and a country.

Findings for Research Question 2

The participants' views for the question "what adaptation problems do the refugee children living in your neighbourhood have?" were divided into 7 themes labelled as "communication", "cultural", "socialising", "accommodation", "health", "educational" and "no problems". The themes and sub-themes distinguished are shown in Table 2.

Table 2. Refugee Children's Adaptation Problems

Themes	f	Sub-themes	f
Communication problems	92	Having language problems	35
		Failure to express themselves	22
		Language differences	18
		Failure to understand others	17
		Cultural chaos	19
Cultural problems	56	Cultural differences	17
		Having cultural shock	11
		Cultural conflicts	7
		Failure to keep step with the culture	2
		Problems in making friends	12
Problems in socialising	34	Failure to adapt into the environment of friendship	11
		Being isolated or despised	6
		Not being adopted	3
		Being made to feel different	2
		Living in community	8
Accommodation problems	12	Failure to find a house	4
Health problems	11	Suffering from health problems	11
		Skippping school	13
Educational problems	32	Being made to work at young age	10
		Not doing homework (because of failure to understand)	9
No problems	3	They have no problems	3

It is evident from Table 2 that "communication problems" (f=92) and "the cultural problems" (f=56) are the most frequently stated themes in the participants' answers to the question about refugee children's problems. They are followed by the themes of "problems in socialising" (f=34), "educational problems" (f=32), "accommodation problems" (f=12) and "health problems" (f=11), respectively. Three participants did not think that refugee children had any problems. The findings demonstrated that the prospective teachers thought that the refugee children living in their neighbourhood had adaptation problems in communication, culture, education, socialising, accommodation, and health. Their main problems were failure to express themselves, failure to understand others- which stemmed from language differences; having cultural chaos, having culture shock and failure to keep pace with the culture-which stemmed from cultural differences. The statement "to begin with, they cannot speak our language and it makes communication very difficult. There are several problems which originate from the fact that their language and their lifestyles are different. They face the problem of failure to express themselves" (O50) is the example for the views in the theme of communication problems. An example for participants' views in the theme of cultural problems is as in the following: "their problems stemming from cultural differences are abundant. Immigrants' adaptation into where they live becomes difficult if they ignore the cultural properties of the place and continue living according to their own culture" (O38). Another participant stated his/her views on the theme of socialising in the statement "an immigrant child in the school where I had practice teaching sat on his own at the back of the classroom. He could not communicate with his classmates because he could not speak the same language. The situation hindered his socialising and made him introvert" (O28). Examples for the views stated in relation to the theme of educational problems were as in the following: "in my opinion, the biggest problem is education. They display crime behaviours because they have a bias towards skipping school. And the fact that they are made to work at a young age causes them to break off from educational life" (O113). The statement "they often have problems meeting nutrition and clothing needs and mainly the problem of finding a house. We also see that more than one family lives in a house" (O96) was an example for the views on the theme of accommodation problems. An example for the participants' views in the theme of health problems was as in the following: "children suffer from emotional traumas because they escape from something like a war, and they also have health problems" (O2). And finally, a participant who did not think that refugee children had any problems said, "on the contrary, they have come to a more comfortable and a nicer place and they are giving birth to a lot of children and they are settling here" (O14).

Findings for Research Question 3

The participants' views for the question "what do you think on the precautions that can be taken against refugee children's adaptation problems?" were divided into 5 themes labelled as "language support", "educational support", "medical support" "economic support" and "cultural support". The themes and sub-themes distinguished are shown in Table 3.

Table 3. Precautions that can be taken for Refugee children not to have adaptation problems

Themes	f	Sub-themes	f
Language support	102	They should be taught Turkish	78
		Support of a helping elder sister	24
		Coalescence days	22
Educational support	54	Group activities	13
		Adaptation activities	12
		Games should be played	7
Medical support	14	Guide teacher support	9
		Psychologist support	5
		Financial support	13
Economic support	28	Accommodation support	8
		Clothing support	7
		They should be informed culturally	23
Cultural support	42	They should be introduced to Turkish culture	11
		Cultural trips should be organised	6
		They should be shown Turkish family life	2

According to Table 3, the most frequently used themes in relation to the participants' answers to the question "what do you think on the precautions that can be taken against refugee children's adaptation problems?" were the themes of "language support" (f=102) and "educational support" (f=54). They were followed by the themes of "cultural support should be given" (f=42), "economic support should be given" (f=28) and "medical support should be given" (f=14) respectively. The prospective teachers held the view that refugee children should first be taught Turkish during preschool period as a precaution to prevent adaptation problems, they recommended that coalescence days, activities and projects should be prepared and said that assistance from guide teachers and psychologists should be received. They also suggested that they should be introduced to Turkish culture, they should be informed of the culture, informative trips should be organised and that examples from Turkish culture should be given. Some of the examples for participants' views in the theme of "language support should be given" were as in the following: "language courses can be organised, and the language as spoken in the area can be taught because effective communication is possible through language. Younger children in particular should be taught Turkish during preschool period, service should be offered in terms of language to help adaptation" (O155). The examples for the views in the theme of "educational support should be given" were as in the following: "activities called coalescence days can be organised for refugee children. In this way, an amusing atmosphere can be created and the people in the community can get rid of prejudices and coalesce" (O103). Some of the samples for the views in the theme of "cultural support should be given" were quoted below: "they should be given cultural support by considering their own culture so that they can adapt into our culture and our environment, the necessary research and work should be done. They should be informed of the culture and introduced into Turkish culture in social life and in school" (O223). An example for the views included in the theme of "economic support should be given" were as in the following: "I think that they should be given economic support such as nutrition, clothing and mainly accommodation" (O54). The examples for the views in the theme of "medical support should be given" were as in the following: "medical support could be given. Psychological counselling service can also be given by considering the difficulties individuals encounter" (O87).

Finding for Research Question 4

The participants' views for the question "what methods and techniques should be used in classes where refugee children exist?" were divided into 6 themes. The themes were labelled as "showing and letting them do", "discussion", "collaborative learning", "individual work", "case study" and "drama" methods. The themes and sub-themes distinguished are shown in Table 4.

Table 4. Methods Used in Teaching the Refugee Children

Themes	f	Sub-themes	f
Methods	240	Showing and letting them do	49
		Case study	41
		Collaborative learning	42
		Individual work	28
		Discussion	16
		Drama	64

As clear from Table 4, the theme that was the most frequently used in including the participants' views in relation to the research question about the methods used in teaching the refugee children was the theme of "drama method" (f=64)- which was

followed by “case study method” (f=41), “individual work method” (f=28) and “discussion method” (f=16). Some of the examples for participants’ views included in the theme of “drama method” were as in the following: “methods such as drama, animation and role playing can be used so that they do not feel limited and so that they can express themselves more comfortably. In this way the refugee children can express themselves more freely and other children can also understand them and empathise with them more easily” (O187). To illustrate the views in the theme of “showing and letting them do”, the statement “presentation in the form of showing and letting them do” should be preferred if refugee children do not have a good command of the language. Communication will be easier if methods appealing to eyes are used” (O106) can be quoted. The statement “lessons can be taught in a collaborative learning method by taking individual differences into consideration” made by O49 can be an example for participants’ views in the theme of collaborative learning method. As to the theme of case study method, the statement “I think that case study method in which effective teaching is conducted by giving amusing examples from daily life can be used in classroom activities since they are the children who have acculturation problems” (O39) is an example for participants’ views in the theme. A sample representing participants’ views in the theme of individual work method is the statement “first, individuals’ prior knowledge and level of maturation may not be compatible with the environment they are in. in such cases, the level of mental and affective introductory behaviours should be determined. Individualised teaching- which is one of the teaching theories should be used for it” (O70). The examples for the views in the theme of discussion method were as in the following: “discussion method should be used frequently and thus environments in which all the students can express themselves should be created. I think immigrant children can get rid of shyness in this way” (O206).

Findings for Research Question 5

The participants’ views for the question “what amenities and difficulties do refugees have in terms of adaptation into areas in which they settle?” were divided in the form of “amenities” (n=102) and “difficulties” (n=138). The themes and sub-themes distinguished are shown in Table 5.

Table 5. The Amenities and Difficulties in Adaptation

Themes	f	Sub-themes	f
Amenities	102	Comfortable and peaceful life	33
		Psychological recovery	20
		Recovering from war trauma	18
		A better economy	13
		New communication	8
		Richness of culture	5
		Rise in the level of development	4
		Improvement in job opportunities	1
		Financial problems	47
		Difficulties in getting a job	27
Difficulties	138	Being isolated	20
		Different political views	13
		Environment and neighbourhood	11
		Failure to find a house	7
		Religious, linguistic and cultural differences	6
		Educational problems	4
		Psychological problems	2
		Communication problems	1

As apparent from Table 5, the participants mentioned amenities such as comfortable and peaceful life, psychological recovery, recovering from war trauma, a better economy, new communication, richness of culture, rise in the level of development and improvement in job opportunities as well as difficulties such as financial problems, difficulties in getting a job, religious beliefs, environment and neighbourhood, religious, linguistic and cultural differences, the weather conditions of the new country, health problems, psychological problems, difficulties in communication, being isolated and introversion because they are not wanted there in relation to refugees in response to the question about the amenities and difficulties that refugees had in adaptation. Some of the examples for views that they had amenities were as in the following: “of course, they have amenities. Comfortable life, psychological recovery, recovering from the war trauma, a better economy, new communication, etc. ...” (O91). “There are amenities for them. They can communicate more easily if they learn two languages and if they get organised and adjust into the place where they settle; and they can live more comfortably and more peacefully in this way” (O19). The examples for views that they had difficulties were as in the following: “I don’t think they have amenities in this respect. Facing a new country, a new language and a new culture is a challenging process. Both children and adults will have psychological breakdown if they cannot adapt into the process and if they suffer. The moral destruction they have will not be a finished thing, but it can also turn into anger and lead to bad results in the future” (O44). “The difficulties are trying to learn a language and culture that they don’t know, being refused by local people in the place they have arrived and being isolated by them” (O158).

Findings for Research Question 6

The participants' answers to the question "do you think it is immigrants who experience difficulty in the process of social acceptance and adaptation, or it is those who receive immigration?" were divided into three labelled as "the immigrants" (n=93), "those who receive immigrants" (n=86) and "both" (n=61). The relevant themes and sub-themes are shown in Table 6.

Table 6. The Parties who have the difficulty according to migrating or receiving the migration

Themes	f	Sub-themes	f
Immigrants	93	Economic difficulties	48
		Difficulties in adaptation	28
		Being isolated, not being accepted, being considered different	13
		Cultural differences	3
		Failure to express oneself	1
		Changes in ethnic structure	32
		Deterioration in job opportunities	21
Those who receive immigrants	86	Deterioration in educational opportunities	15
		Differences in healthcare services	9
		Failure to preserve the native language	5
		Fear of being assimilated	4
		Increase in population	28
		Coalescence problems	22
Both	61	Increase in environmental and water pollution	6
		Lack of communication	5

Accordingly, the difficulties listed by the participants in response to the research question about the sides who have difficulty in the process of adaptation and the reasons for the difficulties were mainly economic difficulties, difficulties in adaptation, being isolated, not being accepted, being considered different, cultural differences and failure to express oneself. In addition to that, the participants who thought that those who received immigrants had more difficulties listed such problems as changes in ethnic structure, deterioration in job opportunities, deterioration in educational opportunities, differences in healthcare services, failure to preserve the native language and fear of being assimilated. An example for the view that immigrants had the most difficulties might be the statement "it is more difficult for those who immigrate. Because they feel like they are suspended in the air by coming from their own environment into a very different environment. They find themselves in a culture shock such as fear of being isolated, failure to get accustomed to, failure to adjust, failure to express themselves and so on. they may also face the risk of assimilation of their culture" (O24). The statement "in my opinion, it is a difficult process for the countries that receive immigrants. Others coming into a country means making changes in areas such as economy, education, and health- that is to say, it means change of the system. I think that it causes negative results especially in the sense of economy. Failure to preserve the native language and fear of being assimilated are also true for the countries which receive immigrants unless precautions are taken" (O199) was the example for the view that the people in the recipient country had the most difficulties. The statement made by participant Ö85 as "it is a difficult situation for both those who emigrate and those who receive the immigration. Perhaps the difficulty is equal for both sides. It is in fact related to the problem of coalescence. If the problem is eliminated, coalescence will occur. It is something like fitting a piece of puzzle into a place-which never fits. Perhaps, the piece needs cutting so that it fits; perhaps it will fit a place without cutting it" was the example for participant views who believed that the process was difficult for both sides.

CONCLUSION, DISCUSSION AND RECOMMENDATIONS

Refugees who face the safety of life and property and who are obliged to leave their country due to force majeure have difficulty in adapting into the country to which they come. Teachers should be aware of refugee children's needs and problems they can encounter, and they should adopt solution-oriented approaches towards events. The ones who will raise the awareness are prospective teachers- who will be the practising teachers in the future and who will be appointed to the cities where such children live. Along with the changing programme, the goals of Drama course include inculcating skills of working together and cooperation, developing learning based on experiences, developing behaviours compatible with values, having confidence in oneself and in others and looking at problems from different perspectives and generating new solutions (MoNE, 2018). The skills mentioned are the skills which refugees and local people should acquire, and which are thought to help in generating solutions to problems caused by living together. In this context, this study is important in analysing the views held by prospective teachers who take the drama course in relation to immigrants' adaptation. The research findings demonstrated that the prospective teachers generally described their thoughts about "adaptation" as the process of getting to know and adapting into a job, a person,

and a country. The word is also defined in a similar way in relevant literature as “being consistent with, adapting or adjusting into a situation and integration into it” (dictionary of Turkish Language Association, 2019).

The prospective teachers who were included in this study said that the refugee children living in their environment had adaptation problems in communication, culture, education, socialising, accommodation, and health. The leading problems they had were failure to express themselves and failure to understand others which stemmed from language differences, having cultural chaos stemming from cultural differences and problems stemming from culture shock and from failure to keep step with the culture. Besides, their failure to adapt into the circle of friends because of having difficulty in making friends, their isolation, being despised, not being accepted and making them feel different all slow down their process of adaptation. Their break from educational life due to their tendency to skip school and since they are made to work at a young age were also the major problems that those children had. The results obtained in this study are also consistent with the ones obtained in the literature. Yavuz (2013) states that immigrants have the greatest problem in language since they have a low level of education and that the problem makes adaptation into the area of settlement difficult for them. Rettberg and Gajjala (2016) claim that arguments against refugees can be threats to their existence. Research has found that refugee children suffer from stress, depression, and continuous anxiety (Eruyar, Maltby and Vostanis, 2018; Uğurlu, Akça and Acartürk, 2016). Ehnholt and Yule (2006) argue that the psychological and medical problems that refugees have endanger their mental development. Wofford and Tibi (2018) contend that refugee children have the probability to have low level of participation in classes and to drop out of school unless they have education in language and in literacy. Accordingly, refugee children can be said to be cognitively, mentally, and psychologically at risk.

The participants argued for the view that refugee children needed to be taught Turkish during preschool period so that they could communicate and recommended that coalescence days, activities and projects should be prepared so that they did not have adaptation problems and they said that teachers and psychologists should be consulted for help in this respect. They said that the children should be introduced into Turkish culture, be informed of culture, informative trips should be organised and examples from Turkish family life should be given to prevent cultural chaos. The refugee children are at risk in terms of education since they have language problems. Hence, Morali (2018) found that problems stemming from affective situation (lack of motivation, resistance, traumatic situation, applying violence, worries about losing one’s identity, responsibility), problems stemming from the target language (consonants, vowels, pronunciation, abstract words, difference in the alphabet), problems stemming from materials (books unsuitable to the level, inadequate book content, insufficient materials, stationery subvention, inconsistency between books in terms of levels, curricula), problems in classroom management (unattendance, being late for classes, failure to establish discipline, the attitudes displayed by the administration), problems stemming from the classroom environment (crowded classrooms, the physical environment of the classrooms, grade levels) and problems stemming from family cooperation (homework support, communication, creating the environment to use Turkish at home, indifference, cooperation, children’s attitudes towards learning Turkish) occurred in teaching Turkish to Syrian children. The fact that refugee children encounter problems in several areas exhibits that care should be taken in terms of the quality of education to be offered to them. Thus, Vostanis (2016) points out that interventions in traumatic situations for refugee children require skills and education at differing degrees and that the situation is important in balancing the accuracy of the remedy.

The participants said that drama, showing and letting them do, collaborative learning, case study, individual work and discussion methods would be effective in response to the question of what methods would be more effective in teaching refugee children. Aykaç and Aykaç (2018) found that applications on the basis of creative drama and active teaching methods had significant functions in understanding the feelings and problems immigrants had and in empathising with them. and thus, eliminated the prejudices against them at least in part. The researchers stated that creative drama-based activities shed light on the problems immigrants had. Several researchers also found that the drama method was more effective than the direct teaching method (Üstündağ, 1998; Koç, 1999; Atar, 2003; Yalçın, 2004; Debre, 2008; Aykaç, 2008; Rüzgar, 2014). The participants said that teaching through collaborative learning would also be effective by taking individual differences into consideration. Göncüoğlu (2010) also found that drama along with collaborative learning had positive effects on students’ achievement in teaching the unit of “the Adventure of Democracy” in social studies courses. On the other hand, the prospective teachers’ emphasis on the importance of collaborative learning in classes where refugee students existed was consistent with the findings obtained in the literature. Madziva and Thondlana (2017) argue that refugee children should be educated by considering such components as the school, home, and the society for quality of education. In a similar way, Culbertson and Constant (2015) also point out that appropriate plans should be made, and strategies should be developed by considering the out-of-the-school resources.

The prospective teachers who took part in this study listed such amenities as comfortable and peaceful life, psychological recovery, recovering from the war trauma, a better economy, new communication, richness of culture, rise in the level of development and improvement in job opportunities beside such difficulties as financial problems, difficulties in getting a job, religious beliefs, political views, environment and neighbourhood, religious, linguistic and cultural differences, the weather conditions of the new country, health problems, educational problems, psychological problems, difficulties in communication and being isolated and introversion because they are not wanted there in response to the question about the amenities and difficulties that refugees had in adaptation. Cebeci (2015)-who obtained similar results- pointed out that refugees had various problems in such basic needs as nutrition, accommodation, health, and education. In a similar vein, Sezgin and Yolcu (2016), stating that refugee university students make efforts to gain acceptance and to adapt despite their hard life conditions and that they avoid

the conditions which are difficult for them, describe the problems they have with their Turkish friends and attract attention to their efforts to adapt socially and to gain social acceptance.

The participants who held the view that those who emigrate had more difficulties in the process of adaptation listed such difficulties as economic difficulties, difficulties in adaptation, being isolated, not being accepted, being considered different, cultural differences and failure to express oneself. On the other hand, the participants who thought that those who received immigrants had more difficulties described the challenges as changes in ethnic structure, deterioration in job opportunities, deterioration in educational opportunities, differences in healthcare services, failure to preserve the native language and fear of being assimilated. Birdal (2016) found that people began to fear losing their job, found streets less safe, were disturbed by Syrian child beggars and had worries about cultural incongruities due to incorrect and inadequate feelings after the arrival of Syrian immigrants. The participants who thought that both those who emigrate and those who receive the immigrants had equal difficulties stated that problems such as increase in population, coalescence problems, increase in environmental and water pollution and lack of communication had influenced both sides in negative ways. Günay, Atılğan and Serin (2017) mentioned both the positive and negative sides of immigration and pointed out that the problem of immigration affected not only those who left their country but also the citizens of the country receiving immigrants. They argue that immigrants should be integrated into society so that the problem can be ignored. The Syrian crisis affected both the current situation and the lives of several people in the next generations in negative ways. It is possible to rebuild Syria to create a society based on equality and justice in the future only through citizens who are intellectually and emotionally ready (Charles and Denman, 2013). In accordance with the results of this study, it is considered necessary to inform pre-service teachers of the issue of refugee children's adaptation and to ensure that those children learn Turkish. Thus, the refugee children are recommended to receive language education in schools that they attend for better coalescence with other children. Activities introducing the children into Turkish culture and Turkish traditions and customs should accompany language education. It might be suggested that fundamental citizenship education be offered to the refugee children and to their families so that they could live in harmony with the society. prospective teachers could be offered appropriate training in the practice of teaching Turkish to refugee children, they could develop themselves in teaching methods and techniques in the process and material use could be enriched. Future researchers are recommended to repeat the study with different samples and by using the quantitative, qualitative and observation techniques in combination.

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Researchers' contribution rate

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| Research Article/Araştırma Makalesi |

A Correlational Study on the School Administrators' Paternalistic Leadership Characteristics and School Effectiveness*

Okul Yöneticilerinin Paternalist Liderlik Davranışları ve Okul Etkililiği Üzerine Korelasyonel Bir Çalışma

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Keywords

- 1.School Administrator
- 2.Paternalistic Leadership
- 3.Effective School

Anahtar Kelimeler

- 1.Okul Müdürü
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Abstract

Purpose: This study aims to examine the relationship between school administrators' paternalistic leadership characteristics and schools effectiveness.

Design/Methodology/Approach: Having a quantitative research design, this research used a relational survey model. The population of the study consisted of the teachers working at public kindergarten, primary, secondary and high schools located within the central districts of Kahramanmaraş province (Onikişubat, Dulkadiroğlu) during the 2019-2020 academic year. The sample held a total of 370 teachers who were selected by random sampling method. The study employed three data collection tools: "Paternalistic Leadership Scale", "School Effectiveness Scale" and "Personal Information Form" developed by the researcher.

Findings: The research findings revealed a positive and medium level relationship between the school administrators' paternalistic leadership behaviors and the effectiveness of the schools; moreover, there was a positive and high level relation between the sub-dimensions of "family atmosphere", "benevolence" and the effectiveness of the schools; a positive and medium level relation between "authoritarianism" sub-scale and the effectiveness of the schools; whereas, a negative and low level relationship was determined between "interventionism", "finding inadequacy" and school effectiveness. Besides, only the "family atmosphere", "benevolence" and "authoritarianism" sub-dimensions of the paternalistic leadership were identified to be significant predictors of the effectiveness of schools.

Highlights: The research findings revealed a positive and medium level relationship between the school administrators' paternalistic leadership behaviors and the effectiveness of the schools. The variables of family atmosphere, benevolence and authoritarianism together explained approximately 63% of the total variance related to school effectiveness.

Öz

Çalışmanın amacı: Bu çalışmada okul yöneticilerinin paternalist liderlik özellikleri ile okulların etkililiği arasındaki ilişkinin incelenmesi amaçlanmıştır.

Materyal ve Yöntem: Nicel yöntemde ve ilişkisel tarama modelinde gerçekleştirilen araştırmanın evrenini 2019-2020 eğitim öğretim yılında Kahramanmaraş ili merkez ilçelerinde (Onikişubat, Dulkadiroğlu) bulunan kamu anaokulu, ilkokulu, ortaokulu ve liselerinde görev yapan öğretmenler; örneklemini ise bu evren içerisinde küme örnekleme yöntemiyle seçilen okullarda görevli ve seçkisiz yöntemle belirlenen 370 öğretmen oluşturmaktadır. Araştırma verilerinin toplanması amacıyla "Paternalist Liderlik Ölçeği", "Etkili Okul Ölçeği" ve "Kişisel Bilgi Formu" kullanılmıştır.

Bulgular: Araştırma sonucunda okul müdürlerinin paternalist liderlik davranışları ile okul etkililiği arasında pozitif yönlü orta düzeyde; paternalist liderliğin alt boyutları olan "aile havası" ve "hayırseverlik" alt boyutları ile okul etkililiği arasında pozitif yönlü yüksek düzeyde; "otoriterlik" alt boyutu ile okul etkililiği arasında pozitif yönlü orta düzeyde; "müdahalecilik" ve "yetersiz görme" alt boyutları ile okul etkililiği arasında ise negatif yönlü düşük düzeyde anlamlı ilişkilerin olduğu ortaya çıkmıştır. Ayrıca paternalist liderliğin sadece "aile havası", "hayırseverlik" ve "otoriterlik" alt boyutlarının okulların etkililiği üzerinde anlamlı birer yordayıcı oldukları belirlenmiştir.

Önemli Vurgular: Okul müdürlerinin paternalist liderlik özellikleri ile okul etkililiği arasında pozitif yönlü orta düzey bir ilişkinin olduğu ortaya çıkmıştır. Aile havası, hayırseverlik ve otoriterlik alt boyutlarının okulların etkililiğine ilişkin varyansın yaklaşık %63' ünü açıkladığı belirlenmiştir.

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INTRODUCTION

Schools are organizations that perform educational services. The organization, on the other hand, is a coalition established by the community members to achieve certain goals (Bursalıoğlu, 2015). Where there is organization, there is management which can be mentioned in every environment where two people coordinate (Sağır & Göksoy, 2016). The introduction of the concepts of organization and management homogeneously refer to the association of the concepts of school and administrator. Besides, school leadership is defined as the ability of the school administrator to help the school use human and material resources effectively (Can, 2018).

Considering the historical development of leadership, societies need leaders in almost every era and these leaders make decisions that will create turning points in history and affect the society (Güçlü & Koşar, 2019). Numerous definitions have been made regarding the concept of leadership. This concept is defined as a process by which a person can change and manage the attitudes, behaviors and activities of the group or society to which he is associated thanks to his power, reputation and social place within certain times and situations (TDK, 2019a). Saylık (2017) defined leadership as a person with leadership behavior patterns that guides and mobilizes followers, sets goals for them and combines them in line with these goals, and interacts with them, while Tahaoğlu and Gedikoğlu (2009) described the term as the ability to transcend customary practices and certain sources of authority for influencing and directing the staff's beliefs, behaviors, thoughts, feelings, value judgments. Studies on leadership revealed the undisputable significance of leadership for society. Because, it is widely accepted that leaders have guided societies in achieving their goals throughout history (Güçlü & Koşar, 2019).

The world is experiencing rapid changes today. Therefore, it is inevitable for educational organizations to stay untouched with this change. In this regard, various leadership approaches appropriate for different environmental conditions and rapidly changing educational organizations have been identified (Gürer, 2019). Beyond applying strict authority and giving orders, administrators can enable the organization to achieve its goals more easily by motivating employees, helping them realize their personal development, and allowing them to increase their performance (Korkmaz, Gökdeniz, & Zorlu, 2018). Paternalistic leadership is regarded as one of the leadership styles that provides these characteristics. The word paternalism was translated into Turkish from the French word "paternalisme" (Gürer, 2019). The meaning that corresponds to paternalism and that is frequently used is called paternalism (TDK, 2019b). Paternalistic leadership has emerged as a concept in the management literature, particularly in the last 20 years (Dağlı & Ağalday, 2018). Aycan (2006) stated that paternalistic leadership occurs in a dual and hierarchical manner, and the superiority in the subordinate-superior relationship is to provide care, protection and guidance in both work and out-of-work areas. Fettahloğlu, Akdoğan, and Özay (2018), on the other hand, considered the paternalistic leadership approach as an element that motivates employees to achieve the goals of the organization by guiding their private lives in a similar way to a family environment with the expectation of loyalty and obedience in the society where the leader is present as well as motivating them with insurance that they are united in the vision and mission of the organization. Based upon these explanations, administrators who can show a paternalistic leadership approach exhibit helpful and tolerant behavior, and as a result, employees can create positive attitudes and behaviors towards the administrator.

Farh and Cheng (2000) identified three constituent elements of paternalistic leadership. The *authoritarian* leadership refers to an instructive understanding of administrators who are empowered, who exercise strict control, who do not care much about the suggestions and contributions of subordinates, who display a dignified attitude and high self-confidence as an image, and who show higher performance than subordinates. *Benevolent* leadership indicates treating subordinates like family members, supporting them in their troubled days without any embarrassment. *Moral* leadership refers to prioritizing the interests of the group, showing interest collectively, and not abusing authority. In an organization managed with a paternalistic understanding, administrators are expected to care about the health, education, individual happiness and family life of the employees, while employees are likely to increase their commitment to the leader and have a sense of belonging (Cerit, Özdemir, & Akgün, 2011). In their research, Çıraklar, Uçar, and Sezgin (2016) also concluded that the paternalistic leadership characteristic of the administrator increases the trust of the employees within the group. Increased commitment to the organization and the presence of a sense of ownership facilitate the achievement of the group's goals. The task of management is to help the organization attain its goals. Administrators have a significant role and responsibility in helping the school, which is an organization, achieve its goals. The success of the administrator in fulfilling this role and responsibilities as required is the key for school effectiveness as the effectiveness of organizations is valid when they achieve the goals.

Studies conducted to increase the quality of education in schools have highlighted the concept of effective school (Helvacıoğlu & Aydoğan, 2011). The concept of effectiveness is defined as the success achieved in the outputs, the level of achieving the purpose, the ability to obtain the necessary resources, and to adapt to the environment (Ada & Baysal, 2010). In the 1930s, Bernard expressed effectiveness as "the degree to which the organization achieves its goals" (Cited by Balcı, 2014). The overall definitions suggested that effectiveness is the degree to which the organization achieves its purpose. The school organization also endeavors to accomplish the goals related to education. Hence, the effectiveness or ineffectiveness of schools can be determined depending on the accomplishment level of their goals.

School effectiveness is also defined as the school grade calculated by taking into consideration students' data (Balcı, 2014). The basis of an effective school is the student, and the school that determines the student's interests, the educational field in which s/he can be successful, and that directs and develops him/her can be considered an effective school (Baştepe, 2009).

Elements that make up the school consist of administrators, teachers, students, civil servants and other personnel along with the environment and parents, which are the factors that affect the school (Bursalıoğlu, 2015). The administrators' work and management styles at school, teachers, students, the school's curriculum, the school's environment and relations with the students' families, the school culture and environment can be listed as the dimensions that directly affect school effectiveness (Şenel & Buluç, 2016). Studies demonstrated that the school administrator, one of the elements of the school, has a key role in school effectiveness (Balci, 2014; Baştepe, 2009; Helvacı & Aydoğan, 2011). Increasing teachers' work efficiency and other staff, motivating the staff to achieve the school's goals, and realizing mechanisms that will increase the school's effectiveness are the cornerstones of management (Ada & Baysal, 2010). Today, it is unlikely to assert that all schools are effective. This may arise due to the management skills of the school administration. Motivation and increasing the work efficiency of the staff, which are among the managerial skills, are also the characteristics of administrators having paternalistic leadership. Thus, there may be a relationship between the paternalistic leadership behaviors of administrators and the school effectiveness.

Various studies were conducted on the effective school and student achievement (Günel, 2014), transformational leadership role of the effective school and school administrator (Tuncel, 2013), cultural leadership role in effective school (Dinçsoy, 2011), the relation between teacher loyalty and transformational leadership in effective school (Güngör, 2018), the effectiveness levels of schools and teachers' work engagement level (Atçioğlu, 2018). However, there is no such a study specifically published on the relationship between the paternalistic leadership characteristics of the administrators and school effectiveness (limited to the literature review conducted within the scope of this research). In this context, such a research was carried out to reveal the relationship between the paternalistic leadership characteristics of the school administrators and the effectiveness of schools.

Thus, this research aims to explore the relationship between the paternalistic leadership characteristics of the school administrators and the effectiveness of schools. In service of this aim, answers to the following questions were sought:

1. Is there a significant relationship between the paternalistic leadership characteristics of the school administrators and school effectiveness?
2. Do the paternalistic leadership characteristics of the school administrators significantly predict the effectiveness of schools?

METHOD

This section covers information regarding the research model, population and sample, data collection tools and data analysis.

Research Design

Having a quantitative research design, this study used a relational survey model. Relational survey models are a research model designed to identify relationships between two or more variables, and to allow the prediction of the degree, direction and level of these relationships (Karasar, 2012). The study focused on revealing the relationship between the paternalistic leadership characteristics of the school administrators and the effectiveness levels of schools.

Population and Sample

The population consisted of teachers working at public kindergartens, primary, secondary and high schools located within the central districts of Kahramanmaraş Province, Onikişubat and Dulkadiroğlu during the 2019-2020 academic year. At first, each school was accepted as a cluster through cluster sampling method, and the sample was selected by random sampling method among the teachers working at these schools. The calculation suggested that a sample of approximately 366 teachers would be sufficient for the present study. Karasar (2012) pinpointed that it is unlikely to give an exact number for the sample size, and that data analysis techniques require increasing the required numbers and it will be beneficial to have a large sample size due to the problems that may occur in the return of the scales. Therefore, the data were collected from 500 teachers in order to have a larger sample.

Within the scope of the study, 500 data collection tools were distributed by visiting 25 selected schools. Participants filled 375 forms and the return rate of the forms was 75%. In this regard, five forms that were considered incomplete and incorrect were excluded from the data set and 370 forms were evaluated during data analysis process. Among the participants, 47.6% (n=176) were men and 52.4% (n=194) were women. 83% (n=307) of the participants were married and 17% (n=63) were single. Considering the participants' seniority, 7.8% (n=29) had 1-5 years of experience, 18.6% (n=69) had a seniority of 6-10 years, and 36.5% (n=135) had 11-15 years, 26.5% (n=98) had 16-20 years and 10.5% (n=39) had 21 years and over experience. 91.6% (n=339) of the teachers were undergraduates, while 8.4% (n=31) were postgraduates. The ratio of primary school teachers in the total of the participants was determined as 18.1% (n=67), branch teachers as 71.6% (n=265), preschool teachers as 8.1% (n=30) and guidance teachers (evaluated among branch teachers) as 2.2% (n= 8). 7.3% (n=27) of the teachers work at kindergartens, 20.8% (n=77) at primary schools, 67% (n=248) at secondary schools and 4.9% (n=18) at high schools. In terms of the number of teachers in their institutions, 17% (n=63) of them were in schools with 1-20 teachers, 23.5% (n=87) in schools with 21-40 teachers, 59.5% (n=220) in those with 40 and over teachers.

Data Collection Tools and Data Collection Process

This study employed Personal Information Form to determine the demographic information regarding teachers; "Paternalistic Leadership Scale" to identify teachers' views on the paternalistic leadership characteristics of school administrators, and the "Effective School Scale" to determine the effectiveness levels of schools. Necessary permissions were obtained from the researchers via e-mail. After obtaining official permission from Kahramanmaraş Provincial Directorate of National Education in order to administer the data collection tools, the relevant schools were visited and teachers were informed about the implementation process of the scales. Information related to data collection tools is presented as following:

Paternalistic Leadership Scale

The Paternalistic Leadership Scale (PLS) was developed by Saylık and Aydın (2019). Being a, the tool consists of 30 items based on a Likert type with 5 points "1=Never (1.00-1.80), 2=Rarely (1.81-2.60), 3=Sometimes (2.61-3.40), 4= Usually (3.41-4.20) and 5 = Always (4.21-5.00) with a view to determining teachers' views on the paternalistic leadership characteristics of school administrators. A high score in any of the sub-dimensions of the scale indicates that school administrators possess paternalistic leadership characteristics in that dimension.

The factor analysis carried out by Saylık and Aydın (2019) during the scale development process, the scale items were gathered under 5 sub-dimensions (family atmosphere, benevolence, authoritarianism, interventionism and finding inadequacy), and Cronbach's Alpha coefficients of the sub-dimensions were determined as .82, .90, .85, .89 and .92, respectively.

In the current study, the Cronbach Alpha coefficients for the sub-dimensions of the scale were identified to be .90, .91, .84, .79 and .90, respectively. Besides, Confirmatory Factor Analysis (CFA) was conducted to verify the 5-factor structure of the Paternalistic Leadership Scale. Figure 1 depicts the model regarding the CFA results:

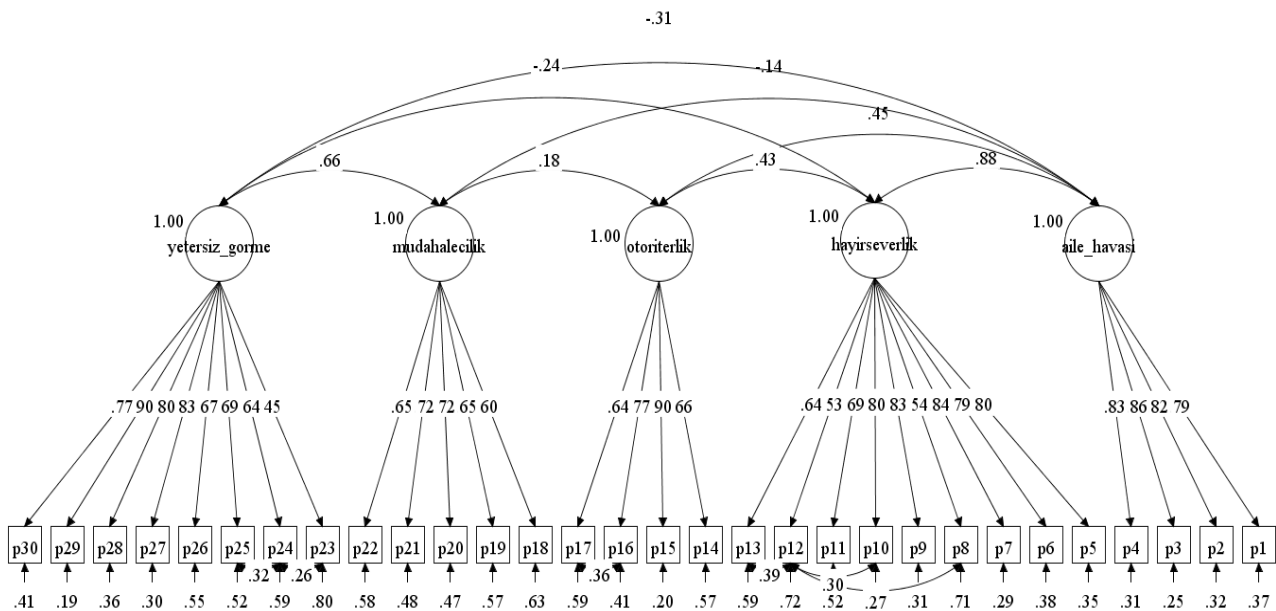


Figure 1. Paternalistic leadership scale diagram model and standardized factor loads

Figure 1 demonstrates that the scale is grouped under five subdimensions as a result of CFA. Considering model fit indices, CFI and TLI values are indicative of acceptable values, and RMSEA and SRMR values are at acceptable levels ($\chi^2/sd=2.95$, CFI=.89, TLI=.88, RMSEA=.073, SRMR=.065).

School Effectiveness Scale

The School Effectiveness Scale was developed by Abdurrezzak and Uğurlu (2019) based upon the studies of Balcı (1993), Şişman (1996), Baştepe (2002) and Ayık (2007). It has a five-point likert structure (1-“Strongly Disagree” (1.00-1.80), 2-“Agree Slightly” (1.81-2.60), 3-“Agree moderately” (2.61-3.40), 4 -“Agree” (3.41-4.20), 5-“Totally Agree” (4.21-5.00)) including 31 items and 5 sub-dimensions (administrator, teacher, student, school environment, school environment and parents). The reliability of the tool was found as (Cronbach Alpha) 0,95 by Abdurrezzak and Uğurlu (2019), and those of the dimensions- Administrator, Teacher, Student, School Environment, School Environment and Parents- were noted to be .77, .90, .88, .92 and .91, respectively. The reliability coefficient was found to be .94 for the overall scale in the current research. As for the sub-dimensions, the coefficients were determined as .86, .88, .81, .83 and .91, respectively.

Figure 2 displays the model related to the CFA conducted in order to verify the 5-factor structure of the School Effectiveness Scale (SEC):

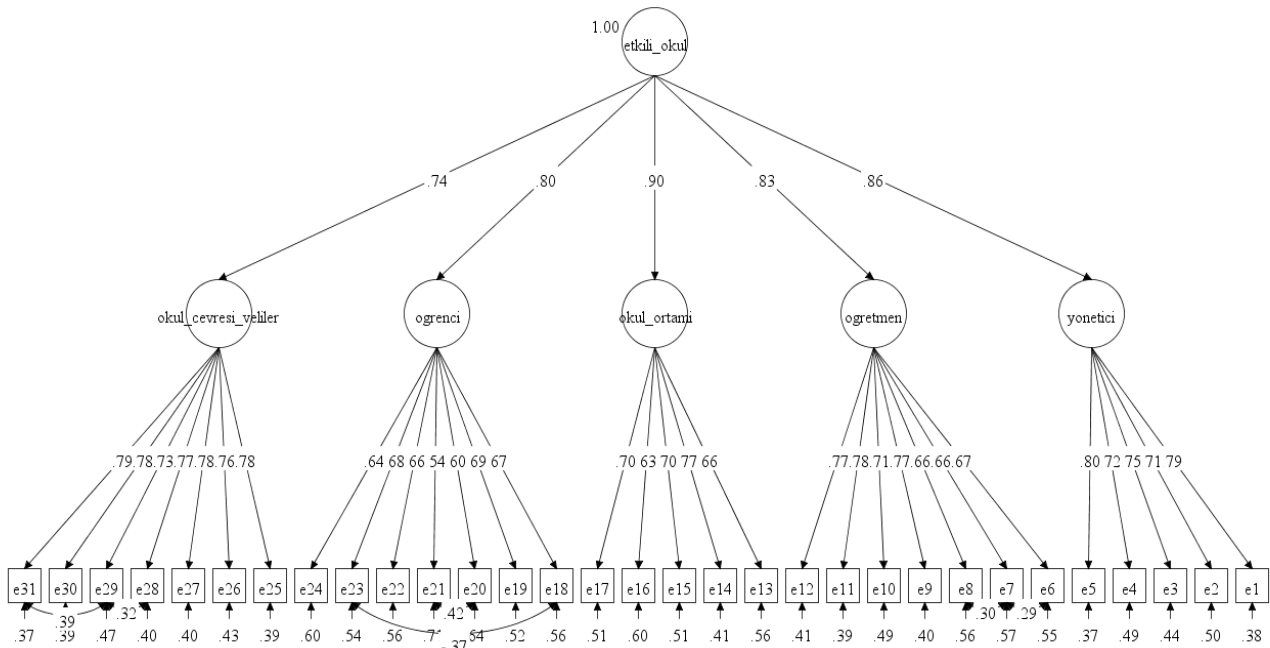


Figure 2. Diagram model of school effectiveness scale

As is seen in Figure 2, the scale was found to have five sub-dimensions, and the model fit indexes showed that the CFI and TLI values were close to acceptable values; besides, the RMSEA and SRMR values were acceptable ($\chi^2/sd=2.70$, CFI= .89, TLI=.88, RMSEA= .068, SRMR= .061).

Data Analysis

Correlation analysis was conducted to determine the relationship between the paternalistic leadership characteristics of the school administrators and the effectiveness levels of schools. Regression analysis was also used to identify the extent to which school administrators' paternalistic leadership behaviors predicted the effectiveness of schools. Prior to the multiple regression analysis, the binary correlations between the independent variables were examined to see if there was a multiple correlation between the predictor variables or not. As a result of the first stage of the multiple regression analysis using the full method (Enter Method), the sub-dimensions that did not contribute significantly to the regression model were removed from the model, and multiple regression analysis was performed again with the variables that contributed to the model significantly.

FINDINGS

This section includes the findings with regard to the research questions. The findings are presented in line with each research question.

Findings Regarding the Relationship between School Administrators' Paternalistic Leadership Characteristics and School Effectiveness

The study analyzed the relationship between school administrators' paternalistic leadership characteristics and school effectiveness. Pearson Product Moments Correlation Coefficients (r) were calculated to determine the relationship between the sub-dimensions of the scales. Büyüköztürk (2017: 32) pointed out that correlation coefficient below 0.29 indicates a low correlation, the magnitude between 0.30 and 0.69 is considered moderately correlated and that of between 0.70-1.00 shows high level of correlation. The results related to the Pearson Product-Moment Correlation Coefficient analysis are presented in Table1:

Table 1. Correlation values regarding the relationship between school administrators' paternalistic leadership characteristics and school effectiveness

Variables	1	2	3	4	5	6	7	8	9	10	11	12
1. Paternalistic Leadership	-											
2. Family atmosphere	.592*	-										
3. Benevolence	.722*	.766*	-									
4. Authoritarianism	.605*	.385*	.353*	-								
5. Interventionism	.545*	-.112*	.015	.195*	-							
6. Finding inadequacy	.457*	-.254*	-.162*	.086*	.593*	-						
7. School effectiveness	.522*	.758*	.730*	.406*	-.105*	-.254*	-					
8. Administrator	.473*	.704*	.669*	.332*	-.102*	-.225*	.825*	-				
9. Teacher	.356*	.626*	.513*	.392*	-.137*	-.306*	.809*	.652*	-			
10. School Environment	.388*	.626*	.608*	.367*	-.137*	-.306*	.812*	.628*	.695*	-		
11. Student	.497*	.610*	.634*	.279*	.015	-.117*	.815*	.609*	.497*	.556*	-	
12. School Environment and Parents	.419*	.573*	.580*	.307*	-.045	-.189*	.825*	.563*	.511*	.548*	.626*	-

*p<.05

Table 1 revealed a positive and medium-level relationship ($r=.52$) between paternalistic leadership and school effectiveness. A positive and high-level correlation was identified between the sub-dimensions of “family atmosphere” ($r=.75$), “benevolence” ($r=.73$) and the effectiveness of the schools; whereas, a negative and low-level relationship was determined between “interventionism” ($r=-.10$), “finding inadequacy” ($r=-.25$) dimensions and the effectiveness of the schools.

Upon analyzing the relationship between independent and dependent variables, teachers' view scores related to school effectiveness were found to increase as their perception levels regarding the school administrators' paternalistic leadership behaviors in terms of the family atmosphere, benevolence and authoritarianism dimensions increased, while their scores regarding the school effectiveness decreased as those of the interventionism and finding inadequacy dimensions increased.

Regression Analysis Findings on the Prediction of School Effectiveness by School Administrators' Paternalistic Leadership Characteristics

Prior to regression analysis of the PLC dimensions, binary correlations between independent variables were examined, and the correlations of independent variables with each other and with the dependent variable were found to vary across .01 and .76. Since these coefficients were not above .80, no multiple correlation was observed (Büyüköztürk, 2017: 100). Multiple regression analysis was performed as to whether the sub-dimensions of PLC, family atmosphere, benevolence, authoritarianism, interventionism and poor vision predicted school effectiveness. As a result of the multiple regression analysis (1st Analysis) performed by using the full method (Enter Method), interventionism ($\beta = -.04$, $p > .05$) and finding inadequacy ($\beta = -.07$, $p > .05$) variables were found to be free from any significant contribution to the regression model. These two variables were excluded from the model, and the family atmosphere ($\beta = .40$, $p < .05$), benevolence ($\beta = .36$, $p < .05$) and authoritarianism ($\beta = .14$, $p < .05$), which had significant contributions to the model, were included for re-testing the model (2nd Analysis). The multiple regression analysis results suggested that family atmosphere and benevolence had a medium and significant relationship with effective school scores, and authoritarianism had a low and significant relationship with effective school scores ($R=0.799$, $R^2=.636$, $p < .01$). The variables of family atmosphere, benevolence and authoritarianism together explained approximately 63% of the total variance related to school effectiveness.

Table 2. Regression analysis results regarding the prediction of school effectiveness by paternalistic leadership

Variable	B	Sh	β	T	P
Stable	1.794	.115		15.631	.000
Family atmosphere	.272	.035	.403	7.889	.000
Benevolence	.253	.034	.361	7.357	.000
1st Analysis					
Authoritarianism	.093	.023	.140	3.991	.000
Interventionism	-.035	.030	-.047	-1.175	.241
Finding inadequacy	-.060	.030	-.078	-1.964	.050
R= 0.806 R ² = 0.645					
F (5,364)= 135.078 p= .0000					
Stable	1.573	.096		16.437	.000
Family atmosphere	.304	.034	.449	9.027	.000
Benevolence	.244	.034	.347	7.069	.000
2nd Analysis					
Authoritarianism	.074	.023	.111	3.231	.001
R= 0.799 R ² = 0.636					
F (3, 366)= 215.657 p= .0000					

According to Table 2, the regression analysis results (Analysis 2) concluded that family atmosphere and benevolence had a medium level and significant relationship with effective school scores, while a low level and significant relationship was identified between authoritarianism and school effectiveness ($R=0.799$, $R^2=.636$, $p<.01$). The family atmosphere, benevolence and authoritarianism together explained about 63% of the total variance regarding the school effectiveness. Taking the values related to the significance of the regression coefficient into account, family atmosphere, benevolence and authoritarianism were found to be significant predictors of school effectiveness; whereas interventionism and finding inadequacy were not significant predictors of school effectiveness. The mathematical model for the regression equation is as follows: "School Effectiveness= 1.573 + (0.304 Family Atmosphere) + (0.244 Benevolence) + (0.74 Authoritarianism)".

DISCUSSION

The study results revealed a medium level and positive relationship between paternalistic leadership and school effectiveness. A positive and medium level relationship was identified between paternalistic leadership and the sub-dimensions of effective school, "administrator", "teacher", "school environment", "student" and "school environment and parents"; a high level and positive relation between effective school and "family atmosphere" and "benevolence" sub-dimensions of the paternalistic leadership scale; a low level and negative correlation was found between the effective school and the "interventionism" and "finding inadequacy" sub-dimensions. In the study conducted by Anwar (2013), benevolence was determined to have a positive effect on work. Upon analyzing the relationship between independent and dependent variables, teachers' view scores regarding school effectiveness were found to increase as their perceptions regarding the school administrators' paternalistic leadership behaviors in terms of the "family atmosphere", "benevolence" and "authoritarianism" sub-dimensions increased, while their scores regarding the effectiveness of schools decreased as their scores about the "interventionism" and "finding inadequacy" sub-dimensions increased. The high average of teachers' views on the paternalistic leadership characteristics of the school administrators indicated a high average of school effectiveness. The relationship between these two variables was positive and significant. Thus, it may be wise to mention that the school effectiveness level will increase in schools where administrators with paternalistic leadership characteristics work. The relevant literature includes no study focusing on the relationship between these two variables. In this vein, this result of the study is the first contribution to the field in this aspect. The studies conducted on the concept of effective school (school effectiveness) were identified to mostly analyze the correlation of effective school with work engagement, cultural leadership role, decision-making process, productivity, leadership styles, management processes, school culture, school climate, communication skills, student achievement and school stakeholders. Parallel to this study, various researches (focusing on the relationship between effective school and leadership) signified a relationship between leadership styles and school effectiveness (Abdurrezzak, 2015; Dinçsoy, 2011; Kazancıoğlu, 2008; Tuncel, 2013; Yılmaz, 2010).

The research results also showed that the "family atmosphere", "benevolence" and "authoritarianism" sub-dimensions of the paternalistic leadership were significant predictors of school effectiveness, while "interventionism" and "poor vision" were not. Considering the variance value explained in relation to this relationship, 63% of the school effectiveness was explained by the paternalistic leadership characteristics of the school administrators. As a result, school administrators showing paternalistic leadership behaviors significantly predicted school effectiveness. A variety of studies examined the relationship between paternalist leadership and burnout (Sevinç, 2019), employee performance (Aslan, 2015), employees' emotional commitment (Gürcan, 2018), resistance to change (Apaydin, 2017), teachers' perceptions of organizational support (Kılıç, 2019) and job satisfaction (Türesin, 2012); moreover, they were found to have significant relations between paternalistic leadership and these variables, and that paternalistic leadership was predictive at certain levels. A positive and significant relationship between

paternalistic leadership and school effectiveness shows that school administrators with paternalistic leadership characteristics will contribute to school effectiveness.

RESULT AND RECOMMENDATIONS

The study results revealed a medium level and positive relationship between paternalistic leadership and school effectiveness. In this vein, school administrators need to be aware of the theory and practices about paternalistic leadership and that they are required to pursue their management studies with this awareness. Thus, educational environments such as workshops in which theoretical information on paternalistic leadership is presented can be organized for school administrators, and the educational administration departments of universities can provide support at this point.

A positive relationship was identified between teachers' views on effective school and the dimensions of paternalistic dimensions- "family atmosphere", "benevolence", "authoritarianism", while a negative relation was determined in terms of "interventionism" and "finding inadequacy". In other words, teachers' views regarding school effectiveness were found to be positive as their perceptions regarding the school administrators' paternalistic leadership behaviors in terms of the "family atmosphere", "benevolence" and "authoritarianism" dimensions increased, while their had negative views regarding the effectiveness of schools as their scores about the "interventionism" and "finding inadequacy" dimensions increased. This is an undisputable result of the current study, which must be known in the process of increasing school effectiveness. In this respect, school administrators' awareness should be raised by referring to the fact that the behaviors they will exhibit in the "family atmosphere", "benevolence" and "authoritarianism" sub-dimensions of the paternalist leadership will have a contribution to school effectiveness.

The results also showed that the "family atmosphere", "benevolence" and "authoritarianism" sub-dimensions of the paternalistic leadership were significant predictors of school effectiveness. Qualitative research can be conducted to allow for an in-depth analysis of the underlying reasons behind this situation.

The sample consisted of teachers working at public schools. Various studies may be conducted on comparing teachers and administrators' views regarding paternalistic leadership characteristics. Besides, research can be carried out with teachers and administrators working at private education institutions.

This study examined the relationship between paternalistic leadership and school effectiveness. The relationship between school effectiveness and other types of leadership can be examined.

Declaration of Conflicting Interests

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Statements of publication ethics

We hereby declare that the study has no unethical issues and that research and publication ethics have been observed carefully.

Researchers' contribution rate

The first author conceived the presented idea and collected the data. The second author validated the methods. All authors discussed the results and contributed to the final version of the article.

Ethics Committee Approval Information

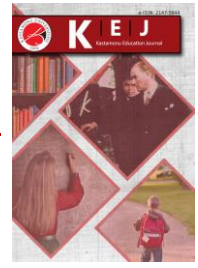
This study was carried out in accordance with the approval of Kahramanmaraş Sütçü İmam University Social and Human Sciences Ethics Committee. (Ethics Committee Approval Date: 05/11/2019, Approval Number: E.45361)

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| Research Article /Araştırma Makalesi |

Technological Pedagogical Content Knowledge of Pre-Service Biology Teachers on Protein Synthesis¹

Biyoloji Öğretmen Adaylarının Protein Sentezi Konusundaki Teknolojik Pedagojik Alan Bilgisi

Elif Deveci², Dilek Sultan Acarlı³

Keywords

1. Biology teaching
2. Protein synthesis
3. Technological pedagogical content knowledge
4. Content analysis

Anahtar kelimeler

1. Biyoloji öğretimi
2. Protein sentezi
3. Teknolojik pedagojik alan bilgisi
4. İçerik analizi

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Abstract

In this study, it is examined that the Technological Pedagogical Content Knowledge (TPACK) of pre-service biology teachers on protein synthesis. The study was carried out with 8 pre-service biology teachers. This research used a semi-structured interview form, open-ended content knowledge test, lesson plan, and lesson plan evaluation form as data collection tools. Data were analyzed simultaneously within the scope of TPACK components and evaluated together. Data were analyzed with MAXqda, a qualitative data analysis program and evaluated by the content analysis method. As a result of the research, it is defined that pedagogical, technological and technological pedagogical knowledge of pre-service biology teachers is partially sufficient. Also, it is determined that their content knowledge of protein synthesis is insufficient, and there are essential knowledge deficiencies and misconceptions. Since their content knowledge of protein synthesis is insufficient, they could not explain how to use their pedagogical knowledge to teach the topic.

Nonetheless, despite their technological and pedagogical knowledge being sufficient separately, they have difficulty integrating technological knowledge with teaching content. Therefore, it is thought that it would be beneficial to refer more about which technologies, at which stages of the teaching process, for what purposes, and how they can be used in the content of the education courses in the biology teaching program and to enable pre-service teachers to practice on this subject. In addition, there is a need to eliminate the misconceptions of pre-service teachers from secondary education and before and to improve their content knowledge. For this reason, it is recommended to add courses to the teacher education program as applications of the related field courses, in which pre-service teachers will be able to explain the knowledge they have learned in the classroom to their other friends. Thus, it is thought that the information they have learned will be more permanent, and they will be aware of their own and their friends' deficiencies and misconceptions while explaining.

Öz

Çalışmada, biyoloji öğretmen adaylarının protein sentezi konusundaki Teknolojik Pedagojik Alan Bilgisi (TPAB) incelenmiştir. Çalışma, 8 biyoloji öğretmen adayı ile gerçekleştirilmiştir. Araştırmada veri toplama aracı olarak yarı yapılandırılmış görüşme formu, açık uçlu alan bilgisi testi, ders planı ve ders planı değerlendirme formu kullanılmıştır. Veri toplama araçlarından elde edilen veriler, TPAB bileşenleri çerçevesinde eş zamanlı olarak analiz edilip birlikte değerlendirilmiştir. Elde edilen verilerin analizinde bir nitel veri analizi programı olan MAXqda kullanılmıştır. Veriler, nitel içerik analizi yapılarak değerlendirilmiştir. Araştırma sonucunda, öğretmen adaylarının pedagojik bilgi, teknolojik bilgi, teknolojik pedagojik bilgi açısından kısmen yeterli oldukları belirlenmiştir. Protein sentezine ilişkin konu alan bilgilerinin ise yeterli düzeyde olmadığı, önemli bilgi eksiklikleri ve kavram yanlışları olduğu tespit edilmiştir. Protein sentezine ilişkin alan bilgileri yeterli olmadığından sahip oldukları pedagojik bilgiyi konunun öğretimi bağlamında nasıl kullanacaklarını açıklayamamışlardır. Bununla birlikte teknoloji bilgileri, pedagojik bilgileri tek başlarına iyi olmasına rağmen teknoloji bilgilerini konu alanının öğretimine entegre etmekte zorlanmışlardır. Dolayısıyla biyoloji öğretmenliği programındaki eğitim derslerinin içeriklerinde hangi teknolojilerin, öğretim sürecinin hangi aşamalarında, hangi amaçlarla, nasıl kullanılabileceğine daha fazla değinilmesinin ve öğretmen adaylarının bu konuda pratik yapmalarına imkân sağlanmasının yararlı olacağı düşünülmektedir. Ayrıca öğretmen adaylarının ortaöğretim ve öncesinden getirdikleri kavram yanlışlarının giderilmesi ve konu alanı bilgilerinin geliştirilmesine ihtiyaç olduğu açıktır. Bu nedenle öğretmen yetiştirme programına ilgili alan derslerinin bir uygulaması olarak öğretmen adaylarının öğrendikleri bilgileri sınıf ortamında anlatmalarının sağlanacağı dersler eklenmesi önerilmektedir. Böylece öğrendikleri bilgilerin daha kalıcı olabileceği, anlatırken kendilerinin ve arkadaşlarının eksiklerinin ve kavram yanlışlarının farkına varabilecekleri düşünülmektedir.

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INTRODUCTION

Questions such as what methods and techniques teachers-who have considerable effects on students- teach their students in addition to having content knowledge, to what extent they know their students, and whether they conduct teaching directed to students have gained more and more importance and have been made the subject matter of research. Consequently, research has focused on the issue of what teachers should be competent on, and different descriptions with points common to all have emerged (Grossman, 1990; Hill, Ball, & Schilling, 2008; Shulman, 1987). Teacher training was based on the concept of content knowledge until the period prior to 1980. Thus, the one who had the most content knowledge was considered the best teacher (Shulman, 1986). However, research done in the 1980s suggested that teachers' knowledge of some general pedagogical methods (asking questions, evaluating the performance, Etc.) apart from content knowledge and their use of such methods in teaching had positive effects on students' achievement. Hence, the idea that teachers' pedagogical knowledge besides content knowledge would secure meaningful learning and increase permanence in learning began to dominate (Doyle, 1986; Feiman-Nemser & Buchman, 1987; Holmes Group, 1986; Reynolds, 1992; Tobin & Garnet, 1988). The thought was posed for the first time by Lee Shulman (1987) as a "missing paradigm" in educational research. Shulman (1987) claims that the missing component in educational research is "pedagogical content knowledge (PCK)"- which is composed of using content knowledge and pedagogical knowledge in combination and which is a particular area of knowledge independent of pedagogy. In a study conducted in 1986, Shulman argued that teachers' knowledge consisted of three categories of knowledge called content knowledge, knowledge of the curriculum and pedagogical content knowledge. The author referred to the ties between pedagogy and content knowledge with the concept of "pedagogical content knowledge"- which he began to use in the literature, said that it was inadequate for teachers to have the only content knowledge and stated that a particular area of knowledge about how to teach the content knowledge was required. He called the particular area of knowledge "pedagogical content knowledge" and described it as "the knowledge of how to make content knowledge understandable to students" (Shulman, 1986; 1987).

The use of technology became more and more widespread at the beginning of the 21st century- which is directly influential in education. Thus, technology was integrated into instructional processes by the educational policies in Turkey. Several indicators are indicated within the framework of General Competencies for Teaching Profession (MofNE, 2017a) and of Biology Teachers Content Knowledge Competencies (MofNE, 2017b) prepared by the ministry of national education general directorate of teacher training and development that teachers are expected to have an approach of teaching and skills through which they can integrate technology into teaching. Computers, tablet PCs, smart boards and several other technological instruments are available today in classrooms. Teachers' proper use of technology offers convenience in learning differences that stem from individual differences, concretizes concepts challenging to learn, and helps students learn at their own pace according to their capabilities and needs. It also enables kinaesthetic learning as well as cognitive and affective learning. Besides, using specialized materials in education is also quite effective in developing students' active learning, purposeful learning and original learning skills (Crook, 1998). Therefore, it is apparent that it is not sufficient for teachers to have strong content knowledge and pedagogical knowledge only. They also need to have adequate technological knowledge and that they need to be able to use the relevant educational technologies effectively. Setting out from this reality, the concept of "technological knowledge" was added to the concept of pedagogical content knowledge described by Shulman in 1986, and thus the concept of technological pedagogical content knowledge (TPACK) was created (Mishra & Koehler, 2006). TPACK is defined as "teachers' knowledge of how to combine technology with pedagogical strategies while teaching a subject in their area and of the effects of technological instruments and presentations on students' understanding the subject" (Graham et al., 2009).

Technological assistance is significant in the visual presentation of subjects in the course with abstract content such as biology. Well-prepared visuals, three-dimensional models, animations and interactional media help understand a subject more easily. One of the subjects that both students and pre-service teachers have learning and teaching difficulties and misconceptions is the subject of protein synthesis in biology (Fisher, 1985; Gerçek, 2018; Guzman & Barlett, 2012; Gül & Özyay Köse, 2018; Koçakoğlu, 2002; Öz Aydın, Şahin, & Sicaker, 2014; Rotbain, Marbach-Ad, & Stavy, 2005; Saygın, 2009; Sinan, Yıldırım, Kocakulah, & Aydın, 2006; Taştan, 2005; Yakışan, 2008). This study was based on the idea that it would be beneficial to know about the efficacies of pre-service biology teachers- who are going to be practicing teachers in the future-in teaching the subject. In this context, the current study considers the concept of TPACK- which is frequently mentioned today in teachers' efficacies (Mishra & Koehler, 2006), and it also investigates pre-service teachers' TPACK and types of knowledge which are the sub-components of TPACK.

The Theoretical Framework

Technological pedagogical content knowledge (TPACK) was built based on the pedagogical content knowledge (PCK) model suggested by Lee Shulman (1986; 1987). Mishra and Koehler (2006) added the component of technology to pedagogical content knowledge, and thus they put forward the concept of technological pedagogical content knowledge (TPACK). The model developed by Koehler and Mishra (2009) to demonstrate the components of TPACK and their interactions is shown in Figure 1.

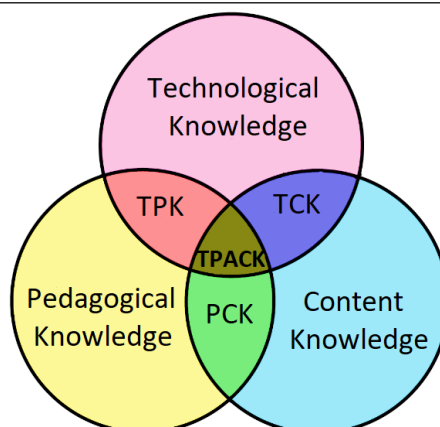


Figure 1. TPACK and the types of Knowledge it contains (Koehler & Mishra, 2009)

The sub-areas of knowledge contained in technological pedagogical content knowledge can be described as in the following (Mishra & Koehler, 2006):

Pedagogical knowledge (PK): It is the knowledge teachers have about using the methods and techniques of teaching. PK consists of how students learn, general classroom management skills, lesson planning and student assessment. A teacher with an accumulation of pedagogical knowledge knows how students will learn and acquire skills.

Pedagogical content knowledge (PCK): It is teachers' knowledge of what methods and techniques of teaching to use in teaching a subject in the best way.

Technological knowledge (TK): Teachers' knowledge of what technology to use in teaching a subject.

Technological pedagogical knowledge (TPK): Teachers' knowledge of the effects of using technology in various ways on teaching and learning.

Technological content knowledge (TCK): Teachers' knowledge of how technological knowledge and content knowledge affect each other.

Content knowledge (CK): It is the scientific knowledge teachers have about the subject they will teach.

Studies concerning TPACK gained momentum with the inclusion of technology in areas of teacher competence and with the revival of integrating it into other areas of competence. Research conducted about TPACK obtained differing results about teacher and pre-service teachers' levels of TPACK. Even though several studies are investigating pre-service teachers' TPACK levels (such as Akarsu & Güven, 2014; Archambault & Crippen, 2009; Avcı & Ateş, 2017; Canbazoglu Bilici, 2012; Gonzales, 2018; Jordan, 2011; Karakaya, 2012; Karataş, 2014; Kaya, 2010; Kılıç & Kazanç, 2016; Özbek, 2014), the number of studies which have obtained detailed findings of a domain is negligible. The number of studies investigating the TPACK levels in a specific subject in teaching biology, in particular, is limited. Therefore, this current study is thought to contribute to the area in this sense.

METHOD

This is a qualitative study, and it uses the method of case study- which is thought to enable researchers to collect detailed data specific to individuals to determine their TPACK levels in the subject of "protein synthesis. The case study is a descriptive method used commonly in qualitative studies, and it enables researchers to analyze a person, an event or a case in-depth and in holistic approach (Yıldırım & Şimşek, 2006). Case studies do not aim to reach general conclusions. People, cases or phenomena are considered in their original environment, and then they are described in detail and interpreted (Seggie & Bayyurt, 2015).

The Study Group

The study group was composed of pre-service teachers who attended the Biology Teaching Programme of a state university in Turkey. The purposeful sampling method, one of the non-random sampling methods, was used in choosing the participants in this study (Yıldırım & Şimşek, 2006). It was demanded that the pre-service teachers' assumption that they should have the necessary knowledge was met since this paper intended to investigate pre-service teachers' technological pedagogical content knowledge. Therefore, the research was conducted with the participation of randomly chosen 8 students (1 male and 7 female) who had taken the Molecular Biology course -in which the subject of protein synthesis was taught in detail- and the teaching and Learning Theories and Approaches course and the Measurement and Evaluation course- in which pedagogical knowledge on teaching the domain was taught- and who had passed their exams in those courses. Two of the participants were second-year students, whereas six were fourth-year students.

Data Collection

The research data were collected in the Spring semester 2018-2019 academic year. Semi-structured interview forms and the lesson plan preparation method (Van Der Valk & Broekman, 1999) were used in collecting the data. The interviews were recorded with a voice recorder.

The pilot scheme was carryout out with the inclusion of two pre-service teachers, and following the pilot, a scheme decision was made to use the data collection tools without making any changes. The data were collected at two stages for each participant. At stage one, data on the components of TPCK outside content knowledge were collected, and then, the participants were asked to complete the template for the lesson plan and answer the questions in the lesson plan evaluation form during the interviews. At stage two, they were asked to give written answers to the questions about content knowledge.

Data Collection Tools

The TPACK interview forms, content knowledge test, template for lesson plans and lesson plan evaluation forms prepared by the researchers were used in collecting the research data.

TPACK Interview Form

The researchers developed the interview form used to collect the research data by taking the components of TPACK (Koehler & Mishra, 2009). The literature concerning how to arrange questions about the components of TPACK was reviewed, informing the questions in the interview form. Some of the questions were re-stated, in other words, during the interviews when necessary or were skipped. Thus, the participant's knowledge of the components of TPACK was analyzed in detail through problem-based semi-structured interviews, which were held based on the questions in the interview form. The TPACK interview form contained open-ended questions through with the components of TPACK was analyzed under specific headings.

Content Knowledge Test

The content knowledge test on protein synthesis, which the researchers developed, consisted of 22 open-ended questions. The test was developed after examining the misconceptions about protein synthesis reported in the literature, and the achievement tests developed. The scope of the content knowledge test was determined according to literature review, secondary education biology curriculum prepared by the Ministry of National Education (MofNE,2018) and the course content of the biology teaching departments of universities, and open-ended questions were prepared accordingly. Two lecturers with experts in biology education and experienced biology teachers analyzed the questions, and construct validity was attained for the questions.

Lessons Plan and Lesson Plan Evaluation Form

A general template for the lesson plan was given to the pre-service teachers, and they were asked to prepare a lesson plan for protein synthesis using the template. The participants were interviewed through 10 open-ended questions available on the lesson plan evaluation form after they had prepared their lesson plans, and thus, detailed information on the points they had taken into consideration while preparing the lesson plan was obtained.

Data Analysis

The 8 participants were coded as PT1...PT8 (PT: pre-service teacher) before the analyses were referred to by using the codes in the analysis and findings sections of this paper. The exclusive interview content concerning TPACK and lesson plan evaluation-voice recorded- was put to writing word by word. The written answers given to the questions of content knowledge besides the interview content and the lesson plans prepared were also digitalized on the computer, the protocols (the data texts) were obtained, and they were evaluated in the categories distinguished. In this way, the entire content was analyzed synchronically. The protocols prepared were re-arranged in interpreted protocol method (Mayring, 2002).

The data was put to content analysis on MAXQDA 2018 program. The deductive and inductive content analysis methods were used in combination. First, the data was divided into categories in the deductive content analysis method by considering the components of TPACK. The answers in each category were evaluated using the deductive and inductive approaches together, and then the sub-categories were distinguished. The sub-headings used in the interview form (deduction) were considered for some TPACK components by content descriptions available in the literature. At the same time, inferences made from students' answers (induction) were considered for some other components of TPACK. The answers given to the sub-categories were analyzed in an inductive approach, and codes were created- that is to say, the guidelines for coding the sub-categories were described. As a result, the data were analyzed more systematically.

The categories distinguished and the codes created in the content analysis to interpret the pre-service teachers' levels of TPACK in protein synthesis are shown in Table 1.

Table 1. The System of Categorising in Data Analysis

Categories	Sub-categories	Coding (guidelines for coding)
Pedagogical knowledge	Knowledge about students' learning difficulties	The characteristics of age group The properties of subjects easy/difficult for them to understand Causes of misconceptions
	Knowledge of teaching strategies, methods, techniques, activities and classroom management	Knowledge of classroom management Knowledge of strategies, methods, techniques and activities
	Knowledge of measurement and evaluation	How often, at what stages of the course Knowledge of measurement and evaluation method Giving feedback, determining misconceptions

Pedagogical content knowledge	Knowledge about students' learning difficulties in biology and in protein synthesis	Subjects easy and difficult for students to understand in the biology course Misconceptions about biology Concepts/events about protein synthesis easy and difficult for students to learn Misconceptions about protein synthesis
	Knowledge of strategies, methods, techniques activities in relation to teaching biology and protein synthesis and knowledge of classroom management	Strategies, methods, techniques and activities they plan to use in their classes Knowledge of classroom management in teaching protein synthesis Strategies, methods, techniques and activities they plan to use while teaching protein synthesis Preventing, determining and removing the misconceptions about protein synthesis
	Knowledge of curriculum and materials in relation to teaching biology and protein synthesis	The specific goals of biology curriculum The distribution of subjects according to years in biology curriculum Knowledge of materials in relation to teaching biology The place of protein synthesis (the scope and time allocated) in the programme The extent to which protein synthesis is associated with other subjects Students' gains in the subject of protein synthesis The way protein synthesis is presented in course books
	Knowledge of measurement and evaluation in relation to teaching biology and protein synthesis	Measurement and evaluation methods they plan to use/what is the object of measurement in the biology course
Technological knowledge	Knowledge of the concept of technology and the use of technology	Definition of the concept of technology What technologies they use and how often they use them Adapting into new technologies The purpose and length of using the internet
	Knowledge of computers	Knowledge of using computers For what purpose and how often they use computers
Technological pedagogical knowledge	The use of technology in teaching	The effects of using technology on the process of teaching (from the aspect of teachers) The effects of using technology on the process of teaching (from the aspect of students) Technologies planned to be used in teaching
	Competence in using technology in the teaching process	The choice of right technologies and implementing them in the process of teaching
Technological content knowledge	Knowledge of technology related to biological studies	Knowledge of technological instruments specific to the area of biology Knowledge of internet sites with content of biology Following technological developments related to biology Technologies scientists use in biology
	Knowledge of technology related to protein synthesis	Knowledge of internet sites related to protein synthesis Knowledge of technologies explaining protein synthesis
Technological pedagogical content knowledge	Knowledge of technological equipment and materials in relation to teaching protein synthesis	Technological equipment and materials they plan to use in teaching protein synthesis and reason for using them
	Knowledge of technology-supported teaching strategies, methods and techniques that can be used in teaching protein synthesis	Technology-supported teaching strategies, methods and techniques they plan to use in teaching protein synthesis and reasons for using them
	Using technology in determining and removing the misconceptions and learning difficulties in protein synthesis	Technological support they plan to use in determining and removing the misconceptions and learning difficulties in protein synthesis

	Using technology at the stage of measurement and evaluation in relation to teaching protein synthesis	Technologies they plan to use at the stage of measurement and evaluation in relation to teaching protein synthesis
Content knowledge	General self-perception of their knowledge of protein synthesis	The mark they give to themselves for their content knowledge (over 5) Being able to set up associations between concepts Misconceptions noticed
	Knowledge of protein synthesis	Coding was made as "adequate scientific explanation", "partially scientific explanation" and "non-scientific explanation" for each of the 22 questions according to the answer key prepared

The categories of evaluation that would enable the researchers to interpret the findings were distinguished after distinguishing the categories and sub-categories about the components of TPACK. The data concerning the sub-categories of TPACK were evaluated as "adequate scientific explanation," "partially scientific explanation," and "non-scientific explanation at this stage (Roth & Anderson, 1987). The principle of the coding set for the three categories was similar to the ones used in Kaya (2010) and Karakaya (2012)-as described below:

Adequate scientific explanation: adequate scientific explanation is made, and there are no misconceptions or partial understanding.

Partially scientific explanation: The answer is made partially, or there are missing parts; there are no misconceptions.

Non-scientific explanation: partially scientific information is given, but there are also incorrect and irrelevant answers, there are no answers, or there are misconceptions.

The grading system recommended by Vazquez-Alonso and Manassero-Mass (1999) was used to evaluate content knowledge questions for the three categories. The marking system was based on the idea that the range between points given to students' complete and incomplete answers should not be too narrow. Thus, scientific explanations were given 3.5 points, partially scientific explanations were given 1 point, and non-scientific answers were given 0 points. The average score that the participants received from the content knowledge test of 22 open-ended questions was calculated, and interpretations of their content knowledge were made possible.

Table 2 gives an example of how the questions in the content knowledge test were evaluated.

Table 2. A question in the Content Knowledge Test and the Analysis for it (question: why are the synthesised polypeptides in living creatures have different structures?)

Non-scientific explanation	Partially scientific explanation	Adequately scientific explanation
"That the genetic materials are different (PT8)" (0 Point)	"The sequence of amino acids is different (PT1)" (1 point)	"The differences in the number, sequence and type of amino acids (PT7)" (3.5 points)

Reliability and Validity of Data Analysis

Reliability in case studies means obtaining the same or similar results when another researcher repeats a study in the same way. Two experts in biology education were consulted to test reliability in this study. The experts analyzed the protocols according to the codes created and the categories distinguished by the researchers; then, the results were compared, the agreement was reached on the differences, and the necessary arrangements on the data were made.

The researchers had the opportunity to collect more comprehensive data with the use of more than one data collection tool, and they made efforts to promote construct validity by having variation in data collection (Yıldırım & Şimşek, 2006; Yin, 2003). Besides, the data collection tools were checked by experts prior to the implementation to test construct validity and content validity (Seggie & Bayyurt, 2015). Two lecturers of biology teaching and an experienced biology teacher were consulted at this stage.

FINDINGS

The findings obtained in this study are shown in Table 3 so that the findings for the components of TPACK can be associated and interpreted more easily. The students' attitudes towards biology science and biology course were analyzed by doing independent samples t-test according to gender. The findings for the analysis are shown briefly in Table 3.

Table 3. Findings for the Analysis of the Pre-service Teachers in the Framework of TPACK

Categories and sub-categories		Pre-service teachers							
Categories	Sub-categories	PT1	PT2	PT3	PT4	PT5	PT6	PT7	PT8
Pedagogical knowledge	Knowledge about students' learning difficulties	P	S	P	P	O	P	S	P
	Knowledge of teaching strategies, methods, techniques activities and classroom management	O	S	S	S	P	P	O	P
	Knowledge of measurement and evaluation	P	S	S	O	O	P	P	P
Pedagogical content knowledge	Knowledge about students' learning difficulties in biology and in protein synthesis	P	S	P	S	P	P	P	P
	Knowledge of strategies, methods, techniques, activities and classroom management in relation to teaching biology and protein synthesis	S	S	S	P	P	P	P	O
	Knowledge of curriculum and materials in relation to teaching biology and protein synthesis	O	P	S	O	O	O	O	O
	Knowledge of measurement and evaluation in relation to teaching biology and protein synthesis	O	P	S	P	S	S	S	P
Technological knowledge	Knowledge of the concept of technology and the use of technology/knowledge of computers	S	S	P	P	P	P	P	P
Technological pedagogical knowledge	Use of technology in teaching/competence	S	S	S	P	P	P	P	O
Technological content knowledge	Knowledge of technology related to biological studies and protein synthesis	O	S	P	P	P	P	O	O
Technological pedagogical content knowledge	Knowledge of technological equipment and materials in relation to teaching protein synthesis	S	S	P	P	S	S	S	O
	Knowledge of technology supported teaching strategies, methods and techniques usable in teaching protein synthesis	O	S	S	P	O	P	P	O
	Use of technology in determining and removing the misconceptions about and learning difficulties in protein synthesis	O	S	O	P	P	P	O	O
	Use of technology in teaching protein synthesis at the stage of measurement and evaluation	O	O	O	O	O	O	P	O
Content knowledge	General self-perceptions about their knowledge of protein synthesis **	3	5	3	3	2	3	3	2,5
	Their knowledge of protein synthesis***	19	34,5	25,5	22,5	28	7	18,5	28

* S stands for adequately scientific explanation; P stands for partially scientific explanation, O stands for non-scientific explanation ** The points that pre-service teachers give to their own content knowledge over 5. *** The average score they received from the content knowledge test over 77.

Although PT1 had given 3 points to his/her knowledge of protein synthesis over 5, the average score he/she received from the content knowledge test was 19 over 77. On examining the answers given to the questions in the content knowledge test and the questions in the interview form, it was found that PT1 lacked content knowledge. The participant was inadequate in technological content knowledge- which was a combination of technological knowledge (adequate) and content knowledge (inadequate). The participant's pedagogical knowledge was partially adequate. Technological pedagogical knowledge was considered to be adequate since he/she could integrate technology into his/her pedagogical knowledge. However, it was also found that the deficiency in PT1's content knowledge was reflected in his/her pedagogical content knowledge. The pre-service teacher was found to have

difficulty integrating the three types of knowledge because he/she had partially adequate pedagogical knowledge and adequate technological knowledge but inadequate content knowledge.

Samples from the statements made by PT1 during the interview areas in the following:

"[A misconception] is that it does not exactly mean what it means."

"Every moment of education is evaluation, in my opinion. The way one listens to the teacher, the way one writes..., everything...I will generally give multiple-choice tests or oral exams [when I become a teacher] and do exercises directed to exams. Feedback is necessary for students [as a result of evaluation]."

"Students have difficulty mostly understanding the major RNA and the minor RNA in protein production and the synthesis of big sub-division and the small sub-division."

"[In daily life] I usually use phones, televisions and computers. I use Facebook and Instagram actively.... I am quite good at computers and the internet."

"Use of technology affects the process of teaching in good ways because students learn better because smart boards are visual and because they make abstract concepts concrete, learning is more permanent. Students can think faster and make decisions more quickly due to technology."

PT2 received 34.5 over 77 in the content knowledge test even though he/she had given 5 points to his/her knowledge of protein synthesis over 5. The data demonstrated that he/she had a medium level of content knowledge. The participant also had adequate technological knowledge, and therefore he/she was adequate in technological content knowledge, a combination of the two domains. The pre-service teacher, who had adequate pedagogical content knowledge, was adequate in TPACK since he/she could integrate technology into the component.

Some of the examples for statements made by PT2 during the interview were as in the following:

"[A misconception] is the situation in which there is a difference of meaning between what students envision in their mind and what it means."

"I evaluate at the end of each subject. I cannot make healthy measurements with one single instrument of measurement. ... I would summon my students one by one and tell them where they had mistakes, and I would give them Feedback...."

"Code, codon, chromosome genes, reproduction can be given as examples [for misconceptions students commonly have]. They first have difficulty understanding protein synthesis because they face too many unknown concepts. They confuse translation with transcription; they learn the concept of amino acid easily because they study it at grade nine."

"I think the fact that biology is within our life should be taught to children by giving examples from life. The subject of protein synthesis is under the subject of genes. The 12th graders are taught protein synthesis as the sub-subject.... Then, they move on to biotechnology."

"I use my phone continuously and my computer for about 4 hours a day.... I use the internet for things such as reading the news, UpToDate knowledge and articles."

"I use computers, overhead projectors and -if there are any- smart boards [in my classes]. [Because] there are too many abstract concepts... learning is retained better in mind by making students watch videos."

PT3 evaluated his/her knowledge of protein synthesis by giving 3 points to himself/herself over 5. The average score he/she received from the content knowledge test was 25.5 over 77. On examining the participant's answers to the questions in the content knowledge test and the questions in the interview form, it was found that he/she had an almost medium level of content knowledge, but it was inferred from his/her repeated statements that he/she had the Misconception that "protein synthesis does not occur unless DNA matches itself." The participant's technological knowledge was partially adequate. Since his/her pedagogical knowledge was adequate, his/her technological pedagogical knowledge was considered sufficient. The pre-service teacher mentioned could integrate technological knowledge into his/her pedagogical knowledge. However, the participant's TPACK component was generally inadequate since he/she could not integrate his/her technological knowledge into teaching protein synthesis even though his/her technological knowledge and pedagogical knowledge each was adequate on its own.

Some of the examples for statements made by PT3 during the interview were as in the following:

"It is necessary to have a good command of all components [of classroom management]. It is necessary to know time management to manage the classroom. ... I want to use the discovery method in my classes."

"Students should be evaluated as a whole. Exams on their own are not important. We should look at whether students can use what they learn, whether they can adapt their learning into daily life, whether they participate in classes and whether they can do projects to be able to inculcate in them the skills which we call 21st-century skills."

"I think misconceptions mostly occur in theories, laws and hypotheses... primarily, there is the process in which DNA matches itself prior to protein synthesis, In fact, in my opinion, they have difficulty.... Because it is too abstract."

"Models, mock-ups can be prepared, or videos are available because subjects are explained rather abstractly while teaching protein synthesis. In my opinion, visualizing such videos and making students watch them enables students to learn better."

"I always use my phone in daily life. ... We also use computers frequently. Furthermore, televisions and radios... the internet is mostly used in social media, but it is also a convenient method to learn what we wonder."

PT4 evaluated his/her knowledge of protein synthesis by giving himself/herself 3 points over 5. The average score he/she received from the content knowledge test was 22.5 over 77. The participant's answers to the questions in the content knowledge test and the questions in the interview form demonstrated that he/she lacked content knowledge. It was also found that the pre-service teacher had difficulty following technological developments specific to the area. Therefore, his/her technological knowledge was considered partially adequate. PT4- because he/she had inadequate knowledge of measurement and evaluation, which was a component of pedagogical knowledge- was partially adequate pedagogical knowledge. In support of this finding, he/she was observed to have partially adequate technological pedagogical knowledge- a combination of technical knowledge and pedagogical knowledge. The participant was inadequate in using technology at the stage of measurement and evaluation in teaching protein synthesis, and he/she generally had difficulty integrating technology into teaching protein synthesis.

Some of the examples for statements made by PT4 during the interview were as in the following:

"[Misconception] is mistaken knowledge of something."

"All students are different. It is difficult to appeal to all. For this reason, managing the classroom is also difficult."

"I think that evaluation should be made frequently because it makes students study hard. ... I can use not only oral but also written exams. [The purpose of using different measurement and evaluation instruments] is to measure students' knowledge and motivate them to understand better."

"[I think that students will have difficulty in understanding protein synthesis] because it is also abstract, it is a subject which they need to imagine more."

"I would use the direct method in teaching protein synthesis. Firstly, I need to have a good command of the subject. I would ask questions when I start a lesson, try to reveal the concepts they know, and then teach them what they do not know. I would prepare worksheets for them; I would give them homework."

"Using technology facilitates students' learning. It motivates students because they learn by watching videos and by seeing. For example, teaching protein synthesis by making them watch videos rather than teaching it on the board enables learning in a shorter time and more effectively."

"I use computers (the internet) for researching outside the school, and I play games in the summer.... I believe that I am good at adapting to new technologies."

"Yes [I make use of technology in measurement and evaluation], such as preparing questions on the computer and getting them photocopied...."

PT5 evaluated his/her knowledge of protein synthesis by giving himself 2 points over 5. The average score he/she received from the content knowledge was 28 over 77. He/she almost had a medium level of content knowledge. His technological knowledge was partially adequate. The participant was found to know technological instruments specific to the area, use them, and be generally informed of technological developments related to biology. Thus, he/she was found to have partially adequate technological content knowledge. The fact that the participant had inadequate knowledge of measurement and evaluation and inadequate knowledge of students' learning difficulties, a component of pedagogical knowledge, demonstrated that he/she lacked pedagogical knowledge. In parallel to that, his/her technological pedagogical knowledge was also found to be partially adequate. The participant's knowledge of technology-supported teaching strategies, methods and techniques and of using technology at the stage of measurement and evaluation in teaching protein synthesis was inadequate. He/she could not know what technology-supported strategies, methods and techniques usable in teaching protein synthesis were. In general, it was concluded that the participant had inadequate TPACK because he/she could not integrate technological knowledge with pedagogical and content knowledge.

Samples from the statements made by PT5 during the interview were as in the following:

"[Misconception] means not knowing the definitions of concepts... the reason for it is insufficiency of resources."

"Managing the classroom is easy for me. It is necessary to know the properties of age groups."

"I plan to use written exams or question and answer method when I become a teacher. The purpose of using different measurement and evaluation instruments is to see what children understand from different aspects because every child may not be good at multiple-choice tests or essay type exams."

"[determining and removing students' misconceptions about protein synthesis] I can give them a quiz; I can do a question-and-answer activity. Even an exam can show what a student is lacking."

"I use technology in any area in daily life. My mobile phone is always in my hand. I spend time on the internet usually for communication. I use sources of news".

"I would use videos to show the stages [while teaching protein synthesis] ... sound, sight; it would be beneficial to appeal to more than one sense. I would make students watch videos to determine misconceptions about protein synthesis and eliminate them. They would ask questions, or they would understand while watching the videos... I do not think that technology can be available [in the process of evaluation]."

PT6 evaluated his/her knowledge of protein synthesis by giving himself/herself 3 points over 5. The participant's average score from the content knowledge test was 7 over 77. He/she was found to have severe inadequacies in content knowledge. The statement "genetic code is created as a result of protein synthesis" notably strengthened the thought that he/she had inaccurate knowledge and misconceptions about the subject. It was found that the pre-service teacher had partially adequate technological knowledge, did not know what technologies to use about protein synthesis, but that he/she could name the technological instruments specific to biology in general and that he/she knew how to use them. Thus, it became apparent that his/her technological content knowledge was partially adequate. The participants' pedagogical knowledge was partially adequate. He/she could not adequately answer the questions about the effects of using technology on the teaching process. In parallel to that, his/her technological pedagogical knowledge was partially adequate. However, his/her knowledge of curriculum and materials about teaching protein synthesis—a component of pedagogical content knowledge—was inadequate, but the other components were partially adequate. The pre-service teacher was found to have difficulty in associating the three types of knowledge because he/she was inadequate in using technology at the stage of measurement and evaluation in teaching protein synthesis because he/she could associate technological knowledge with pedagogical knowledge but because his/her content knowledge was inadequate.

Samples from the statements made by PT6 during the interview were as in the following:

"Misconception. I can give such an example for it. One has logical reasons because He/he has learned it from somewhere, combining the pieces in his or her way, and he or she interprets it in that way. In my opinion, that person has learned the incorrect knowledge, and so the person has misconceptions."

"I think the subject that students can understand the most easily may be the fundamental properties of living things and the subject that they will have the most difficulty with maybe genetics... they can have difficulty understanding protein synthesis because it has complicated features. They may be confusing it with translation." Transcription in particular.

"[In teaching protein synthesis,] I would prefer the direct method. ... However, I would use smart boards, videos, animations and visuals to concrete the subject. I would ask them questions at the beginning to determine misconceptions and to eliminate them. I would evaluate their knowledge and Feedback. Then, I would explain the real knowledge to them."

"Most probably, I would do fill in blanks exercise first to see if they had understood it. Then, I would ask them open-ended questions to see if they had understood the logic of the subject or if they could state it in their own words."

"I use computers, tablet PCs 24 hours a day. I spend time mostly for social media on the internet."

"Using technology affects the teaching process terribly if you are not good at technology. Because it is a waste of time, and students do not take you seriously... If you are competent in technology, I think it affects it positively."

PT7 evaluated his/her knowledge of protein synthesis by giving himself/herself 3 points over 5. The participant's average score from the content knowledge test was 18.5 over 77. It was remarkable that ribosome was a molecule available in the structure of RNA and that rRNA was the place where ribosome was produced. The participant had inaccurate knowledge and deficiencies in content knowledge. The participant was found to have inadequate technological content knowledge because he/she had partially adequate technical knowledge and because he/she could not integrate technology into content knowledge. Apart from inadequate knowledge of teaching strategies, methods, techniques and activities, and classroom management—the components of pedagogical knowledge; PT7 was partially adequate in other components. The participant had difficulty evaluating the effects of technology use on teaching from the aspect of students. Thus, the participant was partially adequate in technological

pedagogical knowledge. He/she was inadequate in the curriculum and material about teaching protein synthesis- a component of pedagogical content knowledge- but partially adequate in the other components. Besides, he/she had inadequate knowledge of using technology to determine misconceptions and eliminate them. In addition to that, he/she had difficulty associating technological knowledge with pedagogical knowledge. It was concluded that participant PT7 had partially adequate TPACK apart from his/her inadequacy in using technology to determine and eliminate misconceptions.

Samples from the statements made by PT7 during the interview were as in the following:

"[Misconception] is the thing that is known incorrectly by a large mass of people. Generalizations can cause it."

"It is generally logical to make evaluations at the end of each unit. There is a program. We should not move on to the next unit until students learn a unit. I would give worksheets, oral tests, open-ended questions... Yes, I would [give Feedback after an evaluation]. I would give worksheets to students. If there were any mistakes, I would explain them. I would ask them if they had any questions."

"I cannot remember the teaching strategies, methods and techniques that I can use in teaching protein synthesis. However, there should be something that will make students active, but it is a difficult subject. The teacher should also be active."

"I have not looked at the course books. I do not know anything about gains about protein synthesis."

"I use my phone and my computer the most. I began to use computers more often when I started university. I watch TV less. I usually spend time researching the internet- 2-3 hours a week. I use Instagram very often. I am concerned with them because I am curious about new technologies."

"Using technology affects the teaching process in terms of length of time. Especially using the smart board.... I think I am good at using the right technology in teaching. Because we know the technologies that students may need."

"Scientists have mostly used microscopes in reaching knowledge related to biology and in researching because they analyze microscopic structures."

PT8 evaluated his/her knowledge of protein synthesis by giving himself/herself 2.5 points over 5. The participant's average score from the content knowledge test was 28 over 77. His/her content knowledge was considered almost at a medium level. The participants' technological knowledge was partially adequate, but he/they did not know what technologies to use in protein synthesis. It became apparent that his/her technological content knowledge was inadequate since he/she could not integrate technology into content knowledge. PT8 had partially adequate pedagogical knowledge. The pre-service teacher could not evaluate the effects of using technology on the teaching process from students and teachers. Despite partial adequacy of his/her technological and pedagogical knowledge, he/she had difficulty associating the two, and his technological pedagogical knowledge was inadequate. The participant's knowledge of curriculum and materials and his/her knowledge of teaching strategies, methods, techniques and materials about teaching biology and protein synthesis was inadequate, but his/her knowledge of the other components was partially adequate. Although his/her technological knowledge, content knowledge and pedagogical knowledge were partially adequate, he/she could not associate the components. Thus, he/she was found to be inadequate in TPACK.

Samples from the statements made by PT8 during the interview were as in the following:

"[Misconception] is the wrong knowledge of a concept. It can stem from teachers. They might have misdescribed concepts."

"Classroom management involves the ability to control the classroom, to attract the attention, to transfer the knowledge and to use the time efficiently... different teaching strategies, methods, techniques and activities are nice in theory but difficult in practice."

"I usually evaluate at the end of classes. Maybe at the end of a unit. I use all of the measurement instruments. How much a student has understood can be found with various questions... Yes, I would explain in what points students have made mistakes as a result of the evaluation."

"Students learn the subject of cells the most easily because they have fundamental knowledge from primary school years. Systems can seem too complex. The misconceptions students commonly have in biology can be in theoretical subjects."

"Using technology can influence students both in positive and negative ways. It changes from person to person... Drawings or videos can be used in teaching protein synthesis... quizzes can be given to determine students' misconceptions about protein synthesis, and I would try to teach the right things based on the quizzes."

"I use computers and my phone very often in daily life. I use the internet usually for watching films, but I also use it for research."

An examination of the answers given to the content knowledge test indicated that the pre-service teachers had significant knowledge deficiencies and misconceptions. They were found to have difficulty in answering the questions in that a codon encoded only one amino acid. However, an amino acid could be encoded by more than one codon, that one type of tRNA carried only one type of amino acid, but a type of amino acid could carry more than one type of tRNA, in the frequency of replication, transcription and translation events and in the way DNA spring unravels in replication.

DISCUSSION, CONCLUSION AND RECOMMENDATIONS

The findings of the components of TPACK are interpreted under separate headings in this section, and then individual evaluations are made based on the relationships between the components within the theoretical framework of TPACK. The results for individual-based analyses are interpreted, and recommendations are made here.

Pedagogical Knowledge

It was found in this study that pre-service teachers' most remarkable deficiency in pedagogical knowledge was about students' misconceptions. Even though they offered a partially adequate definition of a misconception, they did not know the reasons for students' misconceptions. However, knowing the reasons for misconceptions can provide teachers with essential clues on preventing and eliminating them. Apart from that, the pre-service teachers can have a medium level of pedagogical content knowledge even though that is lacking in some points. The results obtained for pre-service teachers' pedagogical content knowledge are also supported by the ones obtained in other studies. Kaya (2010), for instance, in a study conducted with the participation of pre-service science and technology teachers, found that the participants' knowledge of teaching strategies, methods and techniques was partially adequate. Similarly, Uşak (2005) also reported that pre-service science teachers preferred traditional measurement and evaluation instruments.

It is a requirement that pre-service teachers follow the new practices and approaches in teaching for their professional development. Therefore, course content should be created to enable pre-service teachers to follow contemporary developments. They should be informed of and motivated to update their knowledge of new teaching strategies, methods and activities and alternative measurement and evaluation techniques during their education and professional life. Thus, they will be able to understand better the demands and needs of changing student profiles, and they will be able to have more accurate pedagogical approaches towards students. It is also thought that highlighting misconceptions more during teacher training will be beneficial in preventing and eliminating them. In addition, enriching the content of such courses as "Developmental Psychology" and "Teaching Methods and Techniques- which are offered in undergraduate education- would also be beneficial.

Pedagogical Content Knowledge

The pre-service teachers had partially adequate knowledge about learning difficulties in biology and protein synthesis. In addition to their deficiencies about misconceptions in pedagogical knowledge, they were also found to have inadequate knowledge about students' current misconceptions about protein synthesis. However, teachers need to know about students' misconceptions to make meaningful and permanent learning. Therefore, it is thought that considering the subjects in which secondary education students have difficulty and their probable misconceptions in relevant undergraduate courses would be beneficial. In this way, pre-service teachers would know the probable misconceptions and the difficulties students might have and plan the teaching process accordingly.

This current study found that the pre-service teachers knew of the strategies, methods, techniques and activities they could use for permanent and mastery learning but did not have adequate knowledge about how to use them in teaching biology and protein synthesis. Some of the participants used concepts such as constructivist teaching approach and mastery learning model in their explanations, but they had difficulty giving tangible examples for the strategies, methods and techniques they could use in teaching protein synthesis. However, teachers are expected to know the teaching methods, strategies, techniques, and materials, providing students with gains about the content. Such deficiencies in pedagogical content knowledge stem from inadequate content knowledge because the participants tended to give hesitant and general answers to questions about what stage of teaching and what techniques they could use. However, they knew specific teaching methods and techniques.

The participants were found to have inadequate knowledge of the curriculum and materials about teaching the biology course and protein synthesis. The deficiency might be attributed to continual changes in the biology curriculum.

A close examination of the findings demonstrated that the pre-service teachers were weaker in pedagogical content knowledge than in pedagogical knowledge. Studies in the literature also report teachers' and pre-service teachers' deficiencies in pedagogical content knowledge (such as Polly, 2010; Çelik, 2015; Kartal, 2017). The pre-service teachers included in this current study answered the questions measuring their general pedagogical knowledge better, but they had difficulty when they were required to associate their content knowledge with their pedagogical knowledge. It was thought to stem from inadequate content

knowledge. They were found to have significant lacks in and misconceptions about the subject according to the statements they had made in the interviews and the content knowledge test results.

Pre-service teachers' awareness of the necessity for having adequate and up-to-date knowledge about the structure and content of such courses as Teaching Practice, Curriculum Development and Teaching can be raised, and thus, they can be made to follow the changes in the curriculum. The studies conducted in this respect have shown that the activities done in such courses as School Experience and Teaching Practice are insufficient and that they do not serve their purpose (Aksu & Demirtaş, 2006; Güzel & Oral, 2008; Kaya, Kılıç, & Akdeniz, 2004; Şimşek, 2005; Yiğit & Alev, 2005). It may be recommended that the cooperation between teacher training institutions and the Ministry of National Education in teacher training should be revised so that the deficiencies in this respect can be eliminated and the communication between teachers and university lecturers and the length of practice courses should be increased so that the teachers in schools of teaching practice can offer more practical guidance.

Technological Knowledge

This study also found that the pre-service teachers' technological knowledge was partially adequate. All of them were able to make comments on the concept of technology, but they had difficulty defining it. They were less knowledgeable about technologies they did not need to use but were adequately knowledgeable about the technologies they frequently used in daily life. Thus, the pre-service teachers were found to have an acceptable level of technological knowledge. Considering the studies in the literature (such as Hırça & Şimşek, 2013; Kaya et al., 2011; Şad, Açıkgül, & Delican, 2015) and the results of them, the interpretation that pre-service teachers' technological knowledge is inadequate and that they need improvement in this respect can be made. Therefore, the need for pre-service teachers to improve themselves in using technology should be emphasized, their consciousness should be raised, and they should be motivated to take elective courses and learn to use the technologies they need or may need to use. Even though computers and technology use courses are available in universities, practice is also needed in those courses. It is thought that teachers can behave advantages in catching up with the era if they have experience with applied courses and have more self-confidence in using technology.

Technological Pedagogical Knowledge

The participants said that they would use smart boards to make students watch videos and animations or use microscopes to catch their attention, but they had difficulty associating teaching strategies, methods, and techniques with technology. They could not explain using technology, especially in the measurement and evaluation process. In a similar study, Kılıç (2015) also found that most pre-service teachers did not know what technologies to integrate and how to integrate them at the stage of measurement and evaluation, and therefore they could not assess students' knowledge by using technology. The finding was attributed to the fact that they did not have sufficient knowledge and experience to use technological support in measurement and evaluation during their training. As a result, it may be said that pre-service teachers are partially adequate in integrating technology into the teaching process. Similarly, Meriç (2014) concluded that pre-service science teachers had low self-confidence in technological pedagogical knowledge.

Pre-service teachers need more knowledge and more self-confidence in using technology in teaching. It would be beneficial to consider what technologies to use, at what stages of teaching to use them and for what purposes and how to use them in the content of pedagogy-related courses in the biology teaching programs of universities. The pre-service teachers included in this research had difficulty integrating technology, especially into measurement and evaluation. Therefore, knowledge and practice in using technology in measurement and evaluation could be emphasized more in the relevant course content in undergraduate education.

Technological Content Knowledge

Based on the findings obtained in this paper, it may be stated that pre-service biology teachers have partial knowledge of technological content knowledge. It was remarkable that the participants had inadequate knowledge, especially about what technologies scientists used and how they used them to reach knowledge and research biology. Their responses indicated that they were also lacking in knowledge about the scientific method. The pre-service teachers who were relatively good at technological knowledge had difficulty answering the questions on content knowledge- which was also remarkable. The situation was thought to stem from a lack of content knowledge. Studies with similar and different results are available in the literature. While Polly (2010), for instance, reported that teachers' technological content knowledge about mathematics teaching was quite good, Karakaya (2012) concluded that science teachers' technological content knowledge about global environmental problems was inadequate.

Pre-service teachers should be made to have the correct perceptions primarily about the nature of science. It will be beneficial for this purpose to know the misconceptions they bring from secondary education and from earlier education about the nature of science to deal with them and eliminate them during undergraduate education. Encouraging them to follow technological developments related to the area, allocating more space for biotechnological studies and providing them with more opportunities to use domain-specific technologies are also considered beneficial in inculcating the desired level of technological content

knowledge. Technological equipment and material support for pre-service teachers should be increased in universities, and they should be encouraged to use them. In addition to that, they should also be made to prepare more technological materials in the relevant undergraduate courses under the gains described in the secondary education course curriculum.

Content Knowledge

An examination of the pre-service teachers' scores from the content knowledge test- in which the maximum score receivable was 77- showed that only 3 out of 8 participants answered almost half of the questions accurately. The data from the content knowledge test and the interviews indicated that the pre-service teachers, in general, lacked content knowledge. Besides, they were also found to have misconceptions about the subject according to the answers they had given to the content knowledge test and the statements they had made in the interviews. They will cause misconceptions stemming from teaching if they graduate from university and start teaching without eliminating their misconceptions. Thus, Kaya (2012), in a study conducted with pre-service science teachers, points out that pre-service teachers' misconceptions about the subject and their inadequate conceptual knowledge were the most significant problems in students' mastery and permanent learning. The educational process at university might need revision by taking pre-service teachers' inadequacy of content knowledge and their misconceptions into consideration. It becomes clear on examining the content of programs training teachers that the time allocated to teaching protein synthesis in courses such as general biology, molecular genetics and genetics and molecular biology is much less than the time allocated to the subject in secondary education. Undoubtedly, undergraduate students are different from secondary education students in terms of cognitive levels and terms of readiness and therefore, post-graduate students are expected to understand and learn a more significant amount of knowledge in a shorter time, to reach the knowledge on their own and to be able to control their learning better. However, it is also clear that there are deficiencies in having permanence in learning, setting up cause and effect relationships, and learning the subject meaningfully.

Courses in which pre-service teachers can present their content knowledge in the classroom environment can be included in the teacher training program to apply for the courses in their area (such as genetics, molecular biology, etc.). It is believed that knowledge will be more permanent when they prepare to present a subject and become aware of their own and their classmates' deficiencies and misconceptions while presenting the subject. What is said above is not related only to protein synthesis, but it would be beneficial to have similar practice with all the courses in the domain.

Technological Pedagogical Content Knowledge

There was a general decrease in the participants' explanations on TPACK compared to their explanations on PCK. Considering their answers to all the components of TPACK separately, it was clear that they were knowledgeable about certain subjects but had difficulty associating pedagogical knowledge with content knowledge and technological knowledge. Therefore, more studies should be conducted to ensure they are informed of TPACK and its components. It may be said that considering the developing educational and domain-specific technologies, it would be beneficial to consider all three factors together and plan the teaching process accordingly. There is a need to train pre-service teachers so that they are ready to offer effective teaching by using relevant technologies and having adequate pedagogical and content knowledge in our time. This study, which was conducted with the inclusion of 8 pre-service teachers, could be repeated in a quantitative method with larger samples by developing scales to measure the TPACK and including in-service teachers and pre-service teachers. It would be possible to evaluate the TPACK levels of teachers and pre-service teachers concerning protein synthesis.

Additionally, the study could also be repeated with other subjects known to be difficult for students, and thus, efforts could be made to improve pre-service teachers' levels of TPACK. Raising teachers well equipped in TPACK will increase the efficiency of biology courses in secondary education. Classes will be more enjoyable and instructive through teaching, supported by technology and vital in pedagogical knowledge and content knowledge.

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Statements of publication ethics

We hereby declare that the study has not unethical issues and that research and publication ethics have been observed carefully.

Researchers' contribution rate

The study was conducted and reported with equal collaboration of the researchers.

Ethics Committee Approval Information

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| Research Article / Araştırma Makalesi |

Relationships between Adolescents' Irrational Beliefs, Personality Characteristics and Stress Coping Approaches

Ergenlerin Akılcı Olmayan İnançları ile Kişilik Özellikleri ve Stresle Başa Çıkma Yaklaşımları Arasındaki İlişkiler

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Keywords

1. Irrational beliefs
2. Personality characteristics
3. Stress coping
4. Adolescents

Anahtar Kelimeler

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Abstract

Purpose: The current study aims to determine the extent to which adolescents' irrational beliefs are predicted by their personality characteristics and stress coping approaches and investigate whether adolescents' irrational beliefs vary significantly depending on gender and parents' education level.

Design/Methodology/Approach: The study population comprises 5120 high school students attending the high schools in the Menteşe district of the city of Muğla in the 2019-2020 school year. The study sample consists of 512 students selected from among the population by using the stratified sampling method. The data collection tools, an information form to collect demographic data about the students, the Irrational Beliefs Scale-Adolescent Form, the Five-Factor Personality Inventory and the Stress Coping Styles Scale were used in the current study. Hierarchical multiple linear regression analysis was conducted to determine the extent to which the adolescents' personality characteristics and stress coping approaches predict irrational beliefs, and three-directional variance analysis was conducted to determine whether the adolescents' irrational beliefs vary significantly depending on gender, mother's education level and father's education level.

Findings: As a result of the study, it was concluded that from among the personality characteristics, the sub-dimension of "neuroticism" positively and significantly predict the irrational beliefs in adolescents while the sub-dimensions of "openness to experience" and "agreeableness" negatively and significantly predict them and from among of the stress-coping approaches, the sub-dimension of "desperate approach" positively and significantly predicts the irrational beliefs in adolescents while the sub-dimensions of "optimistic approach" and "seeking for social support" negatively and significantly predict them. While the adolescents' irrational beliefs were found to not vary significantly depending on gender, mother's education level and father's education level, they were found to be varying significantly depending on binary interaction of gender x father's education level. While in the male adolescents, the irrational beliefs were found to be decreasing with the increasing education level of the father, this is not true for the female adolescents.

Highlights: The current study is essential in terms of eliciting the factors that should be taken into consideration in explaining and reducing irrational beliefs in adolescents.

Öz

Çalışmanın amacı: Bu araştırmanın amacı ergenlerin akılcı olmayan inançlarının kişilik özellikleri ve stresle başa çıkma yaklaşımları tarafından yordanması ile akılcı olmayan inançlarının cinsiyet ve ebeveyn öğrenim düzeyi değişkenleri açısından farklılaşıp farklılaşmadığının saptanmasıdır.

Materyal ve Yöntem: Araştırmanın evrenini 2019-2020 eğitim öğretim yılında, Muğla ilinin Menteşe ilçesinde, ortaöğretim kurumlarında öğrenim gören 5120 lise öğrencisi oluşturmaktadır. Örneklemi ise evrenden tabakalı örnekleme yöntemiyle seçilen 512 öğrenci oluşturmaktadır. Araştırmada veri toplama araçları olarak öğrencilere ilişkin demografik bilgilerin elde edildiği kişisel bilgi formu, Akılcı Olmayan İnanç Ölçeği-Ergen Formu, Beş Faktör Kişilik Envanteri ve Stresle Başa Çıkma Tarzları Ölçeği kullanılmıştır. Ergenlerin kişilik özellikleri ve stresle başa çıkma yaklaşımlarının akılcı olmayan inançlarını ne ölçüde yordadığını belirlemek için hiyerarşik çoklu doğrusal regresyon analizi ve ergenlerin akılcı olmayan inançlarının cinsiyet, anne öğrenim düzeyi ve baba öğrenim düzeyi değişkenlerine göre istatistiksel olarak anlamlı farklılık gösterip göstermediğini belirlemek üzere üç-yönlü varyans analizi yapılmıştır.

Bulgular: Araştırmanın sonucunda kişilik özelliklerinden "nevrotiklik" alt boyutunun pozitif; "deneyime açıklık" ve "uyumluluk" alt boyutlarının ise negatif yönde; stresle başa çıkma yaklaşımlarından "çaresiz yaklaşım" alt boyutunun pozitif; "iyimser yaklaşım" ve "sosyal destek arama" alt boyutlarının ise negatif yönde ergenlerin akılcı olmayan inançlarını manidar düzeyde yordadığı belirlenmiştir. Ergenlerin akılcı olmayan inançları cinsiyet, anne öğrenim düzeyi ve baba öğrenim düzeyine göre anlamlı farklılık göstermez iken cinsiyet x baba öğrenim düzeyi ikili etkileşimine göre anlamlı farklılık gösterdiği bulunmuştur. Erkek ergenlerde akılcı olmayan inançlar babalarının öğrenim düzeyi arttıkça azalırken kız ergenler de böyle bir örüntü görülmemiştir.

Önemli Vurgular: Bu çalışma, ergenlerin akılcı olmayan inançlarının açıklanması ve azaltılması ile ilgili yapılacak araştırmalarda dikkate alınması gereken faktörlerin ortaya konulması bakımından önem arz etmektedir.

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INTRODUCTION

Adolescence can be defined as a difficult life period in which many novelties are experienced, and some developments enable the transition to adulthood. In addition, it is considered as one of the most critical processes in terms of the development of individuals, since it is the period when the personality is largely shaped (Elçin-Boyacıoğlu & Küçük, 2011). Ellis (1995) emphasized that individuals tend to evaluate themselves and others in adolescence. The same event may be perceived differently by the same adolescent since emotional ups and downs are experienced intensely in adolescence (Kulaksızoğlu, 2011). At this point, Ellis (1995) argued that individuals have some irrational beliefs that negatively affect their perceptions. Bernard (1984) emphasized that these irrational beliefs that individuals have about themselves, others and the world they live in are also possessed by children and adolescents. Significantly adolescents can develop many new irrational beliefs because of the adolescent self-centeredness and the complex reasoning characteristic of Piaget's abstract operations period.

Irrational beliefs focus on Rational Emotive Behaviour Therapy (REBT), developed by Albert Ellis in the 1950s. REBT claims that individuals constantly tend to blame factors outside of their control as the source of their negative emotions. However, the cause of emotional disturbances is not the event but the beliefs and thoughts in the minds of the individuals about that event (Ellis, 1994; Turner & Barker, 2015). In REBT, beliefs are at the center of the feelings and behaviors of individuals and are an essential determinant of these feelings and behaviors (Dryden & Branch, 2008). Individuals' beliefs can be irrational and unhealthy and rational and healthy (Choudhury, 2013; Dryden, 1999; Vernon, 2004). Rational beliefs are logical, flexible, not overwhelming, consistent with reality, and often greatly help an individual achieve his/her goals. However, irrational beliefs at the center of most psychological problems are fundamentally rigid, harsh, extreme, inconsistent with reality, illogical, and prevent the individual from achieving his/her goals (Dryden & Branch, 2008). It has been suggested that undesirable emotional and behavioral consequences are primarily due to irrational thoughts or beliefs (Dryden, 1999; Ellis, 1994).

When the existing research on irrational beliefs is examined, it is seen that personality characteristics are particularly associated with irrational beliefs. For example, studies by Forman and Forman (1978), Gorman and Simon (1977), Jones (1968), Wicker, Richardson and Lambert (1985), Zurawski and Smith (1987) can be cited as evidence for this relationship. Some findings indicating this association are as follows: Jones (1968) found that irrational beliefs are positively correlated with some personality characteristics such as anxiety and nervousness while others such as social courage and emotional stability are negatively correlated with irrational beliefs. Gorman and Simon (1977) found that irrational beliefs are negatively correlated with emotional stability while positively correlated with some personality characteristics such as nervousness and being on alert. Forman and Forman (1978) emphasized that the people receiving high scores from personality characteristics such as individuality and intelligence have lower irrational belief scores. In the subsequent studies, the relationships between personality traits and irrational beliefs were investigated by applying the more superficial "Big Five" model (Davies, 2006; Ghuman & Shoaib, 2013; Jibeen, 2015; Mahfar, Senin, Yong & Ghani, 2018; Samar, Walton & McDermut, 2013; Sava, 2009; Sharah, 2012; Sheng, 2017; Spörrle, Strobel & Tumasjan, 2010). The Five-Factor Model, commonly known as the Big Five model, consists of the concepts of "openness to experience," "conscientiousness," "extraversion," "agreeableness," and "neuroticism" generally represented by the abbreviation OCEAN (McCrae & Costa, 1987, 2008; Samar et al., 2013).

Famous for its ability to predict psychological consequences, the Five-Factor Model is widely used in different contexts and cultures (Costa & McCrae, 1992; McCrae & Costa, 1997; McCrae & John, 1992). According to the model, individuals with higher "openness to experience" are more likely to be more creative, original, insightful and intellectual. Also, these individuals tend to like to learn (McCrae, 1996; Ozer & Benet-Martinez, 2006). On the other hand, individuals tending "conscientiousness" show higher levels of self-discipline. Individuals with this trait are more passionate and insistent in achieving their goals (Costa & McCrae, 1992; Ozer & Benet-Martinez, 2006). On the other hand, individuals with higher "extroversion" tendencies are prone to be more social, confident, talkative, and with more positive energy (Costa & McCrae, 1992; McCrae, 1990); individuals with a tendency towards "agreeableness" tend to be more sympathetic, compassionate, and more sensitive to the needs of others (Graziano, Jensen-Campbell & Hair, 1996). Finally, individuals with a tendency towards "neuroticism" are expected to display higher emotional instability and negative emotions. In addition, these individuals are prone to display higher levels of anxiety, impulsivity, and depression (Costa & McCrae, 1992).

When the findings of some studies using the Five-Factor Model to investigate the relationship between irrational beliefs and personality characteristics in adult samples are examined, it is seen that though these findings have some similarities, they are not much consistent. Sava (2009), Spörrle et al. (2010) and Davies (2006) found that the personality characteristic of "neuroticism" is positively and significantly correlated with irrational beliefs. Moreover, according to Sava (2009), Spörrle et al. (2010) and Davies (2006), there is no correlation between the personality characteristic of "extroversion" and irrational beliefs. On the other hand, while Spörrle et al. (2010) and Davies (2006) claim that there is a negative and significant correlation between the personality characteristic of "openness to experience" and irrational beliefs, Sava (2009) found no significant correlation between the

personality characteristic of "openness to experience" and irrational beliefs. While Sava (2009) and Spörrle et al. (2010) found a negative and significant correlation between the personality characteristic of "agreeableness" and irrational beliefs, Davies (2006) found no significant correlation between the personality characteristic of "agreeableness" and irrational beliefs. Finally, while Davies (2006) found a positive and significant correlation between the personality characteristic of "conscientiousness" and irrational beliefs, Sava (2009) and Spörrle et al. (2010) found no correlation between the personality characteristic of "conscientiousness" and irrational beliefs. All these findings reported in the literature show that it is impossible to clearly define the relationship between personality characteristics (Big Five) and irrational beliefs. In this connection, the relationship between personality characteristics and irrational beliefs in adolescents will be investigated with the current study for the first time. Moreover, the current study will be attempted to clarify the relationship between personality characteristics and irrational beliefs.

Another variable associated with irrational beliefs is stress coping approaches. In the literature, many studies are associating irrational beliefs with stress coping approaches (Akbağ, 2000; Aysan & Bozkurt, 2000; Hamarta, Arslan, Saygın & Özyeşil, 2009; Mayhew & Edelman, 1989; Schill, Adams & Ramanaiah, 1982). Stress can be defined as "a situation that occurs when the physical and mental limits of the organism are threatened or forced" (Baltaş & Baltaş, 2004, p.23). In this context, stress coping can be expressed as all reactions displayed to reduce and eliminate the emotional tension caused by stressors. Strategies for coping with stress fall into two groups; problem-focused coping and emotion-focused coping. The problem-focused coping approach involves more active, rational, calm and conscious efforts to change the situation.

In contrast, the emotion-focused coping approach usually involves negative approaches such as moving away from the source of the problem, excessive self-control, seeking social support and accepting the situation quickly without struggling (Lazarus & Folkman, 1984). Within the context of the current study, approaches to coping with stress will be evaluated based on five basic strategies determined by Lazarus and Folkman. These five basic strategies are (1) self-confident approach, (2) optimistic approach and (3) social support, which are addressed under the umbrella term of problem-focused/active coping and (4) submissive approach and (5) desperate approach, which are addressed under the umbrella term of emotion-oriented/passive coping. When the findings of the studies investigating the relationship between irrational beliefs and stress coping approaches in adult samples are examined, it is seen that approaches that try to cope constructively with the stress situation and focus on solving the problem are associated with low levels of irrational beliefs, but adopting approaches such as submission, helplessness, and avoidance instead of constructively resolving the stress situation is associated with high levels of irrational beliefs (Akbağ, 2000; Aysan & Bozkurt, 2000; Hamarta et al., 2009; Mayhew & Edelman, 1989; Schill et al., 1982). Thus, investigation of the relationship between irrational beliefs and stress-coping approaches in adolescent samples is thought to make essential contributions to the theoretical knowledge base in this field and provide essential insights about how to deal with irrational beliefs in adolescents.

On the other hand, it is seen that some findings show that irrational beliefs in adolescents vary depending on some demographic variables such as gender (Altıntaş, 2006; Erdin, 2016; Göller, 2010) and parents' education level (Altıntaş, 2006; Çivitci, 2006a; Yıldız, 2016). However, while in some of these studies, females were found to have higher levels of irrational beliefs (Altıntaş, 2006; Göller, 2010), in some others, males were found to have higher levels of irrational beliefs (Erdin, 2016) and in some others, it was found that irrational beliefs in adolescents do not vary significantly depending on gender (Aydoğdu, 2017; Çelik, 2019; Çivitci, 2006a; Deniz, 2018; Durm & Stowers, 1998; Elçin-Boyacıoğlu, 2010; Karaman, 2018; Kartol, 2013; Yıldız, 2016). Similar uncertainty has been reported about the effect of parents' education level on irrational beliefs. While in some studies, mother's education level was found to have a significant effect on irrational beliefs in adolescents (Altıntaş, 2006; Çivitci, 2006a), in some others, father's education level was found to have a significant effect on irrational beliefs in adolescents (Çivitci, 2006a; Yıldız, 2016) and in some other studies, irrational beliefs were found not to vary significantly depending on parents' education level (Altıntaş, 2006; Çelik, 2019; Deniz, 2018; Erdin, 2016; Kartol, 2013; Yıldız, 2016). In light of all these findings, it is difficult to say which adolescent groups are more at risk of exhibiting irrational beliefs. In this regard, the current study will be attempted to determine which adolescent groups are at risk. To this end, the variables of gender, mother's education level, and father's education level will be investigated separately and in different combinations by using the factorial ANOVA method; thus, adolescent groups at risk have high levels of irrationality beliefs will be determined. In this way, adolescent groups who will be given priority in the preventive counseling practices at schools will be determined.

The Problem Situation and Significance of the Study

When the studies investigating the relationship between irrational beliefs that are important for the spiritual and physical health of adolescents and psychological variables are examined, it is seen that irrational beliefs in adolescents are positively correlated with depression (Göller, 2010; Karaman, 2018; Küçük, Gür, Şener, Elçin-Boyacıoğlu & Çetindağ, 2016; Marcotte, 1996), emotional and behavioural problems (Silverman & DiGiuseppe, 2001), anger (Fives, Kong, Fuller & DiGiuseppe, 2011; Karaman, 2018), enmity (Fives et al., 2011), hopelessness (Göller, 2010), negative parental attitudes (Güler, 2012; Öztütüncü, 1996), negative familial relationships (Öztütüncü, 1996), trait anxiety (Çetin & Ceyhan, 2018; Çivitci, 2005, 2006b), exam anxiety (Ejei, Rezaei & Lavasani, 2011; Elçin-Boyacıoğlu, 2010; Elçin-Boyacıoğlu & Küçük, 2011; Güler, 2012; Güler & Çakır, 2013), social anxiety (Deniz,

2018), aggression (Fives et al., 2011; Kılıçarslan, 2009; Kılıçarslan & Atıcı, 2010), stress (Craciun, 2013; Mahfar et al., 2014; Yıldız, Baytemir & Demirtaş, 2018), perfectionism (Aydoğdu, Deniz, Dilmaç & Koruklu, 2009; Craciun, 2013; Flett, Hewitt & Cheng, 2008), professional indecisiveness (Hamamcı & Çoban, 2012), general self-efficacy (Alçay, 2015), anxiety, negative self-esteem, somatisation (Karaman, 2018), school burnout (Uzun & Kemerli, 2019), alexithymia and intolerance of uncertainty (Uzun, Gönültaş & Akın, 2020). Moreover, adolescents' irrational beliefs were found to be negatively correlated with problem-solving skills (Uygun, 2018; Yıkılmaz, 2009; Yıkılmaz & Hamamcı, 2012), perceived academic achievement (Göller, 2010), general grade point average (Çetin & Ceyhan, 2018), social skill (Çivitci & Çivitci, 2009), learned optimism (Ulusoy & Duy, 2013), intrapersonal and interpersonal skills (Kartol, 2013), adaptation to conditions and environment (Kartol, 2013), social, affective and educational adaptation (Hamidi & Hosseini, 2010), stress management, general mood (Kartol, 2013), professional maturity (Hamamcı & Çoban, 2012), empathy (Kızılyar, 2010), leadership (Morris, 1992), perceived social support (Öksüz, Ayvalı, Coşkun, Baba & İnci, 2011), life satisfaction (Çivitci, 2009), self-esteem (Deniz, 2018; Yıldız et al., 2018), self-regulation skill (Çetin & Ceyhan, 2018), decision making skill (Peker, Kartol & Demir, 2015) and subjective well-being (Aydoğdu, 2017). In this respect, it can be said that irrational beliefs in adolescents have a complex construct affected by many variables. In the literature, studies are revealing the relationships between personality characteristics of adolescents (Davies, 2006; Ghumman & Shoaib, 2013; Jibeen, 2015; Mahfar et al., 2018; Sava, 2009; Sharah, 2012; Sheng, 2017; Spörrle et al., 2010) and their stress-coping approaches (Akbağ, 2000; Aysan & Bozkurt, 2000; Hamarta et al., 2009; Mayhew & Edelmann, 1989; Schill et al., 1982) with irrational beliefs. However, as a result of the literature review, it was seen that there is no study investigating the effect of personality characteristics and stress-coping approaches in explaining irrational beliefs in adolescents. This shows a paucity of research focused on the explanation of possible sources of irrational beliefs in adolescent samples and the determination of risk factors. Unlike other studies, the extent to which personality characteristics and stress coping approaches affect irrational beliefs in adolescents was investigated in the current study. In this regard, the current study is original and makes theoretical contributions to irrational beliefs in adolescents. The current study is essential in eliciting the factors that should be taken into consideration in explaining and reducing irrational beliefs in adolescents.

Moreover, when the relevant literature is reviewed, it is seen that the results of the studies conducted to determine whether adolescents' irrational beliefs vary significantly depending on demographic variables such as gender (Altıntaş, 2006; Aydoğdu, 2017; Çelik, 2019; Çivitci, 2006a; Deniz, 2018; Durm & Stowers, 1998; Elçin-Boyacıoğlu, 2010; Erdin, 2016; Göller, 2010; Karaman, 2018; Kartol, 2013; Yıldız, 2016) and parents' education level (Altıntaş, 2006; Çelik, 2019; Çivitci, 2006a; Deniz, 2018; Erdin, 2016; Kartol, 2013; Yıldız, 2016) seem to be not consistent. Investigation of whether adolescents' irrational beliefs vary significantly depending on some demographic variables can clarify this inconsistency in the literature, to the understanding of the phenomenon of irrational beliefs and the knowledge base in the literature.

Purpose of the Study

Based on all these explanations, the purpose of this study is to determine the extent to which personality characteristics and stress coping approaches predict irrational beliefs in adolescents and to investigate whether the adolescents' irrational beliefs vary significantly depending on gender and parents' education level. To this end, answers to the following questions were sought:

1. Is there a statistically significant correlation between the adolescents' irrational beliefs, personality characteristics and stress coping approaches?
2. Are the personality characteristics and stress coping approaches of the adolescents statistically significant predictors of their irrational beliefs?
3. Do the adolescents' irrational beliefs vary significantly depending on gender and parents' education level?

METHOD/MATERIALS

The correlational survey model was used to investigate irrational beliefs in relation to personality characteristics and stress coping approaches. The correlational survey model is a research model aiming to investigate whether there is co-variance between two or more variables and the degree of this co-variance (Karasar, 2012).

Population and Sample

The study population comprises the 5120 high school students attending the high schools in the Menteşe district of the city of Muğla in the 2019-2020 school year. In selecting the students to be included in the sample, the stratified sampling method, one of the random sampling methods, was used. Stratified sampling is a sampling method that aims to identify subgroups in the population and ensure that these sub-groups are represented in the sample proportional to their sizes in the population (Büyüköztürk, Kılıç-Çakmak, Akgün, Karadeniz & Demirel, 2016). In this context, by considering the possibilities and limitations (time, money, etc.) of the researchers, from among 5120 students in the population, it was decided to create a 10% sample that was thought to be able to represent the population (Özen & Gül, 2007). In this way, the sample consisted of 512 students with a mean age of 15.35 was constructed. However, in the data analysis stage, as the data collected from 12 students had outliers, they

were excluded from the data set, and all the remaining analyses were conducted on the data collected from 500 students. The participation was on a volunteer basis. Information about the sample of the study is given in Table 1.

Table 1. Demographic information about the sample of the study

Factor	Variable	n	%
Gender	Female	280	56.00
	Male	220	44.00
School Type	Vocational High School	257	51.40
	Anatolian High School	243	48.60
Mother's Education Level	Primary School	261	52.20
	Middle School	88	17.60
Father's Education Level	High School and Higher	151	30.20
	Primary School	205	41.00
Total	Middle School	115	23.00
	High School and Higher	180	36.00
Total		500	100.00

As shown in Table 1, 56.00% (n=280) of the participating students are females, and 44.00% (n=220) are males. Of the participants, 51.40% (n=257) are vocational high school students and 48.60% (n=243) are Anatolian high school students. When the education levels of the students' mothers are examined, it is seen that 52.20% (n=261) of the mothers are primary school graduates, 17.60% (n=88) are middle school graduates, and 30.20% (n=151) are high school graduates or hold a higher degree. When the education levels of the students' fathers are examined, it is seen that 41.00% (n=205) of them are primary school graduates, 23.00% (n=115) are middle school graduates, and 36% (n=180) are high school graduates or hold a higher degree. While 85.40% (n=427) of the participating students live with their families, 6.60% (n=33) live with their relatives, and 8.00% (n=40) live in a dormitory.

Data Collection Tools

A personal information form was used to elicit demographic information about the students in the current study. The Irrational Beliefs Scale-Adolescent Form, the Five-Factor Personality Inventory and the Stress Coping Styles Scale were used as the data collection tools. For all the data collection tools, the required permissions were taken from the intellectual property rights owners by e-mail. Before starting the study, all these permissions taken were added to the application file prepared for the Ethics Committee Approval. In the process initiated after the ethics committee approval was taken, no concessions were made in the publication ethics.

Personal Information Form

In order to elicit information about some demographic features of the participating students, a personal information form was developed by the researchers. There are items to elicit gender, school type, and parents' education level in the personal information form.

The Irrational Beliefs Scale-Adolescent Form (IBS-AF)

The IBS-AF was developed by Türküm (2003) to determine the irrational beliefs of university students. The adaptation of the scale for adolescents was performed by Türküm, Balkaya and Karaca (2005). The scale is a single-factor scale consisting of 16 items. Each item is rated on a 5-point Likert scale ranging from 1 (completely unsuitable) to 5 (entirely suitable). The scale is a self-report inventory. On the scale, there are no reverse coded items. The lowest score to be taken from the scale is 16, while the highest is 80. Higher scores taken from the scale indicate an increasing level of irrational beliefs in adolescents. The scale is uni-dimensional. The Cronbach alpha internal consistency coefficient of the IBS-AF was .70 (Türküm et al., 2005).

In order to use the IBS-AF in the current study, reliability and validity studies were carried out first. For the reliability study, Cronbach's alpha consistency coefficient was calculated and found to be .72. CFA was performed to test the structural validity of the scale, and it was found that fit indices were significant ($\chi^2=820.64$, $df=304$, $p=.000$, $\chi^2/df=2.69$, $CFI=.86$, $NNFI=.92$, $RMSEA=.078$, $SRMR=.092$). Considering these values, it can be said that the scale is reliable and valid enough to be used in research (Kline, 2014).

Five-Factor Personality Inventory (FFPI)

The FFPI inventory was developed by Benet-Martinez and John (1998) to briefly and effectively evaluate five dimensions of personality. Sümer and Sümer (2005) performed an adaptation of the scale to the Turkish culture. This self-report inventory

covering five dimensions of personality characteristics consisted of 44 items. Each item is rated on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The scale is a self-report inventory. There are 16 reverse-coded items in the inventory. The inventory has five sub-dimensions. A total score cannot be taken from the scale, and each sub-dimension is evaluated in itself. A score obtained for each sub-dimension of the FFPI indicates the extent to which the respondent possesses the personality characteristic represented by this sub-dimension. The Cronbach alpha internal consistency coefficients of the sub-dimensions of the scale are as follows; .79 for neuroticism (8 items), .77 for extroversion (8 items), .76 for openness to experience (10 items), .70 for agreeableness (9 items) and .78 for conscientiousness (9 items) (Schmitt, Allik, McCrae & Benet-Martinez, 2007).

In order to use the FFPI in the current study, reliability and validity studies were carried out first. For reliability study, the Cronbach's alpha consistency coefficients of the sub-dimensions of the scale were found to be as follows; .71 for the sub-dimension of neuroticism, .69 for the sub-dimension of extroversion, .68 for the sub-dimension of openness to experience, .64 for the sub-dimension of agreeableness and .73 for the sub-dimension of conscientiousness. CFA was performed to test the structural validity of the scale, and it was found that fit indices were significant ($\chi^2=2157.74$, $df=819$, $p=.000$, $\chi^2/df=2.69$, $CFI=.83$, $NNFI=.90$, $RMSEA=.064$, $SRMR=.095$). Considering these values, it can be said that the scale is reliable and valid enough to be used in research (Kline, 2014).

Stress Coping Styles Scale (SCSS)

The SCSS was developed by Lazarus and Folkman (1984) to determine individuals' behaviors and cognitive coping styles in the face of a stressful event. The scale adaptation to the Turkish culture was performed by Siva (1991), and then it was converted into a short form by Şahin and Durak (1995). The scale has consisted of 30 items. Each item is rated on a 4-point Likert scale ranging from 1 (completely unsuitable) to 4 (entirely suitable). The scale is a self-report inventory. There are two reverse-scored items on the scale. The scale has five sub-dimensions. A total score cannot be taken from the scale, and each sub-dimension is evaluated in itself. A score taken for each sub-dimension in the SCSS indicates how much the respondent possesses the stress-coping style represented by this sub-dimension. Within the context of the reliability study of the SCSS, Cronbach alpha internal consistency coefficients were found to be as follows for the sub-dimensions; .80 for self-confident approach (7 items), .68 for optimistic approach (5 items), .47 for social support seeking (4 items), .70 for submissive approach (6 items) and .73 for desperate approach (8 items) (Şahin & Durak, 1995).

In order to use the SCSS in the current study, reliability and validity studies were carried out first. For reliability study, the Cronbach's alpha consistency coefficients of the sub-dimensions of the scale were found to be as follows: .75 for the sub-dimension of self-confident approach, .68 for the sub-dimension of optimistic approach, .48 for the sub-dimension of social support, .68 for the sub-dimension of submissive approach and .74 for the sub-dimension of desperate approach. CFA was performed to test the structural validity of the scale, and it was found that fit indices were significant ($\chi^2=1406.91$, $df=495$, $p=.000$, $\chi^2/df=2.84$, $CFI=.85$, $NNFI=.91$, $RMSEA=.072$, $SRMR=.086$). Considering these values, it can be said that the scale is reliable and valid enough to be used in research (Kline, 2014).

Data Collection

Before initiating the current study, the researchers took approval from the Burdur Mehmet Akif Ersoy University Non-invasive Clinical Research Ethics Committee. Then the required permissions were taken from the Muğla National Education Directorate for conducting the study in the high schools in the Menteşe District of the city of Muğla. To collect the data, the researchers personally went to the schools in the sample. The researchers entered into each class one by one and made the necessary explanations to the students about the content and scales of the study. Informed consent forms were taken from students who wanted to participate on a volunteer basis and their parents. Then, the scales were administered to the students. The administration of the scales lasted for 25 minutes on average. The scales completed by the students were examined, and the incomplete scales were excluded from the study.

Data Analysis

In the first stage of the analysis, it was investigated whether there were missing data, and it was determined that there were less than 5% missing data. Based on Little's MCAR test results conducted to determine whether the missing data were distributed randomly, it was decided that the missing data were distributed randomly. As the missing data were less than 5% and randomly distributed, values were assigned to the missing data through the expectation-maximization (EM) method (Tabachnick, Fidell & Ullman, 2007). After resolving the missing data problem, univariate and multivariate outliers in the data set were examined. First, the z test was conducted to investigate univariate outliers, and as the sample size is more significant than 100, z score between +4.00 and -4.00 was taken as the reference value (Mertler & Vannatta, 2005). The data of seven students whose z score was outside the range of -4.00 and +4.00 were excluded from the study. Then Mahalanobis distance values were calculated to analyze multivariate outliers, and the data of five students were excluded from the study as they expressed outliers (Tabachnick et al.,

2007). Thus, 12 students' data were excluded from the study and all the remaining analyses were conducted on the data collected from 500 students.

Within the current study, the hierarchical multiple regression was conducted to determine how personality characteristics and stress coping approaches predict irrational beliefs. In order to be able to conduct the regression analysis, it was first checked whether the variables in the data set satisfied the normality assumption and whether there was a multicollinearity problem. As skewness and Kurtosis values calculated for each variable were found to be between -1.00 and +1.00, it was concluded that the data did not show extreme deviation from the normal distribution (Çokluk, Şekercioğlu & Büyüköztürk, 2014). Thus, the normality assumption was satisfied. The skewness and Kurtosis coefficients of the variables are given in Table 2.

Table 2. Skewness and Kurtosis coefficients of variables

	Skewness	Kurtosis
Irrational beliefs	-.347	.136
Personality Characteristics		
Neuroticism	.161	.099
Extroversion	-.235	-.244
Openness to experience	-.331	-.077
Agreeableness	-.253	.119
Conscientiousness	-.042	-.588
Stress Coping Styles		
Self-confident approach	-.420	.159
Optimistic approach	-.340	-.072
Social support seeking	-.583	.893
Submissive approach	.523	-.057
Desperate approach	.262	-.468

In order to determine whether there was a multicollinearity problem in the data set, simple correlations between the variables were checked. As a result of the analysis, all the values of the simple correlations between the variables were found to be lower than .90 (Çokluk et al., 2014). Moreover, tolerance and VIF values were also investigated to determine whether there was a multicollinearity problem in the data set, and the obtained values are presented in Table 6. As the VIF value was found to be lower than 10 and tolerance values were found to be higher than .20, it was concluded that there was no multicollinearity problem (Field, 2009).

Beta and Cook's Distance values were examined to make extreme values analysis. It has been observed that there is no value greater than 1 (Tabachnick et al., 2007) expressed as a critical value among the relevant values. In this sense, since it was observed that there was no extreme value in the data set, no observations were removed from the set. Moreover, the plots of residuals were examined to control the homoscedasticity assumption. It was observed that this assumption was fulfilled since the residual values in the related graphs were gathered around zero and in equal proportion (Field, 2009).

The autocorrelation state between variables was examined by looking at the Durbin-Watson coefficient. It was determined that the coefficient was 2.099 in the range of 1.50 - 2.50, which is considered the threshold value range (Kalaycı, 2016). As a result of these analyzes, it was determined that the basic regression analysis assumptions were met, and hierarchical regression analysis was started.

A three-way variance analysis was conducted to determine whether the adolescents' irrational beliefs vary significantly depending on gender, mother's education level and father's education level. Before the variance analysis, the Levene test was run to determine whether the data set satisfied the assumption of the homogeneity of the variances. The results of the Levene test were found to be not statistically significant [$F(17,482)=1.42, p>.05$], and thus, the assumption of the homogeneity of the variances was satisfied.

FINDINGS

As for the first research problem of the current study, Pearson Product-Moments correlation coefficients were used to calculate the simple correlations to determine whether there is a significant correlation between the adolescents' irrational beliefs, personality characteristics and stress coping approaches. Means and standard deviations for each variable and the correlation values between the variables are shown in Table 3.

Table 3. Simple correlation values between the variables

	\bar{X}	S	1	2a	2b	2c	2d	2e	3a	3b	3c	3d	3e
1.Irrational beliefs	60.51	7.86	1.00	.07	-.04	-.24*	-.32*	-.16*	-.21*	-.21*	-.22*	.07	.27*
2a.Neuroticism	24.08	6.14		1.00	-.26*	-.19*	-.23*	-.41*	-.35*	-.43*	-.13*	.05	.33*
2b.Extroversion	27.07	5.51			1.00	.26*	.13*	.11*	.29*	.13*	.19*	-.16*	-.18*
2c.Openness to experience	35.72	6.01				1.00	.21*	.33*	.37*	.23*	.06	-.09*	-.02
2d.Agreeableness	31.89	4.91					1.00	.28*	.19*	.32*	.24*	-.07	-.07
2e.Conscientiousness	30.40	6.23						1.00	.41*	.39*	.14*	-.10*	-.09*
3a.Self-confident approach	20.31	3.83							1.00	.58*	.16*	-.15*	-.07
3b.Optimistic approach	13.53	3.03								1.00	.087	-.01	-.10*
3c.Social support seeking	13.35	2.11									1.00	-.10*	-.07
3d.Submissive approach	11.20	2.99										1.00	.44*
3e.Desperate approach	19.07	4.68											1.00

*p<.05

As can be seen in Table 3, while there is no statistically significant correlation between the adolescents' irrational beliefs and the five-factor personality inventory's sub-dimensions of neuroticism ($r=.07$, $p>.05$) and extraversion ($r=-.04$, $p>.05$), there is a negative and statistically significant correlation between the irrational beliefs and the sub-dimensions of openness to experience ($r=-.24$, $p<.05$), agreeableness ($r=-.32$, $p<.05$) and conscientiousness ($r=-.16$, $p<.05$). While there is a positive and insignificant correlation between the adolescents' irrational beliefs and the stress coping styles scale's sub-dimensions of submissive approach ($r=.07$, $p>.05$), there is a positive and significant correlation between the irrational beliefs and the sub-dimension of desperate approach ($r=.27$, $p<.05$) and a negative and significant correlation between the irrational beliefs and the sub-dimensions of self-confident approach ($r=-.21$, $p<.05$), optimistic approach ($r=-.21$, $p<.05$) and social support seeking ($r=-.22$, $p<.05$).

As for the second research problem of the current study, hierarchical multiple linear regression was conducted to determine the extent to which personality characteristics and stress coping approaches predict irrational beliefs. During the hierarchical multiple linear regression analysis, the scores belonging to the sub-dimensions of the personality characteristics scale were determined to have theoretically stronger relationships with irrational beliefs in adolescents by previous studies (Davies, 2006; Ghumman & Shoib, 2013; Jibeen, 2015; Mahfar et al., 2018; Sava, 2009; Sharah, 2012; Sheng, 2017; Spörrle et al., 2010) were taken into the model. In the second stage, the scores belonging to the sub-dimensions of the stress-coping approaches scale were added to the model. Findings of the hierarchical multiple regression are presented in Table 4.

Table 4. Findings of the multiple regression analysis conducted to determine the extent to which personality characteristics and stress coping approaches predict irrational beliefs

Model	Predictor Variables	B	SH(B)	β	t	Tolerance	VIF
1	Constant	25.70	3.90		6.59**	-	-
	1a. Neuroticism	.28	.06	.22	4.66*	.78	1.29
	1b. Extraversion	-.01	.06	-.00	-.09	.88	1.13
	1c. Openness to experience	-.24	.06	-.18	-4.08*	.83	1.20
	1d. Agreeableness	-.48	.07	-.30	-6.96*	.89	1.13
	1e. Conscientiousness	-.13	.06	-.10	-2.19*	.74	1.35
2	Constant	9.33	4.41		2.12*	-	-
	1a. Neuroticism	.24	.06	.18	3.83*	.63	1.60
	1b. Extraversion	-.00	.06	-.00	-.07	.81	1.23
	1c. Openness to experience	-.20	.06	-.15	-3.46*	.78	1.28
	1d. Agreeableness	-.39	.07	-.24	-5.75*	.81	1.24
	1e. Conscientiousness	-.05	.06	-.04	-.79	.68	1.47
	2a. Self-confident approach	-.16	.11	-.08	-1.51	.54	1.86
	2b. Optimistic approach	-.33	.13	-.13	-2.50*	.56	1.80
	2c. Social support seeking	-.62	.15	-.17	-4.13*	.90	1.11
	2d. Submissive approach	.04	.12	.01	.33	.75	1.34
2e. Desperate approach	.43	.08	.26	5.53*	.69	1.46	

Note. For Model 1, $R^2 = .17$; For Model 2, $R^2 = .28$; $\Delta R^2 = .11$; * $p<.05$, ** $p<.01$

When Table 4 is examined, it is seen that in the first block, the sub-dimensions of neuroticism, extraversion, openness to experience, agreeableness and conscientiousness in the personality characteristics scale taken into the model significantly predict the adolescents' irrational beliefs ($R=.42$, $R^2=.17$, $F(5,494)=20.77$, $p<.05$). The predictors in Model 1 explain 17% of the variance in the adolescents' irrational belief score. The variables of neuroticism ($t=4.66$, $p<.05$), openness to experience ($t=-4.08$, $p<.05$), agreeableness ($t=-6.96$, $p<.05$) and conscientiousness ($t=-2.19$, $p<.05$) in the Model 1 are statistically significant predictors while the extraversion variable ($t=-.09$, $p>.05$) is not a statistically significant predictor. In Model 2, the sub-scales scores in the stress-coping approaches scale were also included in the model. The sub-dimensions of the personality characteristics and stress coping approaches scales together significantly predict the adolescents' irrational beliefs, and the regression model constructed seems to be statistically significant ($R=.553$, $R^2=.285$, $F(10,489)=19.450$, $p<.01$). After the variables of the personality characteristics in Model 2 are controlled, the contribution of the stress-coping approaches to the total variance is 11%. In Model 2, the sub-dimensions of the personality characteristics and stress coping approaches scales explain 28% of the variance in the adolescents' irrational beliefs. Thus they can be said to have a large effect on the adolescents' irrational beliefs ($R^2>.26$) (Cohen, 1988).

When the results of the t-test conducted on the regression coefficients of Model 2 given in Table 4 are examined, it is seen that the neuroticism variable is a positive and statistically significant predictor ($t=3.83$, $p<.05$); the openness to experience ($t=-3.46$, $p<.05$) and agreeableness ($t=-5.75$, $p<.05$) variables are negative and statistically significant predictors; the extraversion ($t=-.07$, $p>.05$) and conscientiousness ($t=-.79$, $p>.05$) variables are negative and statistically insignificant predictors. While the optimistic approach ($t=-2.50$, $p<.05$) and social support seeking ($t=-4.13$, $p<.05$) variables in Model 2 are negative and statistically significant predictors, the desperate approach is a positive and statistically significant predictor ($t=5.53$, $p<.05$). The self-confident approach variable ($t=-1.51$, $p>.05$) and submissive approach variable ($t=.33$, $p>.05$) are not statistically significant predictors.

According to the standardized regression coefficients (β) of the statistically significant predictors in Model 2 given in Table 4, the variables can be put into order of importance in terms of their effect on the adolescents' irrational beliefs as follows: desperate approach ($\beta=.26$), agreeableness ($\beta=-.24$), neuroticism ($\beta=.18$), social support seeking ($\beta=-.17$), openness to experience ($\beta=-.15$) and optimistic approach ($\beta=-.13$). When these findings are considered, it can be said that neurotic personality tendencies and desperate stress coping approaches increase irrational beliefs while openness to experience and agreeableness personality tendencies and optimistic and social support seeking approaches decrease irrational beliefs.

As for the third research question, a three-way variance analysis was conducted to determine whether the adolescents' irrational beliefs vary significantly depending on gender, mother's education level and father's education level and the obtained findings are presented in Table 5.

Table 5. Findings of the three-way variance analysis

Source of the Variance	Sum of Squares	df	Sum of Squares	F	p
Gender (G)	180.80	1	180.80	3.05	.08
Mother's education level (MEL)	332.24	2	166.12	2.80	.06
Father's education level (FEL)	104.39	2	52.19	.88	.42
G x MEL	148.70	2	74.35	1.25	.29
G x FEL	450.98	2	225.49	3.80	.02*
MEL x FEL	278.33	4	69.58	1.17	.32
G x MEL x FEL	43.96	4	10.99	.18	.95
Error	28613.19	482	59.36		
Total	30899.18	499			

* $p<.05$

As can be seen in Table 5, the adolescents' irrational belief scores do not vary significantly depending on gender [$F(1,482)=3.05$, $p>.05$], mother's education level [$F(2,482)=2.80$, $p>.05$] and father's education level [$F(2,482)=.88$, $p>.05$]. When Table 5 is examined, it is seen that while "gender x mother's education level" [$F(2,482)=1.25$, $p>.05$], "mother's education level x father's education level" [$F(4,482)=1.17$, $p>.05$] binary interactions and "gender x mother's education level x father's education level" [$F(4,482)=.18$, $p>.05$] triplet interaction are statistically insignificant, "gender x father's education level" [$F(2,482)=3.80$, $p<.05$] binary interaction is statistically significant. In order to investigate the effect of gender x father's education level on the irrational belief scores more deeply, the line graph shown in Figure 1 is produced.

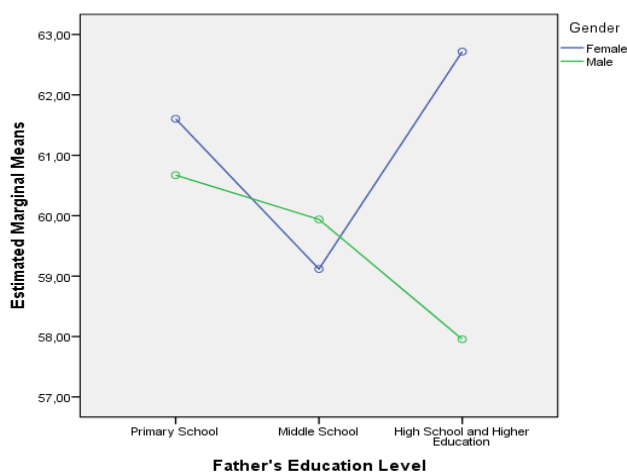


Figure 1. Line graph for the gender x father's education level binary interaction

When the line graph shown in Figure 1 is examined, it is seen that the mean irrational belief score of the female adolescents whose fathers are primary school or high school and higher education graduates is higher than that of the male adolescents whose fathers are primary school or high school and higher education graduates. The mean irrational belief score of the male adolescents whose fathers are middle school graduates is higher than that of the female adolescents. While the mean irrational belief score of the male adolescents was found to be increasing with their fathers' increasing level of education, this pattern was not detected for the female adolescents. While the lowest mean score among the female adolescents was found for the ones whose fathers are middle school graduates, the highest mean score was found for the ones whose fathers are high school and higher education graduates.

DISCUSSION AND CONCLUSION

The current study aimed to investigate the extent to which personality characteristics and stress coping approaches predict irrational beliefs in adolescents. In this respect, when the current study results are examined, it is seen that from among the personality characteristics, the "neuroticism" sub-dimension is a positive and significant predictor of irrational beliefs in adolescents. At the same time, the "openness to experience" and "agreeableness" sub-dimensions are negative and significant predictors of irrational beliefs in adolescents. On the other hand, in the constructed model, from among the personality characteristics, the "extraversion" and "conscientiousness" sub-dimensions were found to be not significant predictors of irrational beliefs in adolescents. These results show that some personality characteristics (neuroticism, openness to experience and agreeableness) considerably affect irrational beliefs in adolescents, yet not all the personality characteristics (extraversion and conscientiousness) affect irrational beliefs. However, when the findings of other studies in the literature are examined, all the studies on this subject agree that the personality characteristic of "neuroticism" is influential on irrational beliefs (positively) (Davies, 2006; Ghumman & Shoaib, 2013; Jibeen, 2015; Mahfar et al., 2018; Samar et al., 2013; Sava, 2009; Sharah, 2012; Sheng, 2017; Spörrle et al., 2010). In this connection, it can be argued that "neuroticism" is the personality characteristic that is the strongest predictor of irrational beliefs.

When the results related to the relationship between the personality characteristics of adolescents and irrational beliefs are examined, it is understood that the adolescents have the personality characteristic of "neuroticism," which is closely associated with the negative emotions of individuals such as sadness, anxiety, anger and shame, develop more irrational beliefs in the face of the events they have experienced. This indicates that neuroticism which is closely associated with the negative emotions of individuals such as sadness, anxiety, anger and shame (Trouba, 2007), can significantly affect the individual's way of thinking. Therefore, due to the features of the developmental stage they are in, the emotional instability of adolescents is high (Koç, 2004), which can increase their tendency towards irrational beliefs. Moreover, this finding is consistent with the basic principle of AADD, claiming that irrational beliefs are correlated with unhealthy emotions and psychological disorders (Ellis, 1997). When the findings of similar studies in the literature are examined, it is seen that Mahfar et al. (2018) conducted a study on elementary school teachers in Malaysia, Sheng (2017) conducted a study on another group of Malaysian elementary school teachers, Ghumman and Shoaib (2013) conducted a study on Pakistani university students, Sharah (2012) conducted a study on Jordanian university students, Samar et al. (2013) conducted a study on American people aged 17-64, Davies (2006) conducted a study on 18-40 British people, Jibeen (2015) conducted a study on Pakistani adults aged 25-60, Spörrle et al. (2010) conducted a study on Australian university students and Sava (2009) conducted a study on Romanian university students and found that irrational beliefs are positively and significantly correlated with the personality characteristic of "neuroticism." These findings in the literature support the finding of the current study.

Another finding of the current study is that the personality characteristic of "openness to experience," which is associated with creativity, original ideas and intrinsic motivation, reduces irrational beliefs (negative). This finding can be interpreted that an adolescent who is open-minded and creative is more prone to developing a way of thinking directed to finding new and practical ways rather than developing irrational beliefs. This tendency facilitates adolescents' discovery of alternative new beliefs and ways rather than developing irrational beliefs. This finding is supported by Mahfar et al. (2018) and Sheng (2017), who conducted studies on teachers, Samar et al. (2013) and Davies (2006), who conducted studies on adults, Spörrle et al. (2010) and Sharah (2012), who conducted studies on university students. A negative and significant correlation was found between the personality characteristic of "openness to experience" and irrational beliefs in these studies. However, in the literature, some study findings conflict with this finding of the current study. In the studies conducted by Ghumman and Shoaib (2013) and Sava (2009) on university students and by Jibeem (2015) on adults, no correlation was found between the personality characteristic of "openness to experience" and irrational beliefs.

Another finding of the current study is that the individuals having the personality characteristic of "agreeableness" are sympathetic, compassionate and sensitive to others' needs and exhibit lower levels of irrational beliefs. Adolescents with irrational beliefs tend to be more demanding, strict, and persistent than others. Therefore, adolescents exhibiting this tendency are mistaken that everyone must approve and achieve everything. In the ongoing process, adolescents who cannot get what they demand to experience intense disappointment and damage their relationships with other people. In this respect, it can be said that adolescents who have irrational beliefs will lose harmony with their environment over time. The reverse of this cause-effect relationship is likewise plausible. It is quite possible that an individual who exhibits incompatible personality characteristics towards nature and the individuals around him/her has an increasing tendency to display irrational beliefs over time. The findings of the studies conducted by Mahfar et al. (2018) on teachers, by Samar et al. (2013) on adults, by Spörrle et al. (2010), Sharah (2012), Ghumman and Shoaib (2013) and Sava (2009) on university students concur with the findings of the current study. In these studies, individuals with the personality characteristic of "conscientiousness" exhibited fewer irrational beliefs. However, some other studies report findings conflicting with the findings of the current study. In the studies conducted by Davies (2006) on British adults, by Jibeem (2015) on Pakistani adults and by Sheng (2017) on Malaysian elementary school teachers, no correlation was found between irrational beliefs and the personality characteristic of "agreeableness."

Another finding of the current study is no correlation between the personality characteristic of "extroversion," which is associated with being social, being self-confident, having positive energy and being talkative, and having irrational beliefs. This finding may indicate that the irrational belief scores obtained from the adolescent sample in the current study cannot be wholly explained with the personality characteristics. As explained before, the irrational beliefs of adolescents are related to many variables. Seen from this perspective, it is clear that the possibility of any variable to explain irrational beliefs in adolescents on its own is weak. This finding of the current study is supported by the findings reported in the study conducted by Davies (2006) on adults and in the studies conducted by Spörrle et al. (2010), Sharah (2012), Ghumman and Shoaib (2013) and Sava (2009) on university students. In these studies, no significant correlation was found between the personality characteristic of "extraversion" and irrational beliefs. On the other hand, a negative and significant correlation was found between the personality characteristic of "extraversion" and irrational beliefs in the studies conducted by Mahfar et al. (2018) and Sheng (2017) on teachers and by Samar et al. (2013) and Jibeem (2015) on adults.

Another finding of the current study is that there is no significant correlation between the personality characteristic of "conscientiousness," which is closely associated with a high level of self-discipline and being highly persistent in the accomplishment of goals and irrational beliefs in adolescents. This finding might be that the current study was conducted on a sample of adolescents. When the general Turkish family structure is considered, we can say that adolescents have less workload and responsibility than adults. In our society, individuals in adolescence are generally expected to complete their education and have a profession. While many responsibilities such as supporting a family, taking care of children, earning money, paying house rent and working in a workplace are expected from adults, adolescents are not expected to take such serious responsibilities. In this context, we can say that the responsibilities on adolescents are not intense enough to cause them to develop irrational beliefs. Parallel to this finding of the current study, no significant correlation was found between the personality characteristic of "conscientiousness" and irrational beliefs in the studies conducted by Sheng (2017) on teachers, by Sharah (2012), Sava (2009) and Spörrle et al. (2010) on university students and by Jibeem (2015) on adults. However, studies have reported findings contradicting the current study's findings in the literature. In the studies conducted by Mahfar et al. (2018) on teachers, by Samar et al. (2013) on adults and by Ghumman and Shoaib (2013) on university students, a negative and significant correlation was found between the personality characteristic of "conscientiousness" and irrational beliefs. Moreover, in a study conducted by Davies (2006) on adults, a positive and significant correlation was found between irrational beliefs and the personality characteristic of "conscientiousness." This uncertainty in the literature might have arisen from cultural differences in general and samples selected in particular.

Another finding of the current study is that from among the stress-coping approaches, the "desperate approach" sub-dimension is a positive and significant predictor of irrational beliefs in adolescents, while the "optimistic approach" and "social support seeking" sub-dimensions are negative and significant predictors of irrational beliefs in adolescents. However, in the constructed model, the "self-confident approach" and "submissive approach" sub-dimensions were not significant predictors of

irrational beliefs in adolescents. This finding shows that if the adolescent has an optimistic view about his/her ability to cope with stress-inducing situations, he/she can actively enter the process of solution-seeking. Similarly, an adolescent who knows that he/she can get help from people around in finding solutions to his/her problems (especially if he/she has experienced it before) can remember to seek help rather than struggling with the problems. Otherwise, an adolescent who does not have hope and options to solve the stressful situation can adopt the desperate approach and develop irrational beliefs. In another study, Türküm (2001) found that the students with higher levels of irrational beliefs used the avoidance coping style to deal with problems more than the students with lower levels of irrational beliefs.

Parallel to the findings obtained in the current study concerning the relationship between irrational beliefs and stress coping approaches, in a study conducted by Akbağ (2000) on university students, it was found that the desperate and submissive approaches, two of the stress-coping approaches, are positively correlated with irrational beliefs while the self-confident, optimistic approaches and social support seeking were found to be positively correlated with irrational beliefs. In another study conducted with university students, Aysan and Bozkurt (2000) found that avoidance is positively correlated with irrational beliefs from among the stress-coping approaches, while problem-solving and social support seeking is negatively correlated with irrational beliefs. In their study conducted on university students, Hamarta et al. (2009) found that avoidance is positively correlated with irrational beliefs while problem-focused coping and social support seeking is negatively correlated with them from among the stress-coping approaches. Moreover, in their study on university students, Mayhew and Edelmann (1989) found that when the stress-coping approach used by the individual is functional and robust, then irrational beliefs in this individual decrease. Finally, in their study conducted on university students, Schill et al. (1982) found that making use of the strategies that are weak in coping with stress is correlated with higher levels of irrational beliefs while the use of the strategies powerful in coping with stress is correlated with decreasing irrational beliefs. When the studies in the literature focusing on the relationship between irrational beliefs and stress coping approaches (Akbağ, 2000; Aysan & Bozkurt, 2000; Hamarta et al., 2009; Mayhew & Edelmann, 1989; Schill et al., 1982) are examined, it is seen that in general the approaches attempting to deal with stress constructively and focusing on solving the problem are correlated with low levels of irrational beliefs while the use of approaches such as desperate and avoidance is correlated with the high levels of irrational beliefs. When all these results are taken into consideration, it can be said that the existing research supports the findings of the current study.

Another finding obtained in the current study is that the adolescents' irrational beliefs do not vary significantly depending on gender, mother's education level and father's education level. This might be because irrational beliefs in adolescents have a complex and multi-dimensional structure affected by many factors. As stated above, irrational beliefs in adolescents are influenced by many variables. In this connection, it can be said that the demographic variables of gender, mother's education level and father's education level do not have the effect size to change irrational beliefs in adolescents on their own significance. This can also be because the discrimination between male and female children has been reduced to a great extent nowadays and that females in their adolescent period are as accessible as their male counterparts in their thoughts and behaviors. Elimination of the societal gender discrimination known to have negative influences on women's mental health is thought to make essential contributions to the prevention of irrational beliefs in the adolescent period when societal gender roles are integrated into the personality.

On the other hand, it has become much easier for adolescents to access computers and smartphones with the advancement of technology. This has resulted in parents' not being as influential on adolescents' personal and academic development as in the 1990s. Nowadays, every adolescent, regardless of his/her parents' education level, can easily access the correct information he/she thinks is necessary for him/her. Accordingly, it is expected that the effect of parents' education level on adolescents disappears to a great extent. Parallel to the findings of the current study, when the studies conducted on samples comprised of adolescents are examined, it is seen that irrational beliefs do not vary significantly depending on gender (Aydoğdu, 2017; Çelik, 2019; Çivitci, 2006a; Deniz, 2018; Durm & Stowers, 1998; Elçin-Boyacıoğlu, 2010; Karaman, 2018; Kartol, 2013; Yıldız, 2016), mother's education level (Deniz, 2018; Erdin, 2016; Kartol, 2013; Yıldız, 2016) and father's education level (Altıntaş, 2006; Çelik, 2019; Deniz, 2018; Erdin, 2016; Kartol, 2013). However, there are also some studies in the literature contradictory to the current study's findings. In their studies on adolescents, Altıntaş (2006) and Göller (2010) found that girls have more irrational beliefs than boys. Moreover, Erdin (2016) conducted a study on emerging adolescents and found that boys have more irrational beliefs. Altıntaş (2006) and Çivitci (2006a) found that irrational beliefs in adolescents vary significantly depending on the mother's education level while Çivitci (2006a) and Yıldız (2016) found that they vary significantly depending on father's education level. This difference was found to be between the children of the parents having higher levels of education and the children whose parents have lower levels of education, and they argued that the children of the parents having higher levels of education have fewer irrational beliefs.

In the current study, the adolescents' irrational beliefs were found to be not varying significantly depending on the binary interactions of "gender x father's education level" and "mother's education level x father's education level" and the triplet interaction of "gender x father's education level x father's education level." In contrast, they were found to be varying significantly depending on the binary interaction of "gender x father's education level." While the male adolescents' irrational beliefs were found to be decreasing with their fathers' increasing level of education, this was not observed in the female adolescents. While the female adolescents whose fathers are middle school graduates were the lowest mean score, the highest mean score was taken

by the female students whose fathers are high school or higher education graduates. When this finding is analyzed in terms of the cultural structure, it seems pretty understandable. Regardless of the education level, mothering attitudes are similar to a large extent in Turkey. Therefore, a mother's education level neither on its own nor interaction with other demographic variables does not lead to a significant difference. However, given that the father is responsible primarily for the socio-economic structure of the family in our culture, it can be foreseen that father's education level will be more influential on the social environment of the family (Yıldız, 2016). With the father's increasing level of education, parent-child interaction will be positively affected, and the child's sensitivity to the child's behavioral problems will develop more. In this regard, it seems to be quite normal that male children who generally take their fathers as their role models are affected more by these positive contributions of the father to the family when compared to female children. Fathers with a lower education level expect their children to obey unconditionally and pressure their children to agree with them (Çivitci, 2006a). This pressure environment may cause adolescents to develop irrational beliefs to meet their families' expectations.

RECOMMENDATIONS

In light of the findings of the current study, the following suggestions can be made:

The current study was conducted by using the relational survey model. Future studies can use experimental designs to investigate how irrational beliefs are affected by positive/negative personality characteristics and positive/negative stress coping approaches.

In the current study, quantitative data collection techniques were used. Future research can make use of qualitative research techniques. By conducting in-depth interviews or focus-group interviews with adolescents, the current findings of the relationship between irrational beliefs and personality characteristics and stress coping approaches can be increased. Supporting the findings of the current study conducted using quantitative research design with studies to be conducted by using qualitative research design will increase the reliability and validity of the current study. Using different designs and methods, obtaining similar results is essential for grounding the findings on a solid theoretical base.

The current study investigated the personality characteristics and stress coping approaches predicting irrational beliefs in adolescents. Future research can focus on different variables (psychological mindedness, etc.) to develop a better understanding of irrational beliefs.

The current study sample comprises the students selected from a district (Menteşe) of a city (Muğla) located in the Aegean Region. Using the same variables investigated in the current study, future research can be conducted on samples from different cities, districts and education levels (primary, middle, post-graduate, etc.).

According to the current study's findings, the students exhibiting the characteristics of neurotic personality and using negative (desperate) stress-coping approaches are at a higher risk of developing irrational beliefs. School counselors can determine students in risk groups to develop irrational beliefs by using the five-factor personality characteristics and stress coping approaches scale. Within the context of preventive counseling activities, individual and group counseling activities can be organized with the participation of these students.

School counselors can organize seminars to inform students about positively coping with stress. In this way, adolescents who are in a critical development period can be motivated to develop an optimistic attitude towards the problems they experience and seek social support. Adolescents who learn how to develop positive stress-coping strategies are thought to exhibit a lower tendency towards developing irrational beliefs.

School counselors can prepare a psycho-education program focused on positive stress-coping approaches. Then, this program can be first administered to students displaying the characteristics of neurotic personality and higher levels of irrational beliefs and then to all the students in a school within the context of preventive counseling.

The findings obtained in the current study offer important insights about a relationship that has not been defined before between irrational beliefs and personality characteristics for a sample of adolescents. Awareness of this relationship can help understand the complexity of psychological problems in adolescents and improve the treatments. Moreover, similar studies are needed to replicate the findings and explore the function of personality in developing irrational beliefs.

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Statements of publication ethics

We hereby declare that the study has not unethical issues and that research and publication ethics have been observed carefully.

Researchers' contribution rate

The study was conducted and reported with equal collaboration of the researchers.

Ethics Committee Approval Information

This study was reviewed by the Burdur Mehmet Akif Ersoy University Non-Invasive Clinical Research Ethics Committee at the meeting number 2020/5 on 13/05/2020 in terms of justification, purpose, approach and method and was found ethically appropriate (Decision Number: GO 2020/110).

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| Review Article / Derleme Makalesi |

Dyslexia and Working Memory: Understanding Reading Comprehension and High Level Language Skills in Students with Dyslexia

Disleksi ve İşleyen Bellek: Disleksi Olan Öğrencilerde Okuduğunu Anlama ve Üst Düzey Dil Becerileri

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Keywords

1. Dyslexia
2. Working memory
3. Reading comprehension
4. Language skills

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Abstract

Dyslexia is defined as difficulties determining speech sounds and learning the relationships of speech sounds with letters and words. Children with learning disabilities may experience problems in attention, memory, perception, motor processing, information processing speed, planning and problem-solving skills. Although lack of phonological processing is considered one of the leading causes of dyslexia, the level of influence of other underlying factors such as cognitive deficits on reading gain is still unclear. Numerous studies have shown that dyslexia is associated with poor working memory, a critical component of reading skill acquisition because the temporary processing of newly introduced and previously stored information involves critical thinking, use of cognitive executive skills, comprehension, and learning tasks. Working memory is often used synonymously with short-term memory, but some theorists consider their functions distinct in that working memory allows for the manipulation of the information temporarily stored in short-term memory. Working memory, which provides preservation, integration and processing of verbal and visual-spatial information, works together with short-term memory to help the mind manipulate and determine important information while temporary. This study discussed the effects of working memory on reading, reading comprehension, and high-level language skills.

Öz

Disleksi, konuşma seslerini algılamada ve konuşma seslerinin harfler ve kelimelerle ilişkisini öğrenmede yaşanan güçlükler olarak tanımlanmaktadır. Dislektik çocuklar dikkat, hafıza, algı, motor işlem, bilgi işleme hızı, planlama ve problem çözme becerilerinde sorunlar yaşayabilirler. Fonolojik işleme eksikliği disleksinin ana nedenlerinden biri olarak kabul edilse de, bilişsel eksiklikler gibi diğer altta yatan faktörlerin okuma kazanımı üzerindeki etkisinin düzeyi hala belirsizdir. Çok sayıda çalışma, disleksinin okuma becerisi edinmenin kritik bir bileşeni olan zayıf işleyen bellek ile ilişkili olduğunu göstermiştir. Çünkü yeni tanıtılan ve önceden depolanmış bilgilerin geçici olarak işlenmesi, eleştirel düşünme, bilişsel yürütme becerilerinin kullanımı, anlama ve öğrenme görevlerinde yer almaktadır. İşleyen bellek genellikle kısa süreli bellekle eşanlı olarak kullanılır, ancak bazı teorisyenler işlevlerinin farklı olduğunu düşünürler. Çünkü işleyen bellek, kısa süreli bellekte geçici olarak depolanan bilgilerin işlenmesini sağlar. Sözel ve görsel-uzaysal bilgilerin korunmasını, bütünleştirilmesini ve işlenmesini sağlayan işleyen bellek, kısa süreli bellekle birlikte çalışarak önemli bilgilerin manipüle edilmesine ve belirlenmesine yardımcı olur. Bu çalışmada çalışma belleğinin okuma, okuduğunu anlama ve üst düzey dil becerileri üzerindeki etkileri tartışılmıştır.

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INTRODUCTION

A learning disability is defined as a specific difficulty in mastering the primary language, mathematical, or other skills unrelated to intelligence (Bajre & Khan, 2019), usually diagnosed when a child begins schooling. Students with learning disabilities constitute more than 50% of those who need special education. The most common learning disability, dyslexia or specific reading difficulty, negatively affects the academic life of learners (Cortiella & Horowitz, 2014) as they experience problems at the level of phonological awareness that interferes with reading comprehension and fluency and completion of reading tasks (Fletcher et al., 2019). 20% of dyslexic individuals also have attention deficits and weakness in motor skills, and 50% have deficits in visual focusing. Inadequacy in motor skills can lead to weakness in using psychomotor skills to coordinate acceptable muscle mechanisms. Problems in timing and lack of adaptation, especially in fine motor skills, are closely related to reading acquisition (Rao et al., 2021).

Dyslexia has been divided into two categories, developmental and superficial phonological dyslexia. Developmental dyslexia is a neurological deficiency that makes reading acquisition difficult (Mortimore, 2008) for individuals who have no problems with cognitive and affective skills. Phonological dyslexia is the specific inability to effectively use semantic, morphological, phonological, and visual information. Individuals with phonological dyslexia have difficulty distinguishing words due to insufficient visual memory. While problems understanding word affixes and incomplete reading of syllables are defined as morphological errors, the inability to read due to unrecognizable word codes when encountering obscure words is defined as phonological deficiency (Hulme & Snowling, 2016; MacKenzie, 2015).

In this review, following an examination of the components of working memory, the relationship between working memory and reading comprehension and high-level language skills in children with dyslexia are examined. Also, the effect of working memory on phonological and mental changes in understanding reading and its relation to problems with high-level language skills are investigated. This study aims to contribute to research on and practice in preparing effective curricula, developing effective teaching strategies, and providing appropriate educational environments for children with dyslexia..

Memory and Cognition

Memory, including the ability to store memories, is a primary brain function in the individual's development of a sense of self and the ability to reason, understand, and, of course, learn (Protopapas & Parrila, 2018). To examine the relationship between dyslexia and working memory, it is of critical importance to understand the concept and types of memory and the processing of information into memory (Parrila et al., 2020). In cognitive psychology, memory is conceptualized in three stages: coding, storage and access (Austin et al., 2014).

Coding refers to the process of grasping, processing and combining information, achieved by physical and chemical mechanisms operating through our senses. Storage refers to the process of ensuring the persistence of encoded information over time (Romani et al., 2015). Retrieval refers to the process of recovering the information required for a transaction or activity. This process involves finding the needed information and transferring it to consciousness. Such recalling can be easy or difficult depending on the type of information (Bosse et al., 2015). Figure 1 illustrates the three types or stages of memory through which information must pass before being permanently stored: sensory memory, short-term memory/working memory, and long-term memory (Melby-Lervåg et al., 2016). Short-term memory/working and long-term memory may weaken with age or due to clinical conditions or other factors that disrupt memory processes (Randall, 2007).

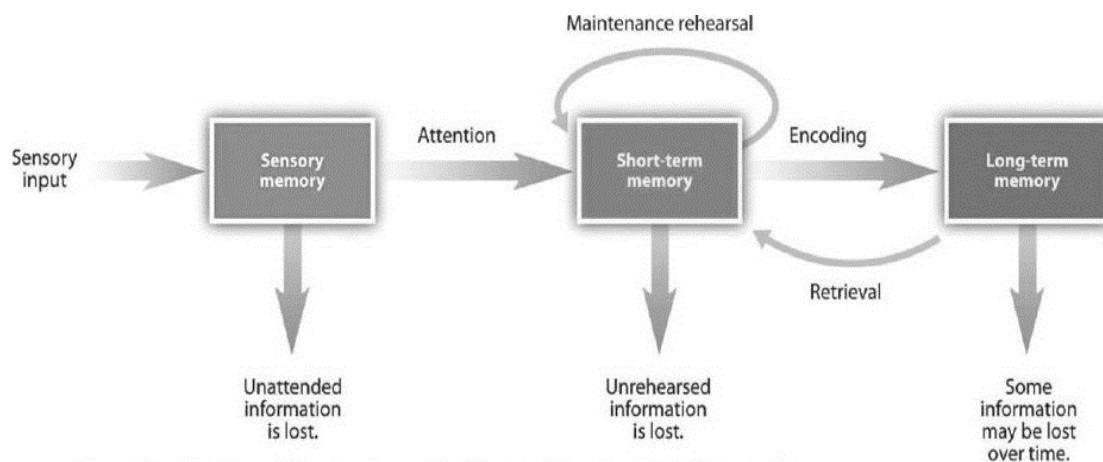


Figure 1. Stage of memory

Sensory memory is the first step in processing the information we receive from the outside through sight, hearing, touch, smell and taste. In sensory memory, the information obtained through the sensory organs is briefly stored before being transferred to

short-term memory. Because of the brevity of sensory memory, if the information is not immediately transferred to short-term memory for processing, it is lost (Maehler & Schuchardt, 2016).

In short-term memory, information is temporarily stored just long enough for processing. Just as sensory memory is a necessary step toward short-term memory, it is a necessary step for long-term memory, which involves working memory, a component of short-term memory which helps direct the memory process of receiving and organizing information, making it a critical element of the learning process (Parrila et al., 2020). For example, working memory is engaged when solving an arithmetic problem without paper. Also, one uses working memory to bake a cake efficiently without diverging into a long rhetorical argument, employing partially preserved information, or adding the same ingredient twice (Ottem et al., 2007).

Long-term memory allows information to be durably persevered for as long as a lifetime. kept in mind continuously. Long-term memory is a system that has limited capacity yet contains an unlimited amount of information. The essential function of long-term memory is its role in complex tasks such as problem-solving, social interaction, decision making, and reflecting on important moments in one's life (Ottem et al., 2007). Accessibility of Information stored in long-term memory varies. For example, some memories are relatively easy and others more challenging to retrieve. Three basic memory types are involved in storing long-term memories: procedural memory, semantic memory, and episodic memory (Maehler & Schuchardt, 2016). Procedural memory includes memories associated with learning, such as the motor skills involved in skating, cycling or running. Semantic memory stores general information, including the meanings of words, and is of vital importance to academic learning. Episodic memory stores information about experiential events such as one's first day of school, one's wedding day, or the birth of one's child (Dahlin et al., 2008).

Working Memory and Dyslexia

Working memory is often used synonymously with short-term memory, but some theorists consider their functions distinct in that working memory allows for the manipulation of the information temporarily stored in short-term memory. Working memory, which provides preservation, integration and processing of verbal and visual-spatial information, works together with short-term memory to help the mind manipulate and determine important information while in temporary storage (Baddeley, 2006). Studies of working memory address daily cognitive activities that require both processing and storage, such as mental arithmetic and comparative reasoning. However, working memory capacity is limited, and a loss of information in working memory may occur due to cognitive overload during an ongoing activity due to excessive storage or information processing requests (Ottem et al., 2007).

Working memory is a critical component of the learning process as it undertakes essential tasks related to the retention and processing of information to be transferred to long-term memory and its integration with previously stored information. Working memory supports cognitive skills for comprehension, learning new information, critical thinking, and memory updates (Reis et al., 2020). To help execute tasks that require attention and focus, subsystems in working memory store and process auditory, verbal, and visual information. Focusing is essential for the completion of these tasks and the cognitive processes associated with memory (Baddeley, 2006). Students with working memory problems may have trouble absorbing lessons and completing learning activities because working memory plays essential roles in decoding and comprehension in reading, solving problems in mathematics and expressing ideas in writing. Therefore, understanding the relationship between working memory and dyslexia and related learning disabilities is critical in planning educational adaptations (Schwarb et al., 2016).

Reading is a complex process that can be explained in terms of a series of cognitive factors, including sensory inputs, working memory, and higher-level cognitive processes (Alloway & Alloway, 2010). Although deficit in phonological processing is accepted as one of the leading causes of dyslexia, the effects of underlying factors and the levels of influence of other cognitive deficiencies on reading acquisition are still uncertain (Warmington et al., 2013). However, there are two alternative neurocognitive explanations of dyslexia. One focuses on a fundamental deficiency in the rapid temporal perception of auditory and visual information, while the other focuses on fundamental shortcomings in skill automation (Bosse et al., 2015).

Numerous studies have shown that dyslexia is associated with poor working memory. Compared with individuals with average reading ability, it has been observed that dyslexic individuals display poor working memory functions (Fischbach et al., 2014). In order to understand the relationship between working memory and dyslexia, it is helpful to closely examine the structural functions of working memory. As seen in Figure 2, the working memory is conceptualized as consisting of (i) central executive, (ii) visual-spatial scratchpad and (iii) phonological loop (Warmington et al., 2013).

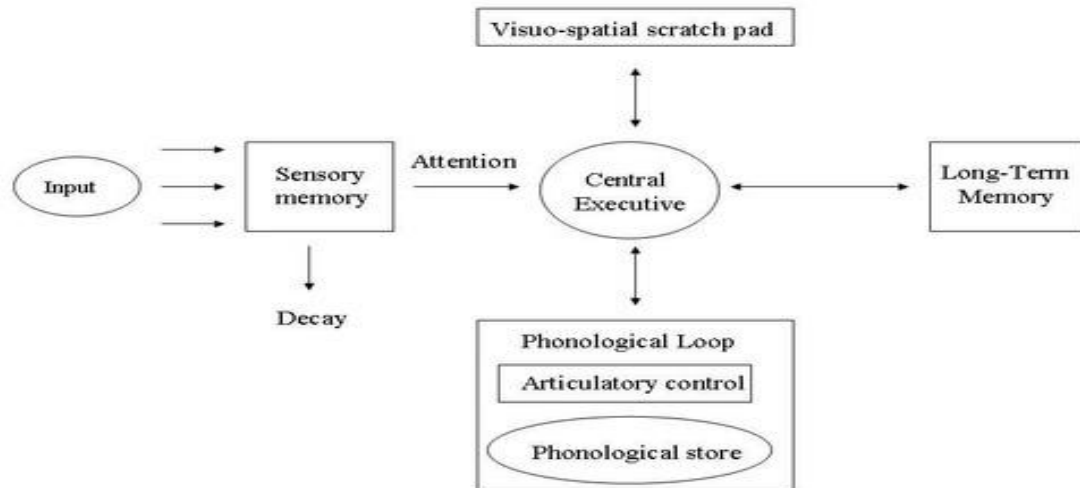


Figure 2. Working memory model

As seen in Figure 3, The central executive is the principal component of the information processing dimension of the working memory. By undertaking many cognitive functions, the central executive gives the working memory the role of manager or central coordinator of metacognitive processes (Fischbach et al., 2014). Strategic use of limited working memory capacity and reprocessing of information that is consciously or unconsciously recalled from long-term memory are other essential functions of the central executive. The central executive combines auditory and verbal phonological information and visual-spatial information. Verbal working memory and visual-spatial working memory are activated according to the type of information coming to the central executive (Hamouda & El-Shafaei, 2021).

The executive working memory organizes its tasks using the principles of blocking, switching, and updating, without which the individual cannot manage or make sense of tasks that require a constant flow of information such as reading (Montgomery & Evans, 2009). Blocking is the process of suppressing information about non-urgent tasks or thoughts. Switching refers to the transition between two tasks. Switching entails organizing relationships between existing processes and rehearsing information held in short-term memory. Updating is the processing of new information that will replace existing information (Fischbach et al., 2014).

Phonological working memory recognizes words by processing the phonological codes. Studies (Wagner & Muse, 2006; Milton, 2008) show that phonological awareness and phonological working memory duration are highly correlated (correlation coefficient: 0.88). Phonological working memory incorporates a phonological loop specialized for short-term storage and manipulation of speech-related stimuli (Montgomery & Evans, 2009). For the phonological processes to be carried out perfectly, the phonological working memory capacity must be fully utilized. Therefore, phonological processing skill is directly related to working memory capacity. Individuals who encounter severe problems in reading are identified as having phonologic disorders (Gutierrez-Clellen et al., 2004). People with phonologic disorders are known to be at risk for related, or co-occurring, problems in phonological awareness, language comprehension and written language (Couture & McCauley, 2000).

When phonological working memory receives auditory and phonologically perceived information, it automatically correlates with relevant sounds kept in long-term memory (Montgomery & Evans, 2009). With automatic subvocal rehearsal, the short-term storage capacity of the phonological working memory is increased, and the cognitive load is reduced. Also, subvocalization, or silent speech, is the inner speech typically performed during the reading that helps the reader correctly pronounce words mentally or orally (Miller & Kupfermann, 2009). This phenomenon, which is a natural process in compelling reading, potentially reduces cognitive load by helping the individual grasp the meaning and remember what is read. If the dyslexic individual does not rehearse sufficiently, the functioning of the phonological working memory decreases significantly (Hartsuiker & Barkuysen, 2006). However, rehearsal has some limits. Regardless of age, the person must have pronounced the corresponding sound or word within two seconds. The ideal speech rate is determined by the amount of information rehearsed in the working memory in a short period (two seconds maximum). Unfortunately, due to the lack of rehearsal and the amount of information retained in the phonological working memory, dyslexic individuals are generally relatively slow at both explicit and latent articulation (Pickering, 2006). Therefore, the diagnosis of reading difficulty can be made by closely examining the individual's phonological working memory (Miller & Kupfermann, 2009 because word recall difficulties detected in the analysis of phonological working memory are accepted as a symptom of language and reading difficulties (Menghini et al., 2011). Tasks that involve immediate sequential recall of letters, sounds, numbers, and words are used in evaluations of phonological working memory (Miller & Kupfermann, 2009).

Visual-spatial working memory, also known as the visual-spatial sketchpad, stores information about objects and their positions in space. Visual-spatial information can be static or dynamic (Dehn, 2014). Static information includes only the colors or

shapes of items (Miller & Kupfermann, 2009). Dynamic information consists of stimuli in motion or stimuli that the individual has to manipulate, such as imagining how puzzle pieces fit together. The information kept in the visual-spatial working memory is constantly updated. The rehearsal of the information transferred visually-spatially is performed by re-imagining (Montgomery & Evans, 2009). Cognitive tests feature many tools for measuring visual-spatial working memory, especially inert materials (Kim & Lombardino, 2017). Until recently, the role of visual-spatial working memory was not considered necessary in reading, but it has been determined that visuospatial working memory plays an essential role in phonetic decoding of long words and keeping these words in memory for a while (Westerberg & Klingberg, 2007). For example, the processes of keeping each morpheme in an extended written word such as “Antarctica” in the memory and reading them together take place in the visual-spatial working memory (Kim, Wiseheart, & Walden, 2018).

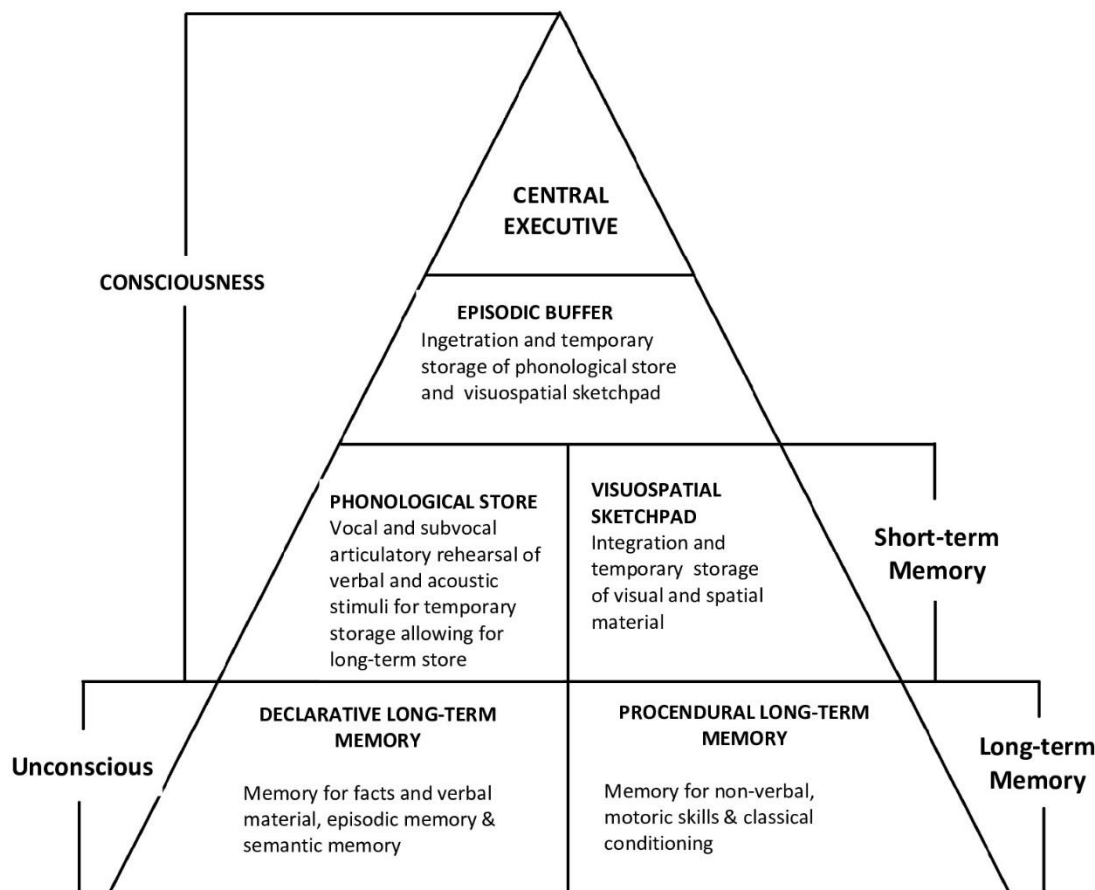


Figure 3. Major components of working memory

Working Memory and Cognitive Load

The amount of information that can be processed in the limited capacity of working memory is referred to as cognitive load (Gathercole & Alloway, 2004). Excessive cognitive load can slow down processing or cause processing errors (Klingberg, 2009). This relationship is twofold. Effective use of working memory depends on fast, back and forth transitions and rehearsal in processing the briefly stored information (Dahlin, 2011). Sweller (1988) argued that, because working memory has a limited capacity, instructional methods should avoid overloading it with additional activities that do not directly contribute to the target learning.

Cognitive load theory differentiates three types of cognitive load: intrinsic, extraneous, and germane. Intrinsic cognitive load is the difficulty inherent to a specific instructional topic or task. All instructional tasks have an inherent difficulty associated with them (e.g., calculating $2 + 2$ versus solving a differential equation) (Sweller, 1988). While this inherent difficulty cannot be altered, an instructor may divide a schema into "subschemas," teach them separately, and then bring them back together to teach the combined whole (Paas, 1992). Extraneous cognitive load is generated by how information is presented to learners and can be attributed to the design of the instructional materials. Because there is a single limited mechanism using finite cognitive resources to process the extraneous load, the amount of resources available to process the intrinsic and germane loads (i.e., learning) is reduced (Sweller & Cooper, 2009). Thus, extraneous cognitive load is under the control of instructional designers. Materials should be designed to reduce the extraneous load, especially when the intrinsic and germane load is high (e.g., when a problem is complex). For example, a teacher can describe a square using either a verbal or figural medium (Loosli et al.). Indeed, the teacher can explain a square in words, but a square is a figure and can be understood with much less effort if learners are shown a square

(Sweller & Cooper, 2009). In this instance, the figural medium is preferred because it does not burden the learner with unnecessary information or extraneous cognitive load (Sweller, 1988).

Germane cognitive load is the processing, construction and automation of schemas that constitute learning. While the intrinsic cognitive load is generally thought to be immutable (although techniques of segmenting and sequencing can be applied to manage complex material), instructional designers can manipulate extraneous and germane load. It is suggested that they limit extraneous load and promote germane load (Sweller, 1988).

Decoding increases the cognitive load during reading, and the cognitive load affects the reader's level of understanding. The decoding process's relatively less developed automaticity imposes more cognitive load (Spironelli et al., 2010) and decreases the working memory capacity for comprehension. As the individual gains reading fluency (automaticity), the cognitive load decreases and s/he will have more working memory capacity for comprehension (Montgomery & Evans, 2009).

Reading Comprehension Skills in Dyslexia Students

The simplistic view of reading is that a student's ability to understand written words depends on how well s/he can sound out (decode) words and understand their meanings (Diamanti et al., 2018). Reading comprehension can be predicted by multiplying skills in decoding the written words by the ability to understand the meanings of those words. However, language involves many other cognitive processes such as comprehension, problem-solving, and intelligence (Martinelli & Fenech, 2017). In this context, there is a close relationship between vocabulary, language comprehension and reading skills, which are essential requirements for reading comprehension (Cain et al., 2004). Studies have shown that while verbal working memory is significantly associated with early reading achievement, it is only a part of a general phonological processing structure related to reading rather than a causal factor, and other components of working memory are also active in reading (Kibby et al., 2004; Van der Leij, & Morfidi, 2006).

Decoding and fluency are mainly related to phonological and visual-spatial working memory, and reading comprehension is primarily related to executive working memory. Converting graphemes to phonemes, that is, decoding depends on the visual-spatial working memory capacity, and combining graphics codes is a time-consuming process in the working memory (Moser et al., 2007). In regular reading, graphemes are matched with phonemes, and all-new visual stimuli coming to working memory are re-encoded (Savage et al., 2007). Decoding in reading occurs in phonological working memory (Baddeley, 2003). If there is difficulty in decoding even though the average phonological working memory capacity is sufficient, the order of the phonemes cannot be rehearsed subvocally; that is, the phonological working memory cannot be used effectively (Malaia et al., 2009). Word blending from the codes in the phonological working memory occurs in the executive working memory (Moser et al., 2007).

The reading difficulties of individuals with developmental dyslexia have been attributed to a deficiency in phonological processing, for which a variety of explanations have been proposed, including deficits in phonological awareness and verbal memory (Provazza et al., 2019). Recent investigations suggest that developmental deficits in reading acquisition may co-occur with visual processing deficits, which are particularly salient for visually complex stimuli, yet these deficits have received relatively little attention from researchers (Cain et al., 2004). Dyslexic individuals have trouble synchronously transferring sequential and verbal information such as letters, phonemes, words, and expressions to the phonologically working memory. Examples of phonological working memory impairment are as follows (Smith-Spark & Fisk, 2007):

1. Inability to store phonemes for word blending
2. Forgetting the coded phonemes before sending them to the central executive
3. Forgetting the order of phonemes
4. Inability to keep words long enough for comprehension to take place

There is conflicting evidence as to whether people with dyslexia are better than, the same as, or worse than non-dyslexics at visuospatial processing tasks, with many of the differences, found being the result of task demands. Recent studies have found that visual-spatial storage capacity and visual-spatial processing are insufficient in children with dyslexia (Giovagnoli et al., 2016; Martinelli & Fenech, 2017). Also, Fischbach et al. (2014) found that subjects with dyslexia had a critical deficiency in the processing and storing dynamic visual-spatial information, although they had an average ability to store static visual-spatial information. However, Bosse and Valdois (2009) found that developmental dyslexia is associated with weaknesses in visuospatial working memory's static and dynamic aspects. These studies indicate that even if the visual-spatial storage capacity is average, information can be lost in working memory during synchronous processing. Based on the relationship between storage and cognitive load in individuals with dyslexia, memory studies suggest that they can ignore some visual-spatial information during processing to reduce cognitive load (Stein, 2014).

A reader must keep a sufficient number of words and sentences in memory in order to be able to comprehend the text read and to determine the main ideas. However, reading comprehension puts a heavy cognitive load on the central executive (Moser, Fridriksson & Healy, 2007). Individuals with an enhanced central executive working memory capacity are more successful in comprehending the text read and integrating the information obtained to conceptualize the meaning of longer passages (Skarakis-Doyle & Dempsey, 2008). Phonological and visual-spatial working memory storage components are not highly related to reading comprehension processes (Diamanti et al., 2018). Besides vocabulary knowledge and word decoding, comprehension depends heavily on higher-level processes, such as integration of text information with prior knowledge in the context of inference

generation and simile comprehension, as well as on metacognitive control processes involved in comprehension monitoring (Chrysochoou et al., 2011). Reading comprehension problems are generally more associated with central executive functional processing deficits (De Beni et al., 2007).

High-Level Language Skills in Dyslexia Students

Decoding and word recognition, related to phonological skills, are the first step of understanding the reading process (Cavalli et al., 2017). Understanding is the process of interpreting the relationships among words in syntactical contexts by making inferences and determining their deep structure (Dehaene, 2014). Reading entails using both low-level and high-level cognitive skills, which depend on the performance of certain mental and procedural functions (Purpura & Ganley, 2014). The low-level language skill components can be listed as phonics (phonological context), decoding and repeating auditory information (working memory), and decoding phoneme and morpheme codes and the relationship between them rapidly enough to make sense of the word (word reading). High-level language skills depend on the combination of vocabulary (comprehending the word and interpreting it within the syntactical structure) and cognitive information (being able to analyze and use strategies to determine to mean) (Del Tufo & Earle, 2020). In their most general definition, high-level language skills refer to metacognitive mental processes such as thinking, perception, and remembering (Silva & Cain, 2015). Therefore, high-level language skills are essential for academic and social success beyond vocabulary knowledge and grammar skills. They include advanced comprehension skills such as acquiring and integrating new vocabulary, understanding relationships between words from syntactic context, interpreting sentences, and comprehending the text holistically (Rhea, 2001). In addition, phonology, syntax, morphology, semantics have critical importance in language skills. For example, understanding humor, interpreting body language, and drawing inferences from what is read (Kintsch & Kintsch, 2005) or heard are common indicators of high-level language skills (Alloway et al., 2006). Possession of high-level language skills enables individuals to advance their control over the micro and macro structures of language and the practical and flexibility of the language they use or interpret. Drawing Inferences helps the reader make sense of the text gaps and grasp its implicit meanings. As a result, individuals who effectively use high-level language skills can become independent and critical readers (Cain et al., 2004).

While decoding problems naturally cause dyslexic individuals to have difficulties understanding the context of the text, their reading problems are also due to their inability to organize verbal tasks and lower-upper-level cognitive skills (Smith-Spark et al., 2017). Although vocabulary and grammar are a source of difficulty in reading comprehension for individuals with dyslexia, it is more difficult for them to perform tasks requiring higher-level skills such as listening or reading comprehension and monitoring of complex texts, which require the ability to establish inference and meaning relationships (Hulme & Snowling, 2011). Dyslexic individuals who have problems with high-level language skills are likely to exhibit insufficient ability to draw inferences and inadequate comprehension monitoring skills (Olander et al., M. 2017). Cain et al. (2004), in an examination of the relationship between high-level language skills and working memory in reading comprehension, found that verbal working memory does not have a direct effect on the comprehension of sentences, inference skills, and simple syntax or semantics (Liu et al., 2019). On the other hand, it has been determined that verbal working memory is directly involved in verbal expression, especially in the stages of sentence conceptualization and word formations. Individuals with high-level language skills can readily retrieve words with their intended meanings from long-term memory and efficiently organize these words in the correct syntax within verbal working memory. In addition, they actively and effectively use executive working memory to coordinate word order while speaking fluently (Moser et al., 2007). In addition to adequate executive working memory, adequate phonological storage for receptive and expressive language skills is also essential (Baddeley, 1990). Individuals with incomplete or insufficient high-level language skills often experience situations such as having difficulty understanding words, not correctly using words with different meanings, not perceiving rhymed words, having insufficient phonological awareness, and being generally unable to express their feelings and thoughts (Hulme & Snowling, 2011).

Bishop and Snowling (2004) present a two-dimensional model of the relationship between children with dyslexia and children with language impairment. Children with language impairment have difficulty in the primarily non-phonological language skills of syntax and morphology, while children with dyslexia have impairments primarily in phonological processing. Given that successful reading comprehension requires phonological knowledge for decoding, children with dyslexia may have difficulty reading comprehension due to the complex nature of translating the sounds of their language into meaningful text for comprehension (Araújo & Faísca, 2019). For this reason, children with dyslexia who have primary difficulty with phonological aspects of language continue to exhibit impairments in reading comprehension while they may have relative strengths in oral language comprehension (Hulme & Snowling, 2011). Understanding the functional communication abilities of children with dyslexia, who often have comorbid impairments in at least one of the dimensions of language identified above, is essential to ameliorate their language difficulties and should be an additional goal of educational interventions for dyslexia. Narrative language is one context in which functional language ability may be evaluated in children with dyslexia. The behaviors observed in dyslexic children who have difficulty using high-level language skills are as follows (Rhea, 2001):

- Academic failure,
- Poor social relationships,
- Inability to make connections among and semantic interpretations of words in sentence contexts,
- Difficulty understanding verbal and written expressions,

- Weakness in writing skills,
- Difficulty understanding humor, riddles, and joke narratives

Evidence-Based Working Memory Interventions

It is possible to increase memory performance by applying memory strategies and metacognitive control (Maehler et al., 2019). Two main methods are often used to reduce the difficulties caused by poorly working memory. One includes classroom adaptations to minimize cognitive load to facilitate the child's learning (Elliott et al., 2010; Gathercole & Alloway, 2008). The other method focuses on teaching individuals to use memory strategies to improve working memory and increase memory efficiency (Clair-Thompson et al., 2010).

Classroom adaptations focus on increasing teachers' awareness of working memory problems and encouraging them to adapt their teaching approaches to reduce learners' working memory load (Yang et al., 2017). Teachers are also encouraged to use instructional strategies that help learners with poor working memory overcome cognitive weaknesses (Gathercole et al., 2008; Holmes et al., 2010). This approach is based on principles designed to motivate learners with low working memory by helping them reduce errors and increase self-confidence. The recommendations of this intervention are as follows:

- To identify the areas in which students with poor working memory capacity have difficulty, tasks that require complex mental processes can be given to test the limits of working memory.
- To identify warning signs of cognitive overload, the teacher can observe how the student copes with cognitively challenging activities. Asking simple questions (such as "What will you write?") can reveal whether the student has forgotten important information during an activity.
- Learning activities that reduce the cognitive load in working memory can be developed. By simplifying complex activities, the number of information students need to remember can be reduced, and their awareness of the significance of the material used in the activity can be increased. The number of steps in the activities can be reduced, and a prolonged activity can be divided into shorter segments. In addition, new materials can be associated with previously acquired knowledge, and language structures can be simplified, and the length of sentences can be reduced in explanations of complex activities,
- Partnering students with poor working memory with students who do not have this problem can provide peer support and increase motivation.
- The student can be taught to use memory aids such as wall charts and posters, spelling lists of frequently used words, personalized dictionaries, counters, number lines, multiplication tables, calculators, memory cards and sound recorders. In addition, the student may be taught to bolster weak memory skills through such means as rehearsal, note-taking, creating flowcharts and diagrams, applying organizational strategies, and making connections between new and previously learned information to support long-term memory.

The second approach focuses on improving the efficiency of dyslexic students' working memory by educating them to use specific goal-oriented strategies that require mental effort (Holmes & Adams, 2006). Repeating the information that needs to be remembered aloud, creating sentences or stories using words the student has difficulty remembering, or representing information with visual imagery are examples of these strategies (Dunlosky & Kane, 2007).

Rehearsal can be particularly helpful in information processing by allowing students with dyslexia to keep more information in working memory for a more extended period (Minear & Shah, 2006). Rehearsal is the most basic and straightforward memory strategy, entailing only the repetition of information with low levels of cognitive processing. Readers with standard working memory capacity can perform rehearsal semi-automatically without requiring full attention or taxing working memory capacity. It has been found that the rehearsal strategy improves recall and academic learning in individuals younger than five years old (Lehmann, 2015). However, while a simple rehearsal strategy is used frequently with five or six learners, it is not often or regularly used as a cognitive strategy with learners between the ages of seven and ten (Compton et al., 2020). Another way to support a dyslexic student with poor working memory is to minimize the cognitive load during reading (Lehmann, 2015). Some ways to implement this strategy are as follows:

- Providing a quiet environment can prevent noise and distractions from increasing cognitive load.
- Having the student read texts on the familiar subject can provide a supportive context to insert new words rather than presenting them in isolation. In this way, phonological complexity can be reduced, and an increase in cognitive load can be prevented.
- Excessive verbalization during reading, which adds to cognitive load and slows momentum, can be reduced by providing nonverbal clues in the text such as pictures.
- Providing frequent breaks during reading can alleviate information overload and prevent students from becoming bored or fatigued.

- Finally, an individualized review program can be created to assess each student's progress on an ongoing basis. These reviews and evaluations can be conducted (a) at the end of a lesson, (b) the following day, (c) after a two- or three-day delay, and (d) after another two or three days, and (e) two weeks after the last review.

RESULTS

In recent years, growing awareness of the nature and causes of learning difficulties has increased the number of studies conducted in this area, producing a rich and multi-dimensional body of literature. The present study contributes to this literature by reviewing the cognitive dimensions of reading comprehension and high-level language skills in dyslexic students focusing on working memory processes. The most apparent signs of dyslexia include failure to decode phonemes and morphemes, skipping, adding to texts, and interpreting words differently from their intended meanings. These difficulties negatively affect these students' metacognitive skills and their daily life skills. Students with poor working memory tend to have trouble planning, organizing, and carrying out routine chores that require mentally formulating a "to do" list organized by time and location. Study skills may also suffer. Working memory allows one to keep track of priorities and helps block the external or internal distractors that can derail one from the task at hand. Working memory thus helps one persist with tasks that require focused attention over time. Even strong working memories can experience working memory problems when overly tired, anxious, or stressed.

Working memory is also key to (a) accessing information held in long-term semantic memory stores to provide the meaning and pronunciation of words; (b) holding and sequencing sounds for spelling and composing, holding, and connecting ideas in written text.; and (c) achieving reading comprehension and reading fluency. When reading a long sentence, paragraph or passage, working memory allows one to hold on to and integrate information read early with information that comes later. Students with solid decoding skills but weak working memories often comment that they "cannot remember anything!" from a page that they just read.

Poor working memory can make it difficult for learners to acquire the phonological skills needed for decoding sounds. These difficulties affect reading negatively by reducing the speed of reading and comprehension. In addition, weakness in the short-term storage of phonological information negatively affects the decoding process by making it difficult to remember a series of phonemes long enough to blend them (Holmes & Adams, 2006). Also, to apply grammar rules and understand the text, the visual-spatial information must be processed in the visual-spatial working memory and interpreted, stored, and retained in the phonological working memory under the management of the central executive. The reader with poor executive control over working memory has difficulties understanding what s/he reads as the deficiency prevents information updating, modifying, and error tracking (Skarakis-Doyle & Dempsey, 2008). In addition, excessive cognitive load reduces the working memory capacity required for reading comprehension processes. Therefore, during the decoding process, the individual's cognitive load can be minimized, and his/her comprehension of the text being read is facilitated by directly supporting the repetition of phonemes just before word collation.

The most common problem of individuals with dyslexia is their poor phonological working memory storage capacity and lack of high-level language skills focused on understanding the deep structure of the language. It is possible to improve the working memory performance of individuals by providing an appropriate classroom environment and teaching memory strategies. Applying evidence-based strategies can strengthen and support working memory, which can help improve decoding and comprehension.

As conceptualized in the simple view of reading, reading comprehension is the product of accurate and efficient word reading and language comprehension. As dyslexia is related to poor working memory, vague visual-spatial working memory, and the increase in cognitive load due to the prolongation of the decoding process can negatively affect the process of reading comprehension. For this reason, the implementation of appropriate reading programs and classroom strategies for dyslexic individuals and providing appropriate in-service training for teachers can contribute to the academic success of dyslexic individuals.

In conclusion, working memory deficits are now recognized as one of the major defining characteristics of dyslexia. After phonological processing, working memory is the essential cognitive process required for proficient reading. Working memory, phonological, visual-spatial, and executive aspects play essential roles during reading. Therefore, it is imperative that teachers, reading specialists, psychologists, and speech-language pathologists understand specifically how working memory processes are involved with reading processes.

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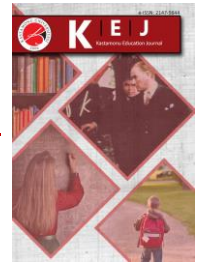
The study was conducted and reported with equal collaboration of the researchers.

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| Research Article / Araştırma Makalesi |

The Correlation Between Ethical Leadership Behaviors of School Principals and Teacher Motivation Okul Müdürlerinin Etik Liderlik Davranışlarının Öğretmen Motivasyonu ile İlişkisinin İncelenmesi

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Keywords

1. Ethical leadership
2. Teacher motivation
3. Leadership

Anahtar Kelimeler

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Abstract

Purpose: The present study aimed to determine the correlation between the ethical leadership attitudes of school principals and teacher motivation.

Design/Methodology/Approach: The study was conducted with the relational screening approach. The ethical leadership attitudes of school principals were determined with the School Administrators' Ethical Leadership Scale developed by Uğurlu and Sincar (2012). Teacher motivation was measured with the Teacher Motivation Scale developed by Kılıç and Yılmaz (2019). The study sample included 298 teachers assigned with the stratified sampling method. Kruskal Wallis, Mann Whitney U and Pearson's Rho tests were employed in data analysis.

Findings: The analysis revealed a positive and medium correlation between the perceptions of the teachers about ethical leadership behavior of school principals and teacher motivation. Furthermore, a moderate positive correlation was determined between ethical leadership and teacher motivation scale internal, external and administrative factors sub-dimensions.

Highlights: The present and similar study findings could be presented in meetings, training activities, official circulars, and the data on the ethical leadership attitudes adopted by school administration would help motivate the teachers could be presented in these activities. Thus, this could lead to higher levels of ethical leadership among school principals, leading to higher teacher motivation.

Öz

Çalışmanın amacı: Bu çalışmada, okul müdürlerinin etik liderlik davranışları ile öğretmen motivasyonu arasındaki ilişkinin belirlenmesi amaçlanmıştır.

Materyal ve Yöntem: Araştırma, ilişkisel tarama modelinde tasarlanmıştır. Okul müdürlerinin etik liderlik davranışları hakkında öğretmen algıları Uğurlu ve Sincar (2012)'in geliştirdikleri Yönetici Etik Liderlik Ölçeği, öğretmen motivasyonu ise Kılıç ve Yılmaz (2019) tarafından geliştirilen Öğretmen Motivasyon Ölçeği ile belirlenmeye çalışılmıştır. Araştırmanın örneklemini tabakalı örnekleme yöntemi ile seçilen 298 öğretmenden oluşmuştur. Verilerin analizinde Kruskal Wallis, Mann Whitney U ve Pearson's Rho testleri kullanılmıştır.

Bulgular: Yapılan analizlerde okul müdürlerinin etik liderlik davranışları hakkında öğretmenlerin algıları ile öğretmen motivasyonu arasında pozitif yönde, orta düzeyli ilişki saptanmıştır. Ayrıca etik liderlik ve öğretmenlerin motivasyonlarının içsel, dışsal, yönetsel faktörler boyutları arasında orta düzeyde, pozitif yönlü ilişki bulunmuştur.

Önemli Vurgular: Bu ve benzeri araştırmalara ilişkin sonuçlar okul müdürleri ile toplantı, eğitim, resmi yazı gibi yollarla paylaşarak, okul yönetiminde etik liderlik davranışları göstermelerinin öğretmenleri motive edebileceği bilgisi iletilebilir. Böylece okul müdürlerinin etik liderlik davranışları gösterme düzeylerinde, dolaylı olarak da öğretmenlerin motivasyonunda artış sağlanabilir.

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INTRODUCTION

Education is as old as human history. The concept of education, which was quite simple initially, has become complex over time and adopted various functions (Mialaret, 1999). Including acquiring high-level and straightforward intellectual skills, humans experience learning processes at every stage of their lives. It would be wrong to associate the history of such a profound phenomenon only with schools. However, despite various educational institutions providing vocational and lifelong education, education with the schools has been widely accepted since schools have been the most critical and active educational institutions (Fidan, 2012). The vital role that schools play in education includes the function of the school and increasing the significance of the individuals responsible for fulfilling this function.

School is an organization developed to achieve predetermined goals and a social system with inputs and outputs that interact with the environment. In this system, the individual's duties include working to realize organizational goals, similar to any organization (Hoy & Miskel, 2015). The teacher is an individual member of this structure. Another member of this structure, the school principal, is responsible for educational planning and the teachers who organize instructional resources and directly conduct the instruction.

The concept of leadership has been an essential attribute of administration since ancient times. A leader is an individual who mobilizes a group and the group members towards a particular goal, develops an organizational vision, gains the trust of the members of the organization, and acts decisively to achieve the organizational goals (Bakan and Doğan, 2013:3; Lunenburg and Ornstein, 2013:102; Güney). , 2012:26). Based on the organizational culture and conditions, leaders could adopt different values, exhibit different attitudes and behaviors (Mihelic, Lipicnik, & Tekavcic, 2010). The school administrator could be a leader of both the teachers and the organization. Thus, as mentioned by Çelik (2015), the leader employs some or all of the 5 effects or power sources. These sources include legal power, reward power, coercive power, expert power, and charismatic power. The teachers, who are unique individuals, would develop internal and external reactions based on the methods adopted by the school administrator. Thus, the school administrator or the organizational leader should adopt consistent decisions and accurate and timely leadership tools when leading the teachers to fulfill their duties.

The teacher should train individuals who work for society's interests and self-interests, allowing them to set self-goals and understand the world. However, teachers also exist outside of their profession, and to fulfill educational missions; they should be personally ready and motivated for these tasks (Kocabaş & Karaköse, 2005). It is challenging to motivate the employees of an organization to work for the organizational goals. It is imperative to develop a system that would facilitate the responsibilities of the employees and reward them. Institutions with best practices are inspiring, trustworthy, fair organizations that create favorable conditions (Öztürk & Dündar, 2003).

It is the leader's responsibility to develop ethical principles in an organization. Influential leaders should establish ethical principles (Alev Sökmen, 2019). An ethical school culture includes trust, justice, commitment to ethical values and freedom. If a leader establishes these principles in the school culture by carefully exhibiting ethical behavior, these ethical principles could be adopted by the teachers and students (Aydın, 2016: 83). In a school environment where there is no doubt about the leader's character and establishment of trust, others comply with the ethical principles. Another issue about school culture and ethical values are the new teachers. When a new teacher is informed that her or his professional future depends on the adoption of ethical values, this teacher will exhibit a higher level of consciousness and ethical behavior (Çelik, 2015). In institutions without an ethical leader, it would be challenging to achieve organizational goals and success (Eser, 2018).

The review of the studies on ethical leadership revealed that the studies conducted by Aykanat and Yıldırım (2012), Mataş Sancak (2014), Yıldırım (2010) reported a significant correlation between ethical leadership and organizational justice. Demirdağ and Ekmekçioğlu (2015), Uğurlu, Sincar and Çınar (2013), and Madenoğlu, Uysal, Sarier and Banoğlu (2014) investigated ethical leadership and organizational commitment and reported that there was a significant correlation between these variables. Furthermore, other studies reported significant correlations between ethical leadership and job performance and satisfaction (Bıyık, Şimşek, & Erden, 2017; Alev Sökmen, 2019), ethical leadership and job integration (Eser, 2018), ethical leadership and organizational creativity (Uğurlu & Ceylan, 2014), and ethical leadership and ethical climate (Akdoğan & Demirtaş, 2014).

Emirbey (2017) investigated the correlation between the ethical leadership behavior of primary school administrators and teacher motivation in the study "The Correlation Between Ethical Leadership Behavior of School Administrators and Teacher Motivation." A significant correlation was reported between the ethical leadership behavior of school administrators and teacher motivation in that study. Ayan (2015) investigated the impact of ethical leadership on internal motivation, job performance and depersonalization. In the study, it was observed that ethical leadership behavior significantly affected internal motivation. The review of the studies on ethical leadership revealed that the correlations between ethical leadership and organizational justice, organizational cynicism, organizational performance, organizational creativity, and internal motivation were investigated. However, since the number of studies on the correlation between ethical leadership and teacher motivation was relatively low, it could be suggested that the present study would fill the gap in the literature.

Ethical Leadership

The term ethics was derived from the Greek ethos, which entails the traditions that distinguish the societies. Today, the concept of ethics is described as socially approved attributes, trends and behavior, while professional ethics is defined as

vocational principles and values (Shapiro & Stefkovich, 2011: 11; McHugh, 1991: 8-11). Professional ethics is developed by the individuals in a specific profession and pressures the professional members to behave in a certain way and avoid specific trends (Pehlivan Aydın, 2002: 4).

Ethical violations have been common in business in recent years, leading to a universal crisis. Furthermore, due to the significance of democracy, the ethical orientation of the leaders became more critical, and undemocratic attitudes and ignorance of universal ethical rules have been disassociated with the concept of leadership (Gümüşeli, 2001). All these developments exacerbated the debate and research on ethical leadership. After these developments, the concept of ethical leadership has been emphasized, revealing the need for taking ethical issues more seriously in leadership (Palalar Alkan, 2015).

Ethical leadership was also described in the literature as moral leadership. Trevino, Hartman, and Brown (2000) discussed ethical leadership based on two dimensions: ethical individual and ethical administrator. Brown, Trevino, and Harrison (2005) described ethical leadership as normative personal and interpersonal behavior and the transfer of this behavior to group members. Furthermore, the encouragement of corruption and unethical behavior by a leader in an organization and the personal unethical behavior of that leader is considered unethical leadership (Brown & Mitchell, 2010).

Ethical leadership theory discusses the extent to which the leader adopts ethical behavior in social relationships and individual activities and the leader's contribution to the ethical behavior of individuals in the organization (Ayan, 2015). The ethical leader combines personal ethical behavior and leadership skills, leading to a particular attitude. The assessment of the ethical behavior of the employees is also an essential task of an ethical leader (Aykanat & Yıldırım, 2012). Necessary ethical leadership behavior is the personal ethical behavior of the leader. A leader becomes a role model when she or he adopts highly ethical criteria, which in turn has a significant impact on the ethical behavior of the employees. As long as the leaders adopt ethical values, they acquire the right to expect others to exhibit ethical behavior (Çelik, 2015; Sezgül, 2010). An ethical leader should also observe the group members and employee reward and punishment methods when necessary to force the followers to adopt the desired behavior, and these rewards and punishments should be transparent and fair (Mayer, Kuenzi, Greenbaum, Bardes, & Salvador, 2009; Akbaş, 2019). Certain members or leaders of a group or all groups in society could deviate from ethical principles. The responsibility of the ethical leader is to reconcile the conflicts among the members when there are differences between the values due to differences in ethnic origins, religious beliefs, Etc. (Çelik, 2015)

For example, a universal moral norm, the concept of justice, is also associated with ethical leadership behavior. Ethical leaders should avoid behavior that would harm others or not be approved by others and exhibit virtuous behavior that would benefit others (Kanungo, 2001). These behaviors could include sacrificial, merciful, just, and honest behavior (Yukl, Mahsud, Hassan, & Prussia, 2011). Different reactions of a leader vis a similar vis behavior of two members of the organization would damage the confidence in the leader and leader's reputation as an ethical model.

De Hoogh and Den Hartog (2008) discussed ethical leadership in 3 sub-dimensions. The ethics and justice dimension includes normative behavior of the ethical leader such as honesty, fairness, trustworthiness (Brown et al., 2005). The dimension of clear duties/roles includes clear announcement of the ethical leader's expectations from the followers, rewarding ethical behavior, and clear communications between the leader and followers. The distribution of power dimension entails including group members and their ideas in the decision-making process (Palalar Alkan, 2016: 45).

Motivation

Maslow (1954) described motivation as the efforts spent by humans to meet their basic needs. According to Maslow, physiological, security, social, respect and self-actualization needs determine the conscious behavior of individuals. Hanks (1999) similarly defined the foundation of motivation as fulfilling the needs. Thus, motivation is a process that aims the fulfillment needs. An individual with psychological or physiological needs strives to fulfill these needs. When they are fulfilled, humans can quickly adopt specific sustainable behavior. Herzberg (1987) focused on hygiene and motivating factors in his description. Herzberg argued that hygienic factors such as occupational safety and wages could not lead to complete satisfaction, and the main motivating factors for the employees are work environment conditions such as self-development and acceptance. Robbins and Coulter (2012: 452) described motivation as a process where individuals continuously achieve specific goals on which their efforts are focused. Eren (2001: 490) discussed motivation based on purposive individual behavior and the continuity of motivation towards the same goal. Alptekin Sökmen (2013: 86) summarized the concept of motivation as the employee behavior towards specific goals under the influence of certain stimuli.

Motivation improves employee and organizational performance. Thus, employee motivation has been a sensitive issue in all lines of business (Ağırbaş, Çelik, & Büyükkayıkçı, 2005). Managers and employees in an organization have desires, needs and expectations. Managers should balance organizational goals and employee needs (Alptekin Sökmen, 2013: 85). Good management entails fulfilling the physiological, psychological and social needs of an employee. The skills of the managers to fulfill these requirements determine employee commitment and motivation. Commitment and motivation are significant for the organization to achieve its goals. The efforts and loyalty of the employees to achieve these goals increase only when the employees accept the manager and the organizational climate is satisfactory. Managers who contradict the mentality and values of the employees would not be accepted, and the management would not be successful (Ergül, 2005).

Teacher Motivation

The performance-enhancing effect of motivation is also actual for teachers who are also employees. For the school as a formal organization to accomplish its goals, teachers should employ all their knowledge and skills (Kocabaş & Karaköse, 2005). Only then could high productivity be expected from the teachers. Teacher motivation would directly affect the quality of the services in educational institutions (Yavuz & Karadeniz, 2009). The fulfillment of the tasks with high motivation by the teachers would significantly impact the motivation and learning of the students and the quality of education (Öztürk & Uzunkol, 2013; Demir, 2018). Teacher motivation not only changes the school's productivity but also plays a decisive role in general education policies. Teachers with a high motivation would be very effective both on future progressive legislation and the new educational policies (De Jesus & Lens, 2005).

One of the essential factors that affect teacher motivation is trustworthy school administrators. Furthermore, factors such as the teacher's conscience and love of the profession, the interest of students and parents, good interpersonal relations at school, and the appreciation of the teacher by the principal also significantly affect teacher motivation (Ada, Akan, Ayık, Yıldırım, & Yalçın, 2013). Alam and Farid (2011) defined the factors that affect teacher motivation as wages, social prestige, self-confidence, and encouragement and rewards. To improve teacher motivation, there should be a career development path, teachers' belief in the education system and the school should be improved, and their achievements should be rewarded (Kurt, 2005).

Kılıç and Yılmaz (2019) analyzed teacher motivation in three sub-dimensions: internal, external and administrative factors. Internal motivation includes teacher attitudes towards self-development, the profession, professional achievements, and acceptance of the institution. External motivation includes the external factors to the individuals that increase their motivation. Administrative factors include the attitudes of school administrators towards the teachers and their leadership traits.

The Aim of the Study

The present study aimed to determine the correlation between the ethical leadership behavior of school principals and teacher motivation. Thus, the following research problems were determined:

1. What are the ethical leadership behavior levels of school principals and the motivation levels of the teachers based on teacher perceptions?
2. Is there a significance between the perceptions of the teachers about ethical leadership behavior of school principals and teacher motivation based on gender?
3. Is there a significance between the perceptions of the teachers about ethical leadership behavior of school principals and teacher motivation based on education level?
4. Is there a significance between the perceptions of the teachers about ethical leadership behavior of school principals and teacher motivation based on the school type?
5. Is there a significance between the perceptions of the teachers about ethical leadership behavior of school principals and teacher motivation based on seniority?
6. Is there a correlation between the ethical leadership behavior of school principals and teacher motivation?

METHOD

The Research Model

The present study was conducted with the relational screening method, a general screening model. In studies conducted with the relational screening method, the data are collected for more than one variable. The correlations between these variables and their effect size are determined (Karasar, 2012; Can, 2016). In the study, the perceptions of teachers about the ethical leadership behavior of school principals and teacher demographics were considered as independent variables, and teacher motivation was considered as the dependent variable.

Data Collection Instruments

Data collection instruments included a Personal Information Form, School Administrators' Ethical Leadership Scale and Teacher Motivation Scale. Personal Information Form included questions about the gender, education level, school type, and teacher seniority.

In the study, the School Administrators' Ethical Leadership Scale developed by Uğurlu and Sincar (2012) was employed to determine the ethical leadership behavior of school principals. It was determined that the Cronbach's alpha coefficient of the scale was .973, and the validity and reliability of the scale were high. The scale is a unidimensional, 5-point Likert-type scale that included 24 items and scored as strongly disagree (1), disagree (2), partially agree (3), agree (4), and completely agree (5) (Uğurlu & Sincar, 2012).

The Teacher Motivation Scale developed by Kılıç and Yılmaz (2019) was employed to measure the teacher motivation. The 5-point Likert-type scale includes 18 items and 3 sub-dimensions (internal motivation, external motivation and administrative motivation). The item is answered with 5 options between strongly disagree (1) and strongly agree (5). The scale developers initially created a question pool based on a literature review. The item count was reduced to 18 based on expert feedback. Exploratory

and confirmatory factor analysis revealed 3 factors (internal, external and administrative factors). The Cronbach alpha internal consistency coefficient was .74 for the whole scale.

Population and Sample

The study population included 4548 teachers employed in public primary, middle and high schools in the Battalgazi district of the Malatya province during the 2019 - 2020 academic year. The study sample was assigned with the stratified sampling method. Thus, 3 layers were determined (primary schools, middle schools and high schools). The sample selection aimed to assign a similar number of teachers in each stratum. The measurement tool was applied to the sample, and 311 teachers completed the measurement instrument. Inaccurate and incomplete scales were excluded, and 298 teachers were included in the sample.

Out of the 298 teachers included in the sample, 144 (48.3%) were female and 154 (51.7%) were male. Based on the education level variable, 257 (86.2%) teachers had undergraduate degrees, and 41 (13.8%) had graduate degrees. 119 (39.9%) teachers were employed in primary schools, 90 (30.2%) in middle schools, and 89 (29.9%) in high schools. Based on the seniority variable, 23 teachers (7.7%) had been working for 1-5 years, 45 teachers (15.1%) had been working for 6-10 years, 54 teachers (18.1%) had been working for 11-15 years, 51 teachers (17.1%) had been working for 16-20 years, and 125 teachers (41.9%) had been working for 21 years or longer.

Data Analysis

The data analysis was conducted on the SPSS 25.0 software. Normality analysis revealed that the data were not distributed normally. Thus, non-parametric tests were employed in data analysis. Mann Whitney U test and Kruskal Wallis test were employed to determine the differences between teacher perceptions about ethical leadership behavior of school principals and teacher motivation based on gender, education level, school type and seniority variables. The Spearman's Rho test was employed to determine the correlation between the ethical leadership behavior of school principals and teacher motivation. In the analysis of the mean scores, the 1.00 - 1.80 interval was interpreted as "very low," the 1.81 - 2.60 interval was interpreted as "low," the 2.61 - 3.40 interval was interpreted as "moderate," the 3.41 - 4.20 interval was interpreted as "high," and the 4.21 - 5.00 interval was interpreted as "very high."

FINDINGS

The first sub-problem of the study was "What are ethical leadership behavior levels of school principals and the motivation levels of the teachers based on teacher perceptions?" Thus, descriptive statistics were determined and the results are presented in Table 1.

Table 1. Descriptive statistics on the teacher perceptions on ethical leadership behavior of school principals and teacher motivation levels

Scale	N	\bar{X}	SD
Ethical Leadership Scale	298	3,84	,70
Motivation Scale			
Internal Motivation	298	3,74	,63
External Motivation	298	3,72	,67
Administrative Motivation	298	3,98	,65

As seen in Table 1, teacher perceptions about the ethical leadership behavior of school principals ($\bar{X}=3.84$) were high. Similarly, it was observed that the internal ($\bar{X}=3.74$), external ($\bar{X}=3.72$) and managerial motivation ($\bar{X}=3.98$) sub-dimensions and overall teacher motivation scale ($\bar{X}=3.80$) scores were high.

The second sub-problem was "Is there a significance between the perceptions of the teachers about ethical leadership behavior of school principals and teacher motivation based on gender?" Since the data did not exhibit normal distribution, the Mann Whitney U test was conducted to determine the differences between the ethical leadership perceptions and motivation levels of the teachers based on the gender variable, and the results are presented in Table 2.

Table 2. The analysis of the differences between the ethical leadership perceptions and motivation levels of the teachers based on the gender variable

Scale	Gender	N	Mean Rank	Rank Total	U	p
Ethical Leadership	Female	144	156,79	22577,50	10038,500	.158
	Male	154	142,69	21973,50		
Teacher Motivation	Female	144	155,41	22379,50	10236,500	.251
	Male	154	143,97	22171,50		
External Motivation	Female	144	149,31	21501,00	11061,000	.971
	Male	154	149,68	23050,00		
Administrative Motivation	Female	144	160,75	23148,50	9467,500	.028
	Male	154	138,98	21402,50		

Scale	Gender	N	Mean Rank	Rank Total	U	p
Motivation (Total)	Female	144	154.94	22311.00	10305.000	.292
	Male	154	144.42	22240.00		

Based on the data presented in Table 2, there was no significant difference between the perceptions of teachers about ethical leadership behavior of school principals based on the gender variable ($p > .05$). General analysis of the Teacher Motivation Scale scores revealed that the motivation levels of the teachers did not differ based on the gender variable ($p > .05$).

There were no significant differences between the internal and external motivation scores based on the gender variable ($p > .05$). However, there was a significant difference between the administrative motivation sub-dimension scores based on gender ($p < .05$). The mean rank revealed that the perception scores of the female teachers in the sub-dimension of administrative motivation were higher when compared to the male teachers.

The third sub-problem was "Is there a significance between the perceptions of the teachers about ethical leadership behavior of school principals and teacher motivation based on education level?" in the study. The Kruskal-Wallis test was conducted and the results are presented in Table 3.

Table 3. The analysis of the differences between the ethical leadership perceptions and motivation levels of the teachers based on the education level variable

Scale	Education Level	N	Mean Rank	χ^2	p
Ethical Leadership	Undergraduate	257	149,35	.006	.939
	Graduate	41	150,46		
Teacher Motivation					
Internal Motivation	Undergraduate	257	149,06	.234	.629
	Graduate	41	152,24		
External Motivation	Undergraduate	257	152,96	.048	.826
	Graduate	41	127,80		
Administrative Motivation	Undergraduate	257	149,97	3.041	.081
	Graduate	41	146,52		
Motivation (Total)	Undergraduate	257	150,46	.057	.811
	Graduate	41	143,46		

As seen in Table 3, there was no significant difference between the perceptions of teachers about ethical leadership behavior of school principals based on the education level variable ($p > .05$). There was no significant difference between the motivation dimension scores based on the education level ($p > .05$).

The fourth sub-problem was "Is there a significance between the perceptions of the teachers about ethical leadership behavior of school principals and teacher motivation based on the school type?" in the study. The Kruskal-Wallis test was conducted and the results are presented in Table 4.

Table 4. The analysis of the differences between the ethical leadership perceptions and motivation levels of the teachers based on the school type variable

Scale	School Type	N	Mean Rank	χ^2	p
Ethical Leadership	Primary	119	148,40	2.564	.278
	Middle	90	140,04		
	High	89	160,53		
Teacher Motivation					
Internal Motivation	Primary	119	140,92	2.728	.256
	Middle	90	149,64		
	High	89	160,82		
External Motivation	Primary	119	132,53	14.426	.001
	Middle	90	144,32		
	High	89	177,43		
Administrative Motivation	Primary	119	147,57	.611	.737
	Middle	90	146,23		
	High	89	155,39		
Motivation (Total)	Primary	119	138,95	4.979	.083
	Middle	90	147,45		
	High	89	165,68		

As seen in Table 4, there was no significant difference between the perceptions of teachers about ethical leadership behavior of school principals based on the school type variable ($p > .05$). Similarly, there was no significant differences between the overall teacher motivation, internal and administrative motivation sub-dimension scores based on the school type variable ($p > .05$). However, there was a significant difference between the external motivation scores based on the school type ($p < .05$).

The Kruskal Wallis test compares the mean scores of more than two groups and determines whether there is a significant difference between these scores. However, the test does not reveal the groups between which there is a significant difference. Thus, the source of the difference could be determined with the Mann Whitney U test in pairwise combinations (Büyüköztürk,2016:171). Mann Whitney U test was conducted to determine the group external motivation scores that contributed to the significant difference based on the school type (primary, middle and high schools). The findings are presented in Table 5.

Table 5. Mann Whitney U Test results conducted on external motivation sub-dimension and the school type variable

School Type	N	Mean Rank	Total Rank	U	p
Primary	119	91,17	10849,50	3709,500	.000
High	89	122,32	10886,50		
Middle	90	80,00	7200,00	3105,000	.009
High	89	100,11	8910,00		
Primary	119	101,35	12061,00	4921,000	.314
Middle	90	109,82	9884,00		

The review of the Table 5 demonstrated that there was no significant difference between the external motivation levels of the primary and middle school teachers ($p>.05$). It was determined that the significant difference between the external motivation sub-dimension was between primary and high school teachers, and middle and high school teachers ($p<.05$). The mean ranks demonstrated that the external motivation levels of the high school teachers were higher when compared to those of the primary and middle school teachers.

The fifth sub-problem was "Is there a significance between the perceptions of the teachers about ethical leadership behavior of school principals and teacher motivation based on seniority?" in the study. The Kruskal-Wallis test was conducted on the Ethical Leadership Scale and the Teacher Motivation Scale data, and the results are presented in Table 6.

Table 6. The analysis of the differences between the ethical leadership perceptions and motivation levels of the teachers based on the seniority variable

Scale	Seniority	N	Mean Rank	χ^2	p
Ethical Leadership	1 - 5 years	23	154,48	4,124	.390
	6 - 10 years	45	130,40		
	11 - 15 years	54	143,19		
	16 - 20 years	51	163,81		
	21 years and over	125	152,35		
Teacher Motivation					
Internal Motivation	1 - 5 years	23	146,52	17,724	.001
	6 - 10 years	45	109,72		
	11 - 15 years	54	138,53		
	16 - 20 years	51	179,66		
	21 years and over	125	156,80		
External Motivation	1 - 5 years	23	123,74	23,955	.000
	6 - 10 years	45	121,84		
	11 - 15 years	54	118,31		
	16 - 20 years	51	176,55		
	21 years and over	125	166,64		
Administrative Motivation	1 - 5 years	23	147,07	4,390	.356
	6 - 10 years	45	127,73		
	11 - 15 years	54	151,35		
	16 - 20 years	51	163,69		
	21 years and over	125	151,20		
Motivation (Total)	1 - 5 years	23	139,83	15,399	.004
	6 - 10 years	45	117,58		
	11 - 15 years	54	132,39		
	16 - 20 years	51	177,35		
	21 years and over	125	158,80		

The analysis results presented in Table 6 demonstrated that there was no significant difference between the perceptions of the teachers about ethical leadership behavior of school principals based on the seniority variable ($p>.05$). There was no significant difference between the administrative motivation sub-dimension scores based on seniority ($p>.05$). However, there was a significant difference between the general motivation scores of the teachers and internal and external motivation scores based

on teacher seniority ($p < .05$). Since the Kruskal-Wallis test could not identify the source of this difference, Mann Whitney U test were conducted on paired groups.

The Mann Whitney U test demonstrated that the motivation scores of teachers with 16-20 years of seniority and 21 years and over were higher when compared to the teachers with 6-10 years and 11-15 years of seniority. In the internal and external motivation sub-dimensions, it was observed that teachers with 16 -20 years and 21 years or more seniority had higher motivation levels when compared to teachers with 1 -5 years, 6 -10 years and 11 -15 years of seniority.

Jonckheere-Terpstra test was also employed to analyze the seniority variable. The Jonckheere-Terpstra test could be used when ranks include categorical data (Kilmen, 2015). It aimed to determine whether the teacher perception about ethical leadership, teacher motivation and motivation sub-dimension scores increased with an increase in seniority. The Jonckheere-Terpstra test results are presented in Table 7.

Table 7. The Jonckheere-Terpstra Test analysis results for the seniority variable

Scale	Seniority	N	Mean J-T Statistics	Standard J-T Statistics	p
Ethical Leadership Scale	5	298	16277,000	.996	.319
Motivation Scale					
Internal Motivation	5	298	16277,000	2.451	.014
External Motivation	5	298	16277,000	3.922	.000
Administrative Motivation	5	298	16277,000	.962	.336
Motivation (Total)	5	298	16277,000	2.632	.008

The Jonckheere-Terpstra test results presented in Table 7 demonstrated that the Standard J-T Statistics was positive for teacher motivation ($p < .05$). Thus, it could be concluded that the increase in teacher seniority led to an increase in teacher motivation. Furthermore, the internal and external motivation dimension scores were also significant in the Jonckheere-Terpstra test ($p < .05$). Thus, it could be suggested that the increase in seniority led to increases in internal and external motivation.

The sixth sub-problem was "Is there a correlation between ethical leadership behavior of school principals and teacher motivation?" in the study. Since the data did not exhibit normal distribution, the correlation between ethical leadership perceptions and teacher motivation was analyzed with the Spearman's Rank-Difference correlation coefficient. The results of the Spearman's Rho test are presented in Table 8.

Table 8. Spearman's Rank-Difference correlation analysis results for the correlation between ethical leadership perception and teacher motivation

	Teacher Motivation		
	N	r	p
Ethical Leadership	298	.587	.000

* $p < .01$

As seen in Table 8, there was a positive, moderate and significant correlation between teacher motivation and ethical leadership behavior of school principals ($r = .587$, $p < .05$). Thus, it could be argued that an increase in ethical leadership behavior of school principals leads to an increase in teacher motivation.

Spearman Rank-Difference correlation analysis was conducted to determine the correlations between ethical leadership and internal, external and administrative teacher motivation dimensions. The results are presented in Table 9.

Table 9. Spearman's Rank-Difference correlation analysis results for the correlation between ethical leadership perception and teacher motivation sub-dimensions

	Ethical Leadership		
	N	r	p
Internal Motivation	298	.486	.000
External Motivation	298	.454	.000
Administrative Motivation	298	.618	.000

* $p < .01$

The analysis results on the correlations between the ethical leadership behavior of school principals based on teacher perceptions and the teacher motivation sub-dimensions are presented in Table 9. Thus, it was observed that there was a positive, moderate and significant correlation between ethical leadership and internal ($r = .486$), external ($r = .454$) and administrative motivation ($r = .618$) ($p < .05$). It was determined that the highest correlation was between ethical leadership and administrative motivation sub-dimension.

DISCUSSION AND CONCLUSION

The present study aimed to determine the correlation between teacher perceptions about the ethical leadership behavior of school principals and teacher motivation. The study findings demonstrated that the teachers' overall teacher motivation and internal, external and managerial motivation sub-dimension scores were high. The studies conducted by Çevik and Köse (2017) and Demirtaş, Aksoy, Balı, and Çağlar (2019) reported that teacher motivation levels were high. In a study conducted by Kılıç and Yılmaz (2019), it was determined that internal and external teacher motivation scores were high, while administrative motivation scores were very high. The study conducted by Ertürk (2016) determined that teacher motivation level was moderate, internal motivation was high, and external motivation was moderate. A study conducted by Aksel and Elma (2018) reported that general teacher motivation was high, internal motivation levels were high, and external motivation levels were moderate. In the study, teacher perceptions about the ethical leadership behavior of school principals were high. This finding was consistent with the findings reported by Sağır and Tutkun (2017), Toytok (2014), and Emirbey (2017).

There was no difference between the teachers' perceptions about the principals' ethical leadership behavior based on the gender variable. Gülcan, Kılınç, and Çepni (2012) also reported similar findings. The analyses revealed no differences between the internal and external teacher motivation scores based on the gender variable. The findings showed that the administrative motivation of the female teachers was higher when compared to male teachers. In a study conducted by Kılıç and Yılmaz (2019), it was concluded that external motivation sub-dimension scores differed based on gender; however, there was no difference between the administrative and internal motivation scores based on gender. Bastick (2000) reported that the motivation of the female teachers was higher when compared to the male teachers. Other studies reported no significant differences between teacher motivation levels based on the gender variable (Urhan, 2018; Yıldırım, 2015).

The study findings revealed no significant difference between the ethical leadership behavior of school principals and teacher motivation based on the education level variable. In a study conducted by Gültekin (2008), it was concluded that there was no significant difference between the ethical leadership behavior levels of school principals based on the education level variable. Ugar (2019) reported no significant difference between teacher motivation levels based on education.

As mentioned in the findings section, there was no significant difference between school principals' ethical leadership behavior and the internal and administrative motivation sub-dimensions based on the school type variable. However, it was determined that the external motivation of the high school teachers was higher when compared to that of the primary and middle school teachers. It could be suggested that the higher external motivation levels among the high school teachers were due to the higher level of facilities available in high schools, such as the professional prestige, availability of field experts, and physical facilities. Furthermore, the lower external motivation of primary and middle school teachers, who establish closer relations with student parents, could be explained by their perceptions about social prestige.

The analysis of the variables based on the seniority variable revealed no significant differences between the teachers' perceptions about the ethical leadership behavior of school principals and administrative motivation sub-dimension based on seniority. In the internal and external motivation sub-dimensions, it was observed that teachers with a seniority of 16 - 20 years and 21 years or more scored higher when compared to teachers with seniority of 1 - 5, 6 - 10, and 11 - 15 years. However, the motivations of the teachers with 16 - 20 years of seniority and teachers with 21 years or more seniority were higher than those with 6 - 10 years and 11 - 15 years of seniority. Furthermore, it was concluded that as seniority increased, motivation and internal and external motivation scores increased.

Thus, the increase in internal motivation with seniority could be due to the high commitment of teachers with more than 16 years of seniority to their profession and institutions. It could be suggested that the increase in external motivation with seniority was due to the increase in concerns of senior teachers about providing for their home, their children's education expenses, or retirement. Furthermore, it could be suggested that the external motivation of the junior teachers was lower when compared to the teacher with over 21 years of seniority due to the social amenities of the profession.

Similar motivation and seniority findings were reported in the studies conducted by Ertürk (2016) and Ugar (2019). However, in studies conducted by Yıldırım (2019), and Çevik and Köse (2017), it was determined that there was no significant difference between teacher motivation levels based on seniority. Kılıç and Yılmaz (2019) determined that the internal motivation scores of the teachers with 1-5 years of seniority were higher when compared to teachers with 16-20 years of seniority, and external and administrative motivation scores of the same group were higher when compared to teachers with 6 - 10 and 11 - 15 years of seniority. This difference could be due to the colleges where these studies were conducted.

In conclusion, a positive and moderate correlation was determined between teacher perceptions about the ethical leadership behavior of school principals and teacher motivation. It was observed that ethical leadership perception was positively and moderately correlated with all teacher motivation scale sub-dimensions. It was determined that the strongest correlation was between the ethical leadership perception and administrative motivation dimension. Thus, it could be suggested that there is a correlation between the ethical leadership behavior of school principals and teacher motivation levels. In a study conducted by Emirbey (2017), a moderate, positive and significant correlation was determined between teacher perceptions about ethical leadership behavior of school principals and teacher motivation. Ayan (2015) reported a moderate and positive correlation between ethical leadership style and job performance.

RECOMMENDATIONS

The study findings revealed that the administrative motivation levels of female teachers were higher when compared to male teachers. The reasons behind this finding could be determined in a qualitative study to discuss the low impact of organizational factors on the motivation of male teachers, and further measures could be determined to alleviate this trend.

In the study, it was determined that the external motivation of the high school teachers was higher when compared to primary and middle school teachers. Thus, future studies could be conducted to improve the physical conditions in primary and middle schools and the approval of these teachers by the parents and the society, to achieve higher external motivation levels across the teachers employed in these schools.

The fact that internal and external teacher motivation increased with an increase in seniority could be considered by practitioners. Thus, social activities could be organized to increase the motivation of junior teachers. New regulations could be adopted to encourage teachers to develop their proficiency and skills and to set career goals to improve internal teacher motivation.

It was determined in the study that there was a moderate and positive correlation between teacher perceptions about the ethical leadership behavior of school principals and teacher motivation. The findings reported in similar studies could be communicated to school principals in meetings, courses, circulars, Etc., to inform them that teachers could be motivated by the ethical leadership behavior of the school administration. Thus, the level of ethical leadership behavior of school principals and the teacher motivation could be increased.

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Statements of publication ethics

We hereby declare that the study has not unethical issues and that research and publication ethics have been observed carefully.

Researchers' contribution rate

The study was conducted and reported with equal collaboration of the researchers.

Ethics Committee Approval

The present study was approved by İnönü University Social and Human Sciences Scientific Research and Publication Ethics Committee (12.06.2020 no: 2020/10-11).

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| Research Article / Araştırma Makalesi |

The Effectiveness of English Textbooks at MoNE from Teachers' Aspect

Öğretmenlerin Bakış Açısından MEB Ders Kitaplarının Etkililiği

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Keywords

1. Textbooks
2. EFL Textbooks
3. EFL Teachers
4. Effectiveness of textbooks

Anahtar Kelimeler

1. Ders kitapları
2. İngilizce ders kitapları
3. İngilizce öğretmenleri
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Abstract

Purpose: Textbooks are handy means in EFL classrooms. However, they may have some lacking points in terms of implementation. EFL teachers' opinions are crucial at that point. Taking this into account, the current study seeks to investigate the effectiveness of the textbooks used at MoNE from teachers' view.

Design/Methodology/Approach: 102 EFL teachers from different cities of Turkey were targeted for the data collection. The participants involved in the study are working in primary, secondary, and high schools all over Turkey. The data were collected in nearly 2 months during Covid-19. The data collection instrument is a five-point Likert-type teacher questionnaire. Hence, this study is a quantitative one for which the data obtained are analyzed through SPSS. One sample t-tests, Pearson correlation statistics, and descriptive statistics are utilized in this study.

Findings: This study reveals that English textbooks are inadequate in terms of layout, design, activities, and skills. On the other hand, the teachers find the subject, content, and language type used in the textbooks appropriate. Most of the teachers believe that textbooks are easily adaptable. Nevertheless, the teachers are knowledgeable enough for overcoming the deficiencies and applying the best method for their students regardless of the textbook.

Highlights: Further studies could be conducted by interviewing the teachers about the drawbacks found in textbooks and how they can adapt them.

Öz

Çalışmanın amacı: Ders kitapları İngilizce derslerinde kullanışlı araçlardır. Yine de uygulama açısından eksik noktaları olabilir. Bu noktada İngilizce öğretmenlerinin fikirleri elzemdir. Bunu göz önünde bulundurarak, mevcut çalışma öğretmenler açısından MEB'de kullanılan kitapların etkililiğini araştırmaktadır.

Materyal ve Yöntem: Bu amaçla veri toplamak için Türkiye'nin farklı şehirlerinden 102 İngilizce öğretmenine ulaşılmıştır. Araştırmaya farklı şehirlerden katılan katılımcılar; ilkokul, ortaokul ve lise kademelerinde çalışmaktadır. Veriler Covid-19 sürecince yaklaşık olarak 2 ayda elde edilmiştir. Veri toplama aracı beşli Likert tipi öğretmen anketidir. Dolayısıyla bu çalışma, elde edilen verilerin SPSS aracılığıyla analiz edildiği nicel bir çalışmadır. Bu çalışmada tek örneklem t-testi, Pearson korelasyon istatistikleri ve betimleyici istatistiklerden yararlanılmıştır.

Bulgular: Bu araştırma, İngilizce ders kitaplarının düzen, dizayn, aktiviteler ve beceriler bakımından yetersiz olduğunu ortaya koymaktadır. Öte yandan öğretmenler konu, içerik ve kullanılan dili uygun bulmaktadırlar. Öğretmenlerin çoğu kitapların kolaylıkla uyarlanabilir olduğu kanaatindedir. Bununla beraber, öğretmenler eksiklikleri gidermede ve ders kitabından bağımsız olarak öğrencileri için en iyi metodu uygulamada yeterlidir.

Önemli Vurgular: İleriki araştırmalar öğretmenlerle ders kitaplarında bulunan eksiklikler ve bunları ne şekilde uyarlayabilecekleri hakkında görüşme yapılarak yürütülebilir.

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INTRODUCTION

Curriculum and course materials are essential in the educational program (Dinçer et al., 2010). In an EFL context, a textbook is a valuable tool enabling the teachers to follow the curriculum. Moreover, Basturkman (1999) identifies ELT textbooks as cultural artifacts and states that they are a genre of some prominence, usually reflecting mainstream views of the ELT community or culture. Nevertheless, it can be stated that the teacher is a unique power in an educational setting in terms of applying for an education program, affecting students' learning, and decreasing the adverse effects of the environment (Dinçer et al., 2010).

Most teachers and students perceive textbooks as a course, and they consider textbooks the only source of information. Teachers stick to the textbooks they use, and they do not allow for additional activities and creativity. However, a book is not a course, but it determines the learning experiences for those who use it (McGrath, 2002). Textbooks also provide information on the target culture, promoting the perception of language and culture. A systematic and comprehensive coursebook may enable the culture input substantially (Wu, 2010). A good combination of language and culture raises the increase to study a textbook to a great extent.

Textbook analysis has great importance in that it should correspond to the learners' needs of the particular situation, promote communicative language, learner autonomy, make use of problem-solving approaches and allow for differentiated instructions (Anjaneyulu, 2014). Likewise, Candlin and Mercer (2001) suggest that in any learning group, learners differ from each other in terms of their perception of learning needs in the target language. Teachers are the ones who are aware of their student's level; therefore, they are to adapt their materials following the student's needs. Analyzing activities to see if they are ready to serve for the aim of being communicatively competent is of great importance, according to Tavil and Demirbaş (2010). Namaghi et al. (2014) emphasize that teacher's role is to administer the checklist. However, this does not necessarily mean that their only task is to complete the teaching process each time. As Tok points out (2010), teachers are entitled to be active in the process of coursebook evaluation.

In Turkey, most universities provide ELT student teachers with the necessary qualification to evaluate, assess, and adapt an EFL coursebook according to the targeted student level. Textbook evaluation is a valuable component of teacher training programs. It makes student teachers aware of the necessary qualities to seek in textbooks while familiarizing them with a complete sequence of published language instruction materials (Litz, 2005). Qualified teachers can share their perceptions of the strengths and weaknesses of the textbook they use in a class (Ahmadi & Derakhshan, 2016).

Dougill (1987) notes that trying to criticize a book that aims to improve reading skills for not comprising good structural practice would be in vain. In Turkey, the government provides coursebooks free of charge, making them accessible for both teachers and students across the country. Hence, evaluating the textbook given by the Ministry of National Education (henceforth MoNE) concerning its cost would be meaningless. Kirkgöz (2011) states that the use of these locally produced textbooks in state primary and secondary schools is encouraged by MoNE. Dougill (1987) maintains that teachers need to determine the objectives of a book. From this point, it is probable to assess the effectiveness of book covers as well.

The brief review of studies shows that there are several suggestions on assessing a textbook from the angle of teachers. The textbook, accepted as a source for self-confidence development by inexperienced teachers (Cunningsworth, 1987), is generally evaluated considering the physical characteristics, language content, design and organization, language skills, exercises and activities, and cultural considerations (Acar, 2006). Tomlinson (2008) suggests that studies on teacher views of ELT materials demonstrate the inclination to approve easily adaptable textbooks.

Kayapınar (2009) argues that successful use could be realized creatively and flexibly rather than dominating the teaching and learning process. Teachers should develop the most effective, suitable, and flexible materials for their students, as Nunez Pardo and Telléz Telléz (2009) claim. If the case is like in Turkey, where the government provides the textbook, adapting a material is a best and easiest option. The adaptation process should begin after the evaluation process ends. What is seen as inadequate should be focused on and improved? The evaluation and adaptation process has many positive and negative sides, however. To name some difficulties, most textbooks are tantalizingly unclear about target learners, as justified by Dougill (1987). Even if a textbook is designed for a particular grade, it is not possible, if not impossible, for teachers to state that this textbook is perfect for their students. While speaking of the advantage of a coursebook, Öztürk (2019) emphasizes textbooks' paving the way for autonomy. The learners could see an organizational chart that enables them to create their studying program, to recognize what they have learned in previous units and what they are supposed to learn in the following units. Öztürk (2019) maintains that if teachers depend heavily on the coursebooks, it would be inevitable not to lose instructional skills in time. Textbooks are simple tools in the hands of teachers, so the teachers are not expected to work miracles with them (Ersöz, undated).

In the literature on EFL textbooks in Turkey, the relative importance of EFL teachers' perceptions has been subject to considerable discussion. For instance, Tok (2010) focuses on teacher views on textbooks used in primary schools. Hopa (2019), on the other hand, handles the EFL textbooks from the learners' aspect. Akin to this, Arıkan (2008) concentrates on fourth-grade students' and teachers' views on EFL textbooks. Arıkan (2009) collects future teachers' opinions on EFL coursebooks in secondary schools. Yılmaz and Aydın (2015) review the literature about EFL teachers' perceptions of EFL coursebooks. They suggest that EFL course books should be pored over from a broad perspective by considering teachers' views. Correspondingly, Dülger (2016) conducts a study by getting the views of the teachers working in primary, secondary, and high schools on EFL textbooks of that time. However, textbooks have changed so far. Moreover, the teachers' attitudes towards applying and assessing the textbooks

may vary. While several studies focus on textbook assessment and teacher views, the researchers are based on former textbooks. There is no study involving the teachers' opinions from all grades. Therefore, this study distinctively centers on the opinions of 102 ELT teachers on EFL textbooks that are designed in line with the updated curriculum and content. Hence, the current study fills the gap in the literature by placing views of the teachers who work in primary, secondary, and high schools about the EFL textbooks used in today's classes. Thus, the main research questions that guided this study are as follows:

1. Are the teachers satisfied with the content of the textbook?
2. To what extent do the teachers find activities related to the topic they are supposed to teach?
3. Are the textbooks adequate for achieving the goals set at the beginning of the teaching and learning process?

METHOD

The design, participants, data collection of the study, and data analysis compatible with the purpose of the study were explained in this section.

Design

This paper reports on a survey on teachers' perception of the effectiveness of the textbooks given by MoNE. Yılmaz and Aydın (2015) assert that teachers need a map no matter how they know a thing or many. Accordingly, the present study is conducted with a quantitative research design to shed light on the adequacy of the textbooks through teachers' views. Quantitative research methods deal with gathering and analyzing data and could be exhibited computationally (Goertzen, 2017). Quantitative research is applied when testing objective theories by analyzing the relationship among variables for which data is analyzed using statistical procedures as Creswell (2017) notes.

Participants

Purposive sampling is used to choose the participants for the present study. The purposive sampling technique is the intentional choice of a participant because of the features the participants have (Etikan et al., 2016). The sample in this study consists of 102 English Language Teachers working at MoNE from different cities around Turkey. Thus, the collected data illustrates a total of 102 teachers volunteered for the current study. Among them, 64 are female (62.7%) and 38 are male (37.3%) teachers. Moreover, 22 participants are between the age of 20-25 (21.6%). 41 of them are between 26-30 (40.2%). 20 of them are between the age of 31-35 (19.6%). 13 of them are between 36-46 (12.7%) and 6 of the teachers are between the age of 41-45 (5.9%). Regarding the teachers' department of graduation, it is found that 91 of the teachers (89.2%) have ELT (English Language Teaching) graduate degrees. 1 teacher (0.9%) graduated from both English Language Teaching and English Language and Literature departments. 5 of them are (4.9%) English Language and Literature graduates. 1 is (0.9%) Translation and Interpreting graduate and 1 is (0.9%) Linguistics/Philology graduate while 3 participants (2.9%) selected 'other' as a department of graduation. As for the years of teaching experience, 28 teachers (27.4%) who participated in this study are working for less than 4 years. 48 of them (47.1%) are working for 4-9 years. 14 of them (13.7%) have the experience of 10-14 years, and 12 of them (11.8%), being the minority in this part, are working for 15 or more years. In terms of the grade where the teachers teach, it is figured out that 20 teachers (19.6%) who took part in the current study teach only at primary schools. 42 of them (41.1%) teach only at secondary schools. 35 of the teachers (34.3) teach only at high schools. 2 of the teachers (1.9%) work both at primary and secondary schools. Similarly, 3 of the participants (2.9%) work at primary, secondary, and high schools at the same time. The last demographic information reached by the collected data demonstrates that 17.6 % (f=18) of the participants work in the Southeastern Anatolian Region. 16.6 % of them (f=17) work in the Central Anatolian Region. Of them, 15.6 % (f=16) work in the Marmara Region and the Eastern Anatolian Region commensurably. 14.7 % (f=15) of the teachers work in the Black Sea Region. 10.7 % (f=11) of the teachers work in the Mediterranean Region. 8.8 % (f=9) of the participants work in the Aegean Region. The questionnaire is administered to the teachers working in 51 different cities (Adana, Adıyaman, Afyon, Ağrı, Amasya, Ankara, Antalya, Balıkesir, Batman, Bayburt, Bilecik, Bingöl, Bitlis, Burdur, Bursa, Diyarbakır, Elazığ, Erzincan, Erzurum, Eskişehir, Gaziantep, Giresun, Hakkari, Hatay, Isparta, İstanbul, İzmir, Kahramanmaraş, Kars, Kayseri, Kocaeli, Konya, Malatya, Manisa, Mardin, Mersin, Muğla, Muş, Niğde, Ordu, Sakarya, Samsun, Sinop, Sivas, Şanlıurfa, Tekirdağ, Tokat, Trabzon, Uşak, Van, Zonguldak). The volunteers are given specific instructions before completing the questionnaire if they hesitate to answer any questions or require further explanations related to the items of the questionnaire or the results of the study, though everything is clear in the instrument. In addition to this, their consent to participate in the study was taken at the beginning of the questionnaire.

Data Collection

The data is collected in 2 months, between March 2020 and May 2020. The questionnaire was developed by Arıkan (2008), and the necessary permission is obtained. The questionnaire is in English and applied to English Language Teachers irrespective of their graduation departments. It contains 2 parts, the first part of which gives demographic information. Gender, age, department of graduation, years of teaching experience, the stage they teach at, and the city they work in are among the information they share. The second part of the questionnaire includes 42 items, and these items are categorized under 6 sections which are layout and design (i1 -i11), activities (i12 - i18), skills (i19 - i22), language type (i23 - i29), subject and content (i30 - i38), and conclusion (i39 - i42). In the "Layout and Design" part, the participants are to rate 11 items related to the organization of the

textbook. In the “Activities” part, there are 7 items concerning the implementation of the task. In the “Skills” part, there are 4 items concerning the practice of skills. In the “Language Type” part, there are 7 items about the language choice. In the “Subject and Content” part, there are 9 items regarding the consistency between the subject/content and the students. In the “Conclusion” part, there are 4 items that aim to grasp the general idea about the textbook. At the very beginning of the study, although the questionnaire was applied before and attested to its reliability, the researchers preferred to recalculate the reliability levels referring to all sections of the questionnaire to make it more applicable.

Table 1. Reliability statistics

Sections of the Scale	N of Items	Cronbach's Alpha
The whole scale (i1-i42)	42	.96
Layout and Design (i1 – i11)	11	.92
Activities (i12 – i18)	7	.91
Skills (i19 – i22)	4	.87
Language Type (i23 – i29)	7	.88
Subject and Content (i30 – i38)	9	.92
Conclusion (i39 – i42)	4	.87

The reliability statistics are represented in table 1. As well as the reliability of the whole scale, each section's reliability Cronbach Alpha level is calculated separately, too. The reliability of this questionnaire as a whole is .96, which is accepted as reliable. The layout and Design section's reliability is found as .92. The reliability of the activities section is .91. The skills section's reliability shows .87. The language Type section's reliability is calculated as .88. The reliability of the Subject and Content section demonstrates .92. Conclusion section's reliability, with being least in number but still high in reliability level, is indicated as .87. All reliability levels are above .70, meaning they are reliable enough statistically.

The participants rated each item on a five-point Likert scale that ranges from 1 (I agree) to 5 (I do not agree at all). At the very beginning of the process, the data was planned to be collected from the teachers working in 7 regions of Turkey. Due to the Covid-19 pandemic, the instrument was converted into an online questionnaire applied to the teachers country-wide. Furthermore, due to this outbreak, a late ethical commission application to Amasya University was made to declare the reality that there is no obstacle to commence and fulfill the target study sincerely. Delightfully, the required approval was attained from the Social Sciences Ethical Commission of Amasya University.

Data Analysis

The teachers' views are collected through an online questionnaire, distributed via social media. In this regard, Google Forms, being one of the widely-used options in Coronavirus days, was preferred. Hence, a quantitative questionnaire was utilized by the researchers of this current study. The statistics are analyzed through SPSS 11, Statistical Package for the Social Sciences. One sample t-tests are applied for the 7 subsections of the questionnaire. Besides, Pearson correlation statistics are calculated to display the correlation levels and descriptive statistics are carried out for the frequencies and percentages of the existing study.

FINDINGS

In compliance with the collected data, the findings are delineated in the tables below.

Table 2. One sample t-test results for sub-sections of scale

Sections of Scale	N	X	S	SD	t	p
Layout and design	102	29.19	9.83	101	29.98	.000
Activities	102	19.56	6.50	101	30.38	.000
Skills	102	10.60	4.16	101	25.71	.000
Language Type	102	20.01	6.87	101	30.92	.000
Subject and Content	102	26.08	8.72	101	30.19	.000
Conclusion	102	10.91	4.27	101	24.83	.000

The analysis of Table 2 displays the one-sample t-test results for the 7 sub-sections of scale. As the table reflects, 7 sub-sections of the scale differ meaningfully from each other ($p < .05$) as the significance level of each section proves the successful distribution of the means since $t(101) = 29.98$ for Layout and Design, 30.38 for Activities, 25.71 for Skills, 30.92 for Language Type, 30.19 for Subject and Content and 24.83 for Conclusion, $p < .01$.

Table 3. Pearson correlation statistics of sub-sections of scale

	Layout-Design	Activities	Skills	Language Type	Subject-Content	Conclusion
Layout-Design						
Activities	.82**					
Skills	.76**	.75**				
Language Type	.79**	.79**	.73**			
Subject-Content	.78**	.82**	.75**	.75**		
Conclusion	.75**	.73**	.57**	.66**	.75**	
Mean	29.19	19.56	10.60	20.01	26.08	10.91
Sd	9.83	6.5	4.16	6.87	8.72	4.27

** . Correlation is significant at the 0.01 level (2-tailed).

In respect to one of the parametric statistical procedures named Pearson correlation results, the correlation levels that indicate the mean values of each section of the scale fit into the significance at the 0.01 level. Furthermore, at the significance level of 0.01, the table informs that each sub-section has a high positive correlation with one another in different degrees. It is obvious that the Layout and Design section has the highest positive correlation level with the Activities section ($r = .82, p < .01$), while it has the lowest high positive correlation level with the Conclusion section ($r = .75, p < .01$). The activities section has the highest positive correlation level with the Subject and Content section ($r = .82, p < .01$), whilst it has the lowest high positive correlation level with the Conclusion section ($r = .73, p < .01$). Skills section has the highest positive correlation level with the Subject and Content section ($r = .75, p < .01$) and Language Type section ($r = .73, p < .01$), whereas it has the lowest high positive correlation level with the Conclusion part ($r = .57, p < .01$). Language Type section has a high positive correlation with the Subject and Content section ($r = .75, p < .01$) and the Conclusion part ($r = .66, p < .01$). Lastly, the Subject and Content sections have a high positive correlation with the conclusion part ($r = .75, p < .01$).

Table 4. Descriptive statistics of teacher's viewpoint on textbooks given by MoNE

Sub-Sections	I totally Agree		I Agree		Not Sure		I Don't Agree		I Don't Agree At All	
	f	%	f	%	f	%	f	%	f	%
Layout-Design (11 Items with 1122 answers)	72	6.422	251	22.38	249	22.19	316	28.16	234	20.86
Activities (7 Items with 714 answers)	45	6.30	178	24.91	187	26.19	205	28.71	105	14.71
Skills (4 Items with 408 answers)	28	6.86	91	22.30	88	21.57	112	27.45	89	21.81
Language Type (7 Items with 714 answers)	49	6.86	240	33.61	125	17.51	181	25.35	119	16.67
Subject-Content (9 Items with 918)	78	8.50	279	30.39	186	20.26	221	24.07	154	16.78
Conclusion (4 Items with 408 answers)	35	8.58	88	21.57	111	27.21	79	19.36	95	23.28

Table 4 shares the findings concerning the frequencies and percentages of the teachers' answers. There are 6 sub-sections consisting of 42 questions. As it is clearly shown in Table 4, the majority of the teachers find textbooks inadequate in terms of Layout and Design since 316 answers which are 28.6 % are among the "I don't agree" option for the related sub-section. To be more precise, the first item is "The textbook includes a detailed overview of the functions, structures, and vocabulary that will be taught in each unit." 32 of the teachers with 31.3 % selected the "I DON'T AGREE" option. For the second item "The layout and design are appropriate and clear", 34 of the teachers with 33.3 % selected the "I AGREE" option dissimilarly. For the third item which is "The textbook is organized effectively.", 33 teachers, with 32.3%, selected the "I AM NOT SURE" option, and 32 of them, 31.3%, selected the "I DON'T AGREE" option. For the third item that is "An adequate vocabulary list or glossary is included", 28 of the teachers, with 27.4 %, selected "I AGREE" and 28 teachers, with 27.4%, selected the "I DON'T AGREE" section equally. For the fifth item which is "Adequate review sections and exercises are included.", 30 of the teachers, with 29.4%, selected the "I DON'T AGREE AT ALL" option. For the sixth item which is "An adequate set of evaluation quizzes or testing suggestions is included.", 38 teachers, with 37.2 %, selected the "I DON'T AGREE" option. The seventh item is "The teacher's book contains guidance about how the textbook can be used to the utmost advantage.", 35 teachers with 34.3 %, opted for the "I DON'T AGREE AT ALL" option. For the eighth item which is "The materials objectives are apparent to both the teacher and student.", 31 of the teachers with 30.3 %, chose the "I AM NOT SURE" option, 25 of the teachers with 24.5 %, selected the "I DON'T AGREE" option, and 24 of them with 23.5 %, selected the "I AGREE" option relatively. The ninth item is "The textbook meets the long- and short-term goals specific to my learners.", 28 of the teachers with 27.4 %, opted for the "I DON'T AGREE" option. For the tenth item which is "The workbook includes appropriate supplementary activities.", 31 of the teachers with 30.3 %, chose the "I AGREE" option. The eleventh item is "There is an adequate explanation to enable teachers to understand the cultural differences of the target language.", 34 of the teachers with 33.3 % opted for the "I DON'T AGREE" option.

The teachers find the activities in the textbook lacking since 205 of the answers with 28.71 % show they opted for the "I DON'T AGREE" option. To enter more details, for the twelfth item of activities sub-section which is "The activities encourage sufficient communicative and meaningful practice.", 35 of the teachers with 34.3 % opted for the "I DON'T AGREE" option. The thirteenth

item is "The activities incorporate individual, pair and group work.", 38 of the teachers with 37.2 % chose the "I AGREE" option differently. The fourteenth item is "The grammar points and vocabulary items are introduced in motivating and realistic contexts through games, songs, and storytelling.", 33 of the teachers with 32.3 % chose the "I DON'T AGREE" option. For the fifteenth item which is "The activities promote creative, original and independent responses.", 37 of the teachers with 36.2% chose the "I DON'T AGREE" option. For the sixteenth item which is "The tasks are conducive to discovery learning and the internalization of newly introduced language.", 32 of the teachers with 31.3% chose the "I AM NOT SURE" option and 29 teachers with 28.4% follow it chosen "I DON'T AGREE" option. For the seventeenth item which is "The textbook's activities can be modified or supplemented easily.", 32 of the teachers with 31.3% opted for the "I AGREE" option divergently. The eighteenth item is "There are interactive and task-based activities that require students to use new vocabulary to communicate.", 31 teachers with 30.3% selected the "I AGREE" option while 29 teachers with 28.4% opted for the "I DON'T AGREE" option closely.

For the skills sub-section, 112 answers given by the teachers with 27.45 % prove that practices of skills in the textbook are insufficient. To clarify, for the nineteenth item included in the skills sub-section which is "The materials include and focus on the skills that I/my students need to practice.", 28 of the teachers with 27.4% selected the "I AGREE" option meanwhile 27 of them with 26.4% opted for the "I DON'T AGREE" option almost coequally. For the twentieth item which is "The materials provide an appropriate balance of the four language skills.", 26 of the teachers with 25.4% selected the "I DON'T AGREE" option and another 26 of the teachers with the same percentage opted for the "I DON'T AGREE AT ALL" option levelly. The twenty-first item is "The textbook highlights and practices natural pronunciation (i.e.- stress and intonation).", 29 teachers with 28.4 % chose the "I DON'T AGREE" option and 29 teachers with the same percentage chose the "I DON'T AGREE AT ALL" option evenly. For the twenty-second item that is "The practice of individual skills is integrated into the practice of other skills.", 30 of the teachers with 29.4 % chose the "I DON'T AGREE" option.

Most of the teachers find the language typically used in the textbooks pertinent as 240 answers with 33.61 % demonstrate satisfaction with the language type used. To make it clear, 37 of the teachers with 36.2% chose the "I AGREE" option for the twenty-third item which is "The language used in the textbook is authentic - i.e., like real-life English.". The twenty-fourth item is "The language used is at the right level for my (students') current English ability.", 36 of the teachers with 35.2% selected the "I AGREE" option accordingly. For the twenty-fifth item which is "The progression of grammar points and vocabulary items is appropriate.", 38 of the teachers with 37.2% opted for the "I AGREE" option. For the twenty-sixth item that is "The grammar points are presented with brief and easy examples and explanations", 35 of the teachers with 34.3% selected the "I AGREE" option. For the twenty-seventh that is "The language functions exemplify English that I/my students will be likely to use.", 36 of the teachers with 35.2% opted for the "I AGREE" option. The twenty-eighth item is "The language represents a diverse range of registers and accents.", 35 of the teachers with 34.3 % selected the "I DON'T AGREE" option discretely. For the twenty-ninth item which is "The new vocabulary words and language structures are repeated in subsequent lessons to reinforce their meaning and use.", 41 of the students with 40.1 % chose the "I AGREE" option.

The subject and content of the textbooks are found viable by the greater part of the teachers as Table 4 suggests. The thirtieth item is "The subject and content of the textbook is relevant to my (students') needs as an English language learner(s).", 39 of the teachers with 38.2 % opted for the "I AGREE" option. For the thirty-first item which is "The subject and content of the textbook is generally realistic.", 45 of the teachers with 44.1 % chose the "I AGREE" option. In discordance with these answers, the thirty-second item that is "The subject and content of the textbook are interesting, challenging and motivating." is selected as "I DON'T AGREE AT ALL" by 28 of the teachers with 27.4%. The thirty-third item is "There is sufficient variety in the subject and content of the textbook." There is sufficient variety in the subject and content of the textbook.", 31 of the teachers with 30.3% opted for the "I AGREE" option. For the thirty-fourth item that is "The materials are not culturally biased, and they do not portray any negative stereotypes", 35 of the teachers with 34.3% chose the "I AGREE" option. For the thirty-fifth item that is "Students learn about the customs and cultures of English-speaking countries.", 34 of the teachers with 33.3% opted for "I AGREE" option. The thirty-sixth item is "The textbook is methodologically in line with the current worldwide theories and practices of language learning.", 31 of the teachers with 30.3 % selected the "I AGREE" option. For the thirty-seventh item which is "Compared to texts for native speakers, the content includes real-life issues that challenge the reader to think critically about his /her worldview.", 29 of the teachers with 28.4% selected the "I AM NOT SURE" option and 24 of them with 23.5 % opted for the "I DON'T AGREE" option. The thirty-eighth item is "The subject and content of the textbook is designed according to the theory of Multiple Intelligence.", 35 of the teachers with 34.3 % selected the "I DON'T AGREE" option.

In the conclusion part of the questionnaire, 111 answers with 27.21 % are from the option "I AM NOT SURE". When looked more closely, for the thirty-ninth item of "The textbook is appropriate for the language-learning aims of the Ministry of National Education in Turkey.", 36 teachers with 35.2 % selected the "I AGREE" option. For the fortieth item which is "The textbook is suitable for small-medium, homogeneous, co-ed. classes of 4th-grade students.", 39 of the teachers with 38.2 % selected the "I AM NOT SURE" option. For the forty-first item which is "The textbook raises my (students') interest in further English language study.", 52 teachers with 50.8 % selected "I AM NOT SURE" and "I DON'T AGREE" options with 25 teachers, 24.5%, selecting the "I DON'T AGREE AT ALL" option. For the last item of the questionnaire which is "I would choose to study/teach this textbook again.", 59 of the teachers with 57.8% opted for "I DON'T AGREE AT ALL" and "I DON'T AGREE" options and only a total of 24 teachers with 23.5% opted for "I AGREE" and "I TOTALLY AGREE" options.

DISCUSSION

This section offers a rendition of the findings of the current study. As Arıkan (2009) contends, what is critical in the application of course books is the teacher's manner of using them. Dinçer et al. (2010) maintain that teacher is the unique power who can affect the learning process for better or worse. From these points of view, it is pivotal to pay attention to the teachers' thoughts which are of paramount importance to uplift the textbooks given by MoNE. Thence, 102 English language teachers are volunteers to state their opinions on textbooks given by MoNE through an online questionnaire for this study.

To go about the descriptive statistics in Table 4, the textbooks given by MoNE are insufficient in recognition of Layout and Design. What is more, functions, structures, and vocabulary have not been discussed; exercises, evaluation quizzes, and guidance are scarce for the teachers. However, most of the teachers are neutral about the organization of the textbooks and the appearance of the material's objectives. Öztürk (2019) states that course books that do not correspond with the learners' needs would not attract their attention which would cause failure in the language learning process. Correlatively, the textbooks do not fit the aims of the process, which is one of the salient results of this study.

The teachers, in many aspects, do not welcome the activities substantial in the textbooks. They do not promote communicative and meaningful practice firstly. Games, songs, and storytelling are not utilized when introducing grammar and vocabulary items. The activities do not motivate students for autonomous responses; instead, they encourage students to work in pairs or groups. Şimşek and Dündar (2017) note that teachers should study their content after choosing a textbook and make preparations accordingly. An adaptation process generally follows this. Fortunately, most teachers think that activities could be modified or supplemented easily. This result exhibits that textbooks could be adapted with ease regardless of the deficiencies.

The practice of skills in textbooks is not balanced and integrated. Moreover, pronunciation practices are not featured adequately. Nevertheless, the teachers hold with the idea that skills-focused are parallel with the needs of their students. One outstanding result of the study reveals that the teachers are content with the language typically used in the textbooks given by MoNE. Öztürk (2019) states that inauthentic language in textbooks is a drawback for the language learning process. The teachers find the language authentic, which draws a positive image when it is considered that non-native authors prepare the books. Besides, the language type is also found proper for the students' level. The teachers deem the progression and presentation of grammar and vocabulary points suitable. Language functions performed in the textbooks are practical, and the new vocabulary and language structures are repeated, which is favorable. However, the textbooks do not offer diversity in registers and accents to listen to and practice.

The teachers tolerate the subject and content of the textbooks as they are found relevant, realistic, and variegated. There are no culturally biased materials and negative stereotypes. The textbooks include traditions of English-speaking countries and are in line with the contemporary theories and practices of language learning collaterally. The teachers are primarily uncertain that the content of the textbooks urges students to think critically. The subject and content of the textbook do not attract the interests of the teachers. Many of the teachers who participated in the study think that the multiple intelligence theory is disregarded while designing the textbooks.

In the conclusion part of the study, which is a thumbnail to some extent, it is in focus that the textbooks are found suitable for the language-learning aims of the Ministry of National Education in Turkey. On the other hand, they do not raise interest for students. A great majority of the teachers think they do not prefer to teach these textbooks again. Parallel to this, the textbooks are not favored by the teachers working in primary, secondary, and high school levels in contrast to the study implemented with 4th-grade teachers by Kırkgöz (2009). Even though textbooks could be modified facilely, they are not preferred to use again by the majority of the teachers.

CONCLUSION AND RECOMMENDATIONS

Textbooks procure novice teachers and learners a schedule appertaining to the curriculum and syllabus. Their role in language teaching and the learning process is voluminosly crucial. They are the most widely used course materials in transmitting knowledge and skills (Demir & Ertaş, 2014). They are also widely utilized when setting students homework. Besides, they guide both teachers and students in transmitting the knowledge of the language with concrete presentation and exemplification of the functions or samples of the target language.

For EFL learners, it can be stated that the teacher and the textbook are the two most important and substantial cultural links between the student's native culture and the target foreign culture (Otlowski, 2003). While learning a language, one learns a great deal about the target language, society, and culture. After the evaluation and assessment process, teachers can decide to omit culturally biased topics or add cultural diversities according to their students' needs. Similarly, they can adjust any unit or topic according to the learners' readiness. In this aspect, the roles and the importance of checklists in the textbook evaluation should be pointed out since they show the significance and relation of the sub-categories referred to as layout-design, activities, skills, language type, subject-content, and conclusion between one another and may display the descriptive of teachers' opinion about these sub-categories that constitute a complete evaluation at the end of this process. All in all, the textbooks used for foreign language teaching and learning in Turkey fails to reach their aims at providing enough input to the learners in terms of the skills of listening, speaking, reading, and writing besides the conclusion involving the aims of the MoNE and the learners' interests, however, they are found thriving in physical appearance, subject-content, and language type.

This seminal study is deeply concerned with the teacher perceptions of English textbooks given by MoNE. Previously published studies are limited to a specific grade or city. This study is implemented in several cities of Turkey to get the opinions of EFL teachers teaching at different educational grades. Therefore, the central thesis of this paper is to get the opinions of English language teachers on textbooks given by MoNE from diverse provinces in Turkey. This study, implemented in the Covid-19 epidemic process, confers on teacher views on English textbooks, making it unique from this standpoint. The study's main weakness lies in the fact that due to practical constraints, this study cannot provide an interview with the teachers, which may recontextualize the findings of the study. Future trials could include the interviews on the drawbacks they stated for their opinions on the textbooks or/and how they would like to adapt or what they come up with for the adaptation of the textbooks. At the same time, they are expected and ruled for using them in their admirable effort of teaching English as a foreign language at schools.

Overall, the striking results of the study indicate that English Language teachers are not satisfied with the content of the textbooks given by MoNE. Contrary to expectations, although the adaptability of the textbooks is found high by the teachers, they do not hope to use these textbooks again. This discrepancy could be attributed to their loss of motivation and reluctance to adopt the textbooks. So, the teachers' lack of motivation and reluctance to adapt the textbooks need to be taken into consideration so that the burnout conditions of teachers who are in-service to teach English as a foreign language should be prevented and revitalized.

Moreover, these disappointing findings leave a question mark over the minds: thinking that the textbooks are insufficient at several points, how do teachers adapt them to their learners? This could be another suggestion to scrutinize for further studies, which is one of the gaps this current study leaves to the researchers interested in the effectiveness of coursebooks in foreign language teaching settings.

Declaration of Conflicting Interests

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Statements of publication ethics

We hereby declare that the study has no unethical issues and that research and publication ethics have been fulfilled carefully.

Researchers' contribution rate

The study was conducted and reported with the equal collaboration of the researchers. S.İ.K. and A.S.B. conceived of the presented idea. S.İ.K. collected data and performed the computations. S.İ.K. and A.S.B. carried out the data analysis process and reported the findings. A.S.B encouraged S.İ.K. to investigate the effectiveness of English textbooks and supervised the findings of this study. All authors discussed the results and contributed to the final manuscript.

Ethics Committee Approval Information

The "Ethics Committee Approval Document" for this current study was taken from the Social Sciences Ethics Committee of Amasya University with the document date and the number 19/06/2020-E.11916.

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| Research Article / Araştırma Makalesi |

An Evaluation on Open and Distance Learning (ODL) Textbooks

Açık ve Uzaktan Öğrenme Ders Kitaplarının Değerlendirilmesi¹

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Keywords

1. Open-distance learning textbook
2. Evaluating textbooks
3. Individual learning
4. Content design
5. Visual design

Anahtar Kelimeler

1. Açık ve uzaktan öğrenme ders kitabı
2. Ders kitabı değerlendirme
3. Bireysel öğrenme
4. İçerik tasarımı
5. Görsel tasarım

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Abstract

Purpose: The present study aimed to investigate the compliance of ODE textbooks published by universities in and outside Turkey to textbook preparation criteria and identify the points that require improvement in those books.

Methodology: A qualitative data analysis method known as document analysis was employed to achieve this. Using the convenience sampling method, the ODE textbooks published by 10 universities in and outside Turkey and were accessible online were determined as the sample of the study. The textbooks were evaluated based on the Open and Distance Education Textbook Evaluation Checklist, developed by a previous study. The checklist comprised 44 items distributed to four domains: individual learning, content, visual design, and language. Each item was scored based on the criterion's complete fulfillment, partial fulfillment, and non-fulfillment.

Finding: The evaluation indicated that the textbooks showed good compliance to the criteria in terms of language and visual design while they needed improvement in the domains of individual learning and content, particularly in providing questions, examples, feedback sections, and in-text highlighting to improve the intelligibility of the content.

Öz

Çalışmanın Amacı: Çalışmada Açık ve Uzaktan Öğrenme (AUÖ) ders kitaplarında, bireysel öğrenme, dil ve anlatım, görsel tasarım ile içerik özelliklerinin uygunluk düzeyinin belirlenmesi amaçlanmaktadır.

Materyal ve Yöntem: Çalışmada nitel araştırma yöntemlerinden açıklayıcı durum çalışması kullanılmıştır. Kolay ulaşılabilir örneklem yöntemiyle ulaşılan toplam 10 üniversitenin AUÖ ders kitabı, araştırmanın örneklemini oluşturmaktadır. Araştırmada veri toplama aracı olarak araştırmacılar tarafından AUÖ ders kitaplarında bulunması gereken ölçütleri belirlemek amacıyla hazırlanmış, "Açık ve Uzaktan Öğrenme Ders Kitaplarını Değerlendirme Kontrol Listesi" kullanılmıştır. Toplam 44 maddeden oluşan kontrol listesi bireysel öğrenme, içerik, görsel tasarım ve dil-anlatım kategorileri altında toplanmıştır. Analiz aşamasında ders kitapları; ölçütler uygulanmamış, belirli bir düzeyde uygulanmış ve tam olarak uygulanmıştır şeklinde kodlama yapılarak incelenmiştir. Üniversite bazında ölçütlerin toplam puanı ve madde bazında ölçütlerin ortalama puanları hesaplanmıştır.

Bulgular: Araştırma sonucunda incelenen AUÖ ders kitaplarının dil ve anlatım ile görsel tasarım açısından yeterli düzeyde olduğu ancak bireysel öğrenme ve içerik konusunda geliştirilmesi gerektiği tespit edilmiştir. Ders kitaplarında geliştirilmesi gereken unsurların ise konunun anlaşılmasını kolaylaştıracak sorular ve örneklere yer verme, geri bildirim sunma, metin içi vurgulama yapma şeklinde sıralanmaktadır.

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INTRODUCTION

As an alternative method to meet the educational needs of society, the history of ODL dates back more than a century. With the general definition of ODL, the instructor and the learner are in separate places, and the time limit disappears, printed materials, or a system in which learning and teaching activities are carried out using electronic tools in ODL systems (Moore, 2013). The interaction factor is also significant because learners and instructors are far from each other regarding time and space (Kaysi & Aydemir, 2017; Mutlu et al., 2005). An essential factor in the success of ODL experiences indicative interaction, affecting the academic achievement of learners, their continuity in the system, and their motivation to learn evaluated as a variable (Anderson, 2006). Thurmond and Wombach (2004) stated that the purpose of interaction. They stated that the content was better understood, and skill acquisition was achieved in reaching the gains. The interactive distance the Moore (1996) interaction proposes his theory; between the learner-content, the learner-tutor, and the learner-learner. Anderson and Garrison (1998) added the "Six Dimensions of Interaction" theory to Moore's interaction dimensions and added the dimensions of instructor content, lecturer-instructor, content-content interaction. These types of interactions are essential. However, learner-content interaction comes to the fore regarding individual learning in ODL. Contents in ODL environments. While it initially consisted of only texts, it was enriched with animation, sound, and images with the developing technology. In this way, the learner takes a more active role in the lesson since the learner, and the instructor is physically in different places.

Individual learning materials designed to study whenever, wherever and whenever they want have become very common over the years. One of the essential individual learning materials offered to learners in ODL is the course is the books. Textbooks are used to transfer, share, and store information in ODL (Bozkurt, 2013). The textbooks' preparation covers a long process, and the content must have specific characteristics (Bodur, 2016). Communication between them is provided mainly by printed or electronic materials (Soules, 2008). Soefijanto (2002) especially. The importance of learner-content interaction in distance education is increasing due to accessibility and low-cost states that he has won. The design of textbooks, especially individual learning, enables learners to be more effective and productive. It allows them to have a learning experience (Bozkurt et al., 2018; Senge, 2001). Individual Textbooks prepared based on learning have some outstanding features (individual speed, repetition, Etc.). Of these, one is the use of various activities to enhance and promote learning. These activities are a topic for learners. Engage learners with content by encouraging them to respond to the text rather than remaining passive while working on it to be in them; to think for themselves, to find solutions to the questions asked, and thus to learn what they have learned enables them to apply (Bullen, 2007).

Victim of the learner about your lessons about a hundred learners without learning from ODL and lesson violations may become appropriate (Karaağaçlı & Erden, 2008). This extra son is in ODL ideal for making suggestions and directing to benefit from learning emerges (Mandernach, 2005). Broadcast quality, writing, content and expression features, and interior and exterior visual design should show different features from other publications and formal education textbooks (Bodur, 2010). Also, the textbook should help learners reach their goals and needs in the fastest and best way (Aydın, 2006; Jacobs, 2015). For this reason, it is of great importance to determine whether the textbooks in OLS systems have these characteristics and present the rationale for the study.

Purpose of the Research and Research Questions

One of the essential components of ODL systems established with extraordinary financial expenditures is textbooks. Considering that it is also a mediator of learning content interaction, the importance of preparing these books becomes clear comes out. Ensuring the suitability of textbooks for individual learning in terms of content, structure, expression, and interaction, it is necessary to examine the reflections of scientific principles such as more practical design, content, language expression in practice. For this reason, the checklist previously created by the researchers (Yavuz et al., 2020) was used in the study, and the ODL determined the appropriateness level of individual learning, language and expression, visual design and content features in textbooks is intended. For this purpose, answers to the following research questions are sought:

1. What is the level of individual learning characteristics in the textbooks used in ODL?
2. What is the level of language and expression features in the textbooks used in ODL?
3. What is the level of visual design features in the textbooks used in ODL?
4. What are the content featured in the textbooks used in ODL?
5. What are the elements in the coursebooks used in ODL? Some need to be developed in individual learning, language-expression, visual design, and content?

METHOD

In this section, the research model, sample, data collection process and data analysis are discussed.

Research Model

In the study, explanatory-descriptive case study, one of the qualitative research methods, is one of the types of case study used. A descriptive case study provides information and interpretation about a situation. It is a genre in which several situations

are used (Datta, 1990). In this case study, the data is interpreted. Therefore, in the study, an explanatory-descriptive case study was used.

Sample

The universe of the study consists of ODL textbooks in the world. The sample of the study is from Turkey and outside of Turkey. It consists of the textbooks of 10 universities' institutions offering ODL. Distribution of universities included in the sample and the books found on the internet with the readily accessible sampling method belonging to universities are shown in Figure 1.

The easily accessible sampling method was preferred as the sample selection method. For this reason, only textbooks universities with internet access were selected. In addition, the books are informatics, social sciences, science, health, history, English and education fields. Universities depend on a standard form of their own in preparing ODL textbooks. It was thought to be sufficient to choose one book from each university and examine only the selected book. The reason is that the structure of each university book is like each other in itself.

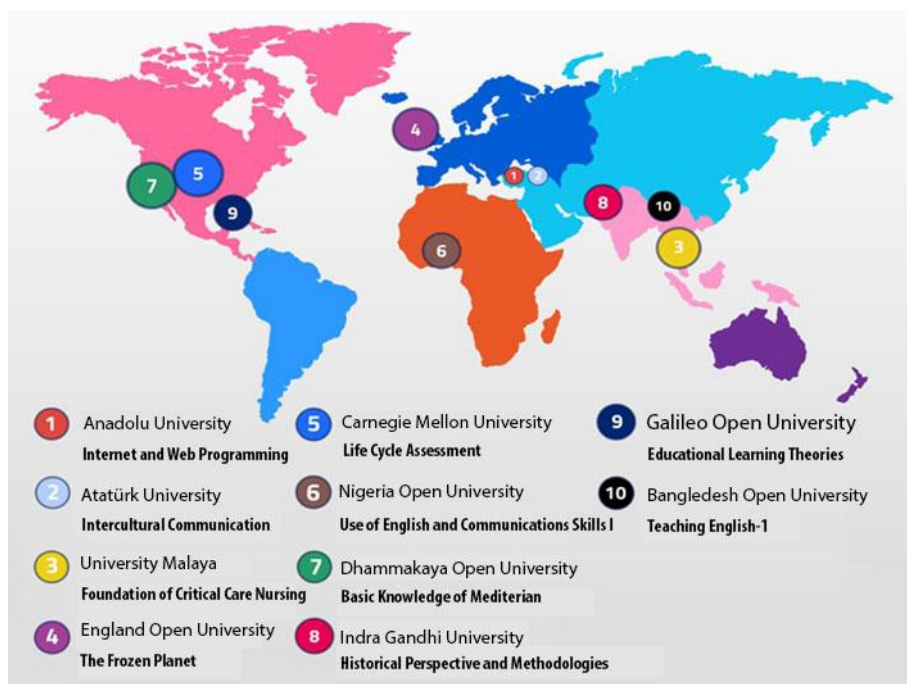


Figure 1. Examined ODL textbooks and universities

Data Collection Process

As a data collection tool in the research (Yavuz et al., 2020), it was further investigated through document review. The previously developed "Open and Distance Learning Textbooks Evaluation Checklist" was used. Checklist, ODL It has been prepared to determine the criteria that should be included in the textbooks. The checklist consists of 44 items in total and these items were grouped under the categories of individual learning (13), content (12), visual design (13), and language-expression (6). In the excel program, the criteria in the checklist were tabulated in a row, with university names in the column. The researcher examined the books independently and the presence or absence of the criteria was scored (0, 1, and 2).

The creation of the "Checklist for Evaluation of Open and Distance Learning Textbooks" used in the study phase has been completed. In the first step to identify the items in the checklist, the literature was scanned, and a conceptual framework was created, and the items were arranged. In the literature, in the preparation of the textbooks used in ODL. These features were determined by analyzing 27 studies on what should be the features to be considered. Second at the second stage, Atatürk University Computer and Computer Science Department was used to evaluate the items in the draft form of the checklist. The opinions of three field experts from the Instructional Technology Education department were sought. Field Experts Distance Education Center and Open Education Faculty members regarding field experts' checklist items, the items that should be changed with their opinions were rearranged and the checklist took its final form.

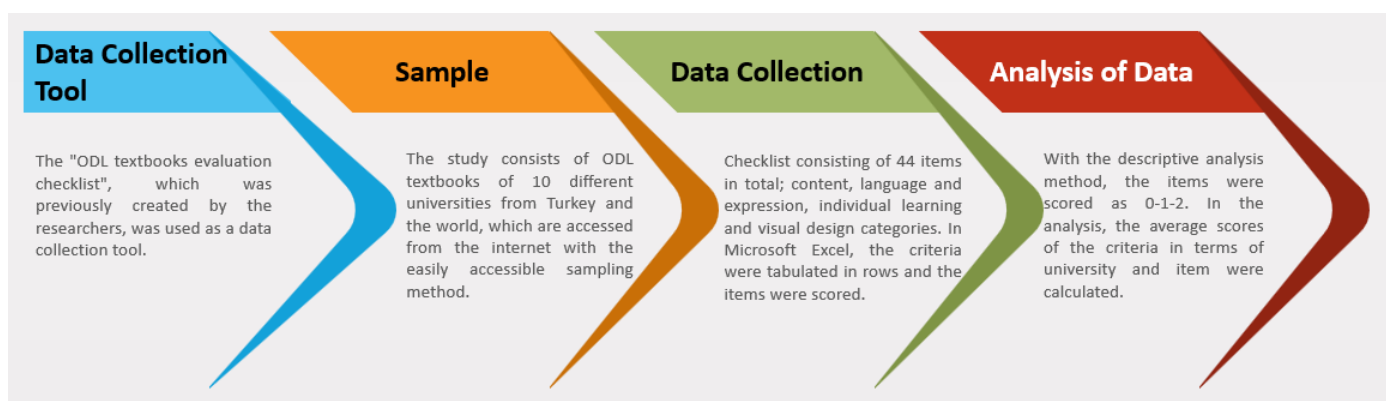


Figure 2. The process of research

Analysis of Data

Descriptive analysis, one of the qualitative data analysis types, was used in the research. Descriptive analysis is obtained with various data collection techniques. It includes summarizing and interpreting the collected data according to predetermined themes (Yıldırım & Şimşek, 2016). Previously created criteria are tabulated in MS excel. criteria in rows, university names in columns. The table is arranged as follows. The levels of finding the criteria were determined by the researchers and marked on the table. This 0, if there is no relevant criterion in the ODL textbook (for all criteria) to determine the level of presence of the criteria at the first stage, if it is at a certain level, it is scored as 1 and if it is at a certain level, it is scored as 2. Also, in the analysis the total score of the criteria based on the criteria and the average score of the criteria based on the item were calculated. Books from two universities analyzed separately by the researcher. Then, the consistency between these two researchers was examined. The consensus that gives consistency in the calculation should be at least 80% from each other (Miles & Huberman, 1994). The consistency between the researchers of these two books, which were evaluated independently, was calculated as 83%. Later on the other books to be examined were divided into two and the authors continued their analyzes separately. Researchers' reviews as a result, the criteria that differed from each other were reviewed and a consensus was achieved.

FINDINGS

In this section, the evaluations of the textbooks in terms of individual learning, language and expression, visual design, and content dimensions are given in the form of a table. University names are given in the tables by coding as U1, U2, U3, independent from Figure 1, due to ethical principles. Table 1 includes the evaluation results in terms of individual learning characteristics that should be included in ODL textbooks within the scope of the study. In terms of individual learning characteristics, the books were evaluated according to 13 criteria, and both the averages of the criteria and the total scores of the universities were given.

Table 1 includes the criteria for individuals to understand and apply the issues individually and evaluate themselves. At Table 1 "A comprehensive dictionary describing words and terms should be included", "The author should inform the reader about how to work with the textbook", and "The purpose and target of the subject should be given and planning should be made for timing" dimensions was found low mean. It is seen that the items with high averages are "informing the students about the target", "having a summary section at the end of the topic", "reinforcing the independent learning ability" and "giving students pre-regulators" have very high averages. Considering these criteria, it can be said that the books are at a good level in terms of preparing students for the concepts and information in the unit. However, it is noteworthy that pre-unit preparations and guidance for students are not sufficient. In general, it can be said that ALS textbooks should be developed in terms of paying attention to individual learning characteristics. In addition, some examples in terms of individual learning in the examined books are given below within the framework of the above items.

Chapter Summary

Life cycle assessment (LCA) is a framework for viewing products and systems from the cradle to the grave. The key benefit of adopting such a perspective is the creation of a "systems thinking" view that is broadly encompassing and can be analyzed with existing methods. When a life cycle perspective has not been used, unexpected environmental impacts have occurred, some that may be anticipated with a broader view.



Bireysel Etkinlik

•Kültürlerarası iletişim çalışmalarının tarihsel süreç içerisinde geçtiği dönüşümlerin toplumsal yaşam pratiklerinde yaşanan değişikliklerle bir bağı olabilir mi? Neden?

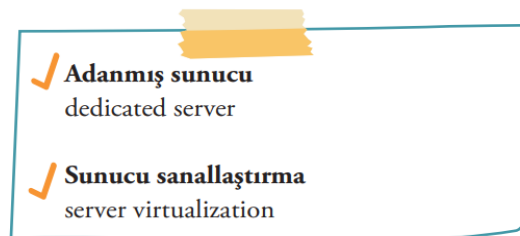
Figure 3. Examples of individual learning principles taken from books

When Figure 3 is examined, the picture on the left is an example of the statement "A repetitive question and summary should be included at the end of the chapters" in the fifth item. In contrast, the picture on the right is given as an example of the statement "It should contain activities to reinforce the independent learning ability" in the eighth item. In the study's second research question, ODL books were examined according to 6 components in terms of language and expression features. As a result of the evaluation, both the averages of the components and the averages of the universities are given in Table 2.

Table 2. Evaluation of ODL textbooks in terms of language and expression

Language and Expression	U1		U2		U3		U4		U5		U6		U7		U8		U9		U10		Mean		
	0	1	2	0	1	2	0	1	2	0	1	2	0	1	2	0	1	2	0	1		2	
1 Sentence lengths should be appropriate for the student.		✓		✓		✓		✓		✓		✓		✓		✓		✓		✓		✓	1.6
2 It should be checked in terms of grammar and spelling and should be free from printing errors.		✓		✓		✓		✓		✓		✓		✓		✓		✓		✓		✓	2.0
3 Active sentence structure should be used.		✓		✓		✓		✓		✓		✓		✓		✓		✓		✓		✓	1.6
4 Simple words should be used instead of technical words.		✓		✓		✓		✓		✓		✓		✓		✓		✓		✓		✓	1.6
5 Difficult words should be avoided.		✓		✓		✓		✓		✓		✓		✓		✓		✓		✓		✓	1.6
6 Foreign words should be given their meanings next to them.		✓		✓		✓		✓		✓		✓		✓		✓		✓		✓		✓	1.4
Total:	12/12		10/12		12/12		12/12		9/12		6/12		7/12		10/12		10/12		10/12				

When Table 2 is examined, it is seen that the textbooks are prepared by paying attention to language and expression criteria. It is seen that all universities pay attention to the criterion "It should be checked in terms of grammar and spelling and should be free from printing errors". It is seen that the averages are high in other criteria as well. At the same time, it was seen that half of the books examined met all the necessary criteria in terms of language and expression at a sufficient level. In addition, some examples in terms of language and expression in the examined books are given in Figure 4.



4.1 What is energy?

Energy is a word in common use but with a variety of everyday meanings. It does however have a precise scientific meaning and is an important concept.

- Think of two or three phrases in which you include the word 'energy' in an everyday sense.
- Possible examples are: 'Where do children get their energy from?', 'I haven't got the energy to get up' or 'Sweets are full of energy'.

None of the everyday uses of the word 'energy' is very precise but they all encapsulate the notion that energy enables activity to take place. This is also at the heart of the scientific notion of energy.

Energy is a physical property possessed by a substance and it is a measure of its capability to 'make things happen'. In order for things to happen, some of the energy

Figure 4. Examples of language and expression principles taken from books

When Figure 4 is examined, the picture on the left is an example of the statement "Foreign words should be given their meanings next to them" in the sixth item, one of the language and expression criteria, while the picture on the right is an example of the statement "Effective sentence structure should be preferred" in the third item. Within the scope of the third research question of the study, ODL textbooks were examined according to 13 criteria for their compliance with visual design principles. As a result of the evaluation, the averages of both the criteria and the universities are given in Table 3.

Table 3. Evaluation of ODL textbooks in terms of visual design

Visual Design	U1		U2		U3		U4		U5		U6		U7		U8		U9		U10		Mean		
	0	1	2	0	1	2	0	1	2	0	1	2	0	1	2	0	1	2	0	1		2	
1 Page layout should be simple.			✓			✓									✓							✓	2.0
2 Topics should be understandable.			✓			✓								✓								✓	1.8
3 Adequate space should be reserved for the images on the page.			✓			✓								✓	✓							✓	1.8
4 Page layout should be considered when using figures or pictures to support verbal information.			✓			✓						✓		✓	✓							✓	1.5
5 Multicolor printing should be avoided, except for the sake of meaning.			✓			✓								✓								✓	1.7
6 Once a standard format has been determined, the same format should be used in each unit or section.			✓			✓								✓								✓	2.0
7 It should have an interesting and course-appropriate cover design.			✓			✓						✓	✓		✓							✓	1.6
8 Page margins, line and paragraph spacing should be adequate for note-taking purposes.			✓			✓								✓								✓	2.0

9	Pages should be visually engaging and effective.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	1.1
10	Important terms should be bold or italicized.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	0.8
11	The figures and pictures used should help explain the text and should be positioned in relation to the text.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	1.3
12	Irregular right indent margins should not be used.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	2.0
13	All capital letters should be avoided.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	2.0
Total:		26/26	25/26	25/26	23/26	24/26	18/26	16/26	13/26	23/26	19/26	

In Table 3, the visual design principles of the ODL textbooks are included. It is seen that universities pay attention to the criteria of "not using irregular right indentation margins", "adequate page margins, line and paragraph spacing", "determining and using a standard format throughout the book" and "simple page layout". It can be said that this situation provides students with ease of use of the books. However, it has been observed that the criteria such as "bold or italicize important concepts", "the pages must be visually interesting and effective" and "the figures and pictures used to help explain the text" are applied less than other criteria. When evaluated as a university, it can be stated that the averages are high. In general, although it is seen that an order in the page structure is tried to be preserved in OLS textbooks, it is possible to say that there are situations that need to be improved in terms of effective use of visual elements. In addition, some examples in terms of visual design in the examined books are given below within the framework of the above items.

Hall, kültürlerarası iletişim paradigmasını oluştururken ne Georg Simmel'in *yabancı* teorisinden ne de Charles Darwin'in yüz ifadeleri ile sözsüz iletişim araştırmasından yararlanmıştı. Hall'ün eserlerinde atıfta bulunulmayan çalışmalar olmalarına rağmen hepsi günümüzde kültürlerarası iletişimin esasını oluşturan eserler olarak değerlendirilir. Öyle ki, kültürlerarası iletişim alanında günümüzde sıkça kullanılan kavramlara bakıldığında, bunların FSI'nin 1951'den 1955'e değin geçen süredeki entelektüel ortamının sonucu olduğu görülür. Georg Simmel'in (1908 ve 1921) *yabancı* kavramı, William Graham Sumner'in (1946/1940) *etnosentrizm* kavramı ve Benjamin Lee Whorf'un (1940) *dilbilimsel relativite* teorisi ilk akla gelen örnekleri oluşturmaktadır. Bununla beraber, 1951'de kültürlerarası iletişimin henüz bir adı yoktu, kültür ve iletişim kesişmesinin kavramsallaşması henüz ortaya çıkmamıştı ve *sessiz dil* (*silent language*) olarak yapılan sözsüz iletişim çalışmasının kültürlerarası iletişimin bir bileşeni olduğu kabul edilmiyordu (Rogers, Hart and Miike, 2002).

Students need real life use, skill based subject, use English texts, journals, research, internet, e-mail, recruitment in GOs, NGOs, civil, military administration

English plays a vital role in Bangladesh at present. Although Bangla has been introduced as the medium of instruction in our universities, teachers and students have to use English textbooks and journals for study and research in nearly all disciplines of knowledge. English is the only means to use internet and e-mail. It is a required subject for all competitive examinations for recruitment in government service and NGOs. It is used extensively in civil and military administration, in courts, in trade and commerce with foreign countries, in banks and tourism. The ability to use English language effectively is regarded as a necessary qualification for our communication with foreigners and foreign countries. Thus both educationally and socially, English has a very important role to play in our country.

Figure 5. Examples of visual design principles taken from books

When Figure 5 is examined, the picture on the left is an example of the statement "Important concepts should be written in bold or italics" in the tenth item of the visual design criteria, while the picture on the right is given as an example of the statement "There should be enough space on the page margins to take notes" in the eighth item. Within the scope of the fourth research question of the study, the content dimension of the ODL textbooks of the universities was examined according to a total of 12 criteria. As a result of the examination, the averages of both the criteria and the universities are given in Table 4.

Table 4. Evaluation of ODL textbooks in terms of content

Content	U1			U2			U3			U4			U5			U6			U7			U8			U9			U10			Mean																														
	0	1	2	0	1	2	0	1	2	0	1	2	0	1	2	0	1	2	0	1	2	0	1	2	0	1	2	0	1	2																															
1	Close, accustomed and examples of daily life should be given to students																														✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	1.6			
2	The Contents section should be included.																														✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	1.8			
3	Subjects should be written according to the principle of simple complex / closely.																														✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	1.9			
4	Unnecessary information intensity should be avoided in the content																														✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	2.0			
5	Examples and sample statements for information should be given.																														✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	1.0			
6	The content flow should consist of interconnected paragraphs.																														✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	1.9			
7	In the content, the student's attention should be kept alive with the interesting questions.																														✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	0.9			
8	Subjects must be preparatory to the next topic of the previous subject.																														✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	2.0			
9	Multiple ways should be monitored when given content.																														✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	0.8			
10	The subject must be divided into small sections that can be read easily and subheadings should not be avoided.																														✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	1.3			
11	General framework of the subject is given at introduction																														✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	1.9			
12	Titles, references and bibliographies of the objects and texts used are given clearly.																														✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	1.4			
Total:																															21/24			20/24			12/24			20/24			21/24			17/24			16/24			19/24			17/24			22/24			

When the Table 4 is examined, "avoidance of unnecessary knowledge", "the preparatory nature of the previous subject of issues is preparatory to the next topic of the submission to the next topic" and "simple complex / close away" is to be written according to the principle in the ODL textbooks. However, it is observed that the students are less payable than other substances, "Considering the student's attention on the content and the student's attention to the student's attention", "more than one path in transferring content" and "exemplary information on the transmitted information". This can be interpreted in the presentation of the content in ODL textbooks in the presentation of a standard structure. In addition, some examples are given in Figure 6 within the framework of the above items in the books.

Contents

Introduction	5
Learning Outcomes	6
1 Views of the frozen planet	7
2 The temperature in the polar regions	9
3 A flat map of a spherical world	14
4 The energy balance	17
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5 Energy from the Sun	22
5.1 The seasons	22
6 Defining the Arctic and Antarctic	26
6.1 Habitats and temperatures: defining the Arctic	27
6.2 A line in the ocean: defining the Antarctic	29

Chapter 1 : Life Cycle and Systems Thinking

In this chapter, we introduce the concept of “thinking” about life cycles. Whether or not you become a practitioner of LCA, this skill of broadly considering the implications of a product or system is useful. We first provide definitions of life cycles and a short history of LCA as it has grown and developed over the past decades, then give some examples where application of life cycle thinking (rather than completion of full-blown LCAs) will demonstrate where analyses can lead (or have already led) to poor decisions. The goal is to learn how to think about problems from a system wide perspective.

Figure 6. Examples of context principles taken from books

When the Figure 6 is examined, the picture on the left is examples of the second item of the content category. It has been stated that the contents section should be in the item. The picture on the right is given as an example of "a general view of the subject" in the 11th item. When preparing ODL textbooks, it is necessary to keep eligible for individual learning, language and explanation, visual design, and content. However, it is seen that the textbooks examined within the scope of the study are not sufficiently provided by these features. Especially the elements that need to be developed in individual learning, visual design and content angle are given in Table 5.

Table 5. Dimensions that need to be developed in ODL textbooks

Individual Learning	<ul style="list-style-type: none"> • Feedback • Expressions to individual research (activities) orientation • Guides related to how students should work • Alphabetical dictionary
Content	<ul style="list-style-type: none"> • Additional reading or activities at the end of the unit • Remarkable and interesting questions in the text • Keywords • Reinforcing samples related to subject
Visual Design	<ul style="list-style-type: none"> • In-text highlights • Inability to emphasize distinctions to be considered

In Table 5, it is observed that the elements that make it easy to study in ODL textbooks, especially in the course books. In addition, it is also understood that the content should be considered in-text highlights to support examples, questions, and events and provide mindfulness in the text.

CONCLUSION and DISCUSSION

Today, ODL institutions, which are becoming more and more widespread, offer printed or digital textbooks to learners. Various features should use these materials to support their learning through these materials effectively needs to be prepared. In this study, individual learning, language expression, visual design and content in the ODL textbooks. It is aimed to determine the level of suitability of the features. In particular, the textbooks are suitable for individual learning preparation, an acceptable level of visual design, a more effective, efficient and satisfying learning experience for learners enables them to experience. In addition, the content is prepared correctly and effectively and reinforces the subject. The presence of examples, questions, and activities also facilitates the understanding and retention of the subject and increases satisfaction (Öztürk et al., 2017).

Students are informed about the objectives in the ODL textbooks prepared according to individual learning characteristics preparers are used (Moore, 2013), and feedback items are included same (Çepni et al., 2001). At the same time, the texts within the subject should be enriched by considering different learning styles (BCcampus, 2018; Jacobs, 2015; Kaya, 2002; Lean, 1996). However, in the textbooks examined within the scope of the study, these features are sufficiently does not appear to have been complied with. Especially in the use of pre-preparers, it is generally accepted that the concepts related to the unit are given, but the unit is noteworthy that the instructions regarding the sections and applications in it are not given mistakes in the textbooks. It is also imperative to provide feedback to prevent learning. Facilitate learning and prevent mislearning to prevent this, unit evaluation questions should be given at the end of the unit (Kızılçaoğlu, 2003; Koçdar, 2006). In some of the books examined within the scope of the study, if the learners give wrong answers to the questions. There is guiding feedback. However, only the correct answer is given by giving multiple-choice questions in some of them. It is noteworthy that confirmation feedback is given by asking open-ended questions based on interpretation. This is the feedback type, and learners may not learn the reason for making mistakes. Instead, learners learn the source of the error. They should be given detailed feedback to understand (Shute, 2008). It is seen that the textbooks examined within the scope of the study do not include intriguing questions, but examples from daily life are presented. However, the only course content to get rid of orderliness, students' attention is drawn with intriguing and compelling questions (Ekici, 2003) and examples from daily life should be tried to withdraw (Willis, 2002).

One of the crucial criteria to be considered in the preparation of ODL textbooks is language and expression features. It is necessary to use plain and understandable language not to have difficulty understanding. Study in the course books examined

within the scope of the study, it is stated that the terms and concepts suitable for the relevant content are not included and that the effective sentence structure is used. When the literature is examined, it can be seen that the comprehensibility of the content in the ODL textbooks using plain language (Kaya, 2002) and active sentence structure free of technical and complex words is emphasized (Lockwood, 2018).

Visual design and page structure are also fundamental in ODL textbooks. According to Megep (2011), the design should have integrity. While designing the books in the ODL books, the integrity of the design, the integrity of the pages in terms of the continuity of the student's attention must carry. In the textbooks examined, it was generally avoided to avoid page density, to work by taking notes. It is seen that there are spaces for those who want it. Intensive presentation of information in textbooks reduces productivity (Moore, 2013). According to Taş (2007), the density of the pages should be avoided, and students should take notes that required space should be left. In addition, it was ensured that the image related to the text was close to the text closeness was observed in the books examined. Considering the spatial proximity (Çepni et al., 2001; Kaya, 2002; Kızılcıoğlu, 2003). Visual according to Yılmaz and Yanarates (2020). Design elements are also crucial in terms of mental development.

As a result, the ODL coursebooks of universities are generally prerequisites that increase readiness in terms of individual learning. Intermediate questions and activities supporting independent learning were included with the organizers. However, the term has determined that the dictionaries with explanations of the concepts are generally not given in terms of language and expression. As a result, the books are well prepared, the words and sentences are suitable for the level of the student, and there are no printing mistakes seen. The books are simply learning, the same standard in all units in terms of visual design. Features such as the adoption of the design and the presence of spaces on the margins of the page for the use of the learner came to the fore. In terms of content, unnecessary density is avoided in ODL textbooks, and an overview of the subject is given at the beginning of the unit and units were observed to be complementary. In short, language and expression and visual design of ODL textbooks. It has been determined that it is at a sufficient level in terms of individual learning and content, but it needs to be developed in terms of individual learning and content. The elements that need to be developed in the books are questions and examples that will facilitate understanding the subject, feedback presenting, and in-text highlighting.

SUGGESTIONS

Within the scope of the study, the critical suggestions that should be considered in the preparation of ODL textbooks are as follows;

- Individual learning characteristics should be taken into account in OLS textbooks:
 - Engaging content with intriguing questions and examples to keep students' attention must be submitted.
 - It should be considered that students can learn in different styles. For this purpose, graphs and pictures should be used in different activities.
 - A comprehensive alphabetical glossary to explain words and terms should be included.
 - At the end of the unit, feedback should be presented to the learners in the questions given for the repetition of the topic.
- Content features should be taken into account in OLS textbooks:
 - The necessary information about the unit (such as activity, application and time) should be made.
 - More than one path in the transmission of content (such as text, pictures, and graphics)
 - The intelligence should be ensured that the content is made up of headings and subtitles.
 - A lot of samples and non-examples of transferred information should be given.
- Visual design features should be taken into account in OLS textbooks:
 - Pages should be visually exciting and straightforward.
 - Important terms should be bold or italicized.

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| Research Article / Araştırma Makalesi |

The Relationship between Organisational Support and Teacher Leadership Perceptions of High School Teachers

Liselerde Görev Yapan Öğretmenlerinin Örgütsel Destek ile Öğretmen Liderliği Algıları Arasındaki İlişki

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Abstract

Purpose: The main purpose of this study is to determine the relationship between organisational support and teacher leadership perceptions of high school teachers.

Design/Methodology/Approach: The population of this study, which was designed in the relational screening model, consists of teachers working in state high schools in the central districts of Hatay in the 2018-2019 academic year. 298 teachers were selected through the random selection method. The research data collected by the "Perceived Organisational Support Scale" and "Teacher Leadership Scale" were analysed via arithmetic means frequency values, percentage, standard deviation, Kruskal Wallis test, Mann Whitney U test, Pearson product of moments, and simple linear regression analysis.

Findings: According to the results, it was determined that teachers' perceptions of organisational support and teacher leadership are high. Teachers' perceptions of the teacher leadership's dimension of collaboration with colleagues differ significantly according to seniority and educational status variables. It has been observed that teachers working in schools accepting students without examination have a higher perception of organisational support than teachers working in schools that accept students with aptitude tests. There is a moderately positive significant relationship between teachers' perceptions of organisational support and teacher leadership. The study determined that organisational support is a significant predictor of the sub-dimensions of teacher leadership, institutional development, professional development, and collaboration with colleagues.

Highlights: Teachers who accept students without an exam have a higher perception of organisational support than teachers who accept students with aptitude tests. This shows that the school type is an important variable. In this direction, qualitative studies can be conducted to gain in-depth information on why the perception of organisational support differs according to school types. Considering that organisational support is a predictor of teacher leadership, it can be stated that there is a need for studies to determine the factors affecting teachers' perceptions of organisational support.

Öz

Çalışmanın amacı: Makalenin özeti, "Calibri (Gövde)" metin fontu, 8 punto, tek satır aralığı ve paragraf sonuna 6 nk boşluk eklenilerek yazılmalıdır. Özet 150 ile 350 kelime arasında olmalıdır. Özetle makalenin amacı, kullanılan yöntemi, ulaşılan temel bulgular, sonuç ve önerileri açık bir şekilde belirtilmelidir. Makalenin özeti, "Calibri (Gövde)" metin fontu, 8 punto, tek satır aralığı ve paragraf sonuna 6 nk boşluk eklenilerek yazılmalıdır.

Materyal ve Yöntem: Makalenin özeti, "Calibri (Gövde)" metin fontu, 8 punto, tek satır aralığı ve paragraf sonuna 6 nk boşluk eklenilerek yazılmalıdır. Özet 150 ile 350 kelime arasında olmalıdır. Özetle makalenin amacı, kullanılan yöntemi, ulaşılan temel bulgular, sonuç ve önerileri açık bir şekilde belirtilmelidir. Makalenin özeti, "Calibri (Gövde)" metin fontu, 8 punto, tek satır aralığı ve paragraf sonuna 6 nk boşluk eklenilerek yazılmalıdır.

Bulgular: Makalenin özeti, "Calibri (Gövde)" metin fontu, 8 punto, tek satır aralığı ve paragraf sonuna 6 nk boşluk eklenilerek yazılmalıdır. Özet 150 ile 350 kelime arasında olmalıdır. Özetle makalenin amacı, kullanılan yöntemi, ulaşılan temel bulgular, sonuç ve önerileri açık bir şekilde belirtilmelidir. Makalenin özeti, "Calibri (Gövde)" metin fontu, 8 punto, tek satır aralığı ve paragraf sonuna 6 nk boşluk eklenilerek yazılmalıdır.

Önemli Vurgular: Makalenin özeti, "Calibri (Gövde)" metin fontu, 8 punto, tek satır aralığı ve paragraf sonuna 6 nk boşluk eklenilerek yazılmalıdır. Özet 150 ile 350 kelime arasında olmalıdır. Özetle makalenin amacı, kullanılan yöntemi, ulaşılan temel bulgular, sonuç ve önerileri açık bir şekilde belirtilmelidir. Makalenin özeti, "Calibri (Gövde)" metin fontu, 8 punto, tek satır aralığı ve paragraf sonuna 6 nk boşluk eklenilerek yazılmalıdır.

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INTRODUCTION

Various theories and concepts are put forward to understand, explain, predict, and control the behavior of employees in the organisational environment. Therefore, a theory that comes to the fore in the literature is social change. According to the social change theory, when employees feel supported by their organisations, they reflect these feelings as positive attitudes and behaviors towards their organisations (Uzun, 2018). In other words, the perception of organisational support is an element that shapes employees' behaviors. Perceived organisational support is defined as employees' perceptions about how much importance is attached to their contributions to the organisation and how much attention is paid to their welfare (Eisenberger, Huntington, Hutchison, and Sowa 1986).

The fact that the employees in the organisation feel safe and know that the organisation is behind them is an indicator of perceived organisational support (Özdevecioğlu, 2003, p. 113). Perceived organisational support meets employees' socio-emotional needs such as respect, attachment, and emotional support (Eisenberger & Stinglhamber, 2011). Employees who feel cared for and valued in the organisation tend to develop an emotional commitment to the organisation (Tsui, Pearce, Porter, & Tripoli, 1997). Rewarding the efforts of employees in the organisation to achieve a job, appreciating their contribution to the organisation, and paying attention to their well-being, etc., are all indicators of perceived organisational support (Eisenberger et al., 1986).

Organisational support has many positive effects on employees and the organisation. Employees who perceive organisational support have increased creativity, responsibility, job satisfaction, organisational commitment, organisational citizenship behaviors, and decreased feelings of stress, exhaustion, absenteeism, and quitting (Akin, 2008). As a result of the research, it has been revealed that organisational support increases employees' performance and organisational commitment (Bishop, 2000; Cropanzano, 1999; Erdoğan & Ender, 2007; Meyer et al., 2002). Perceived organisational support is also related to employees' psychological well-being and positive attitudes towards their jobs (Eisenberger & Stinglhamber, 2011; Rhoades & Eisenberger, 2002). While perceived organisational support leads to organisational citizenship behaviours (Rhoades & Eisenberger, 2002; Riggle, Edmondson, & Hansen, 2009; Wayne, Shore, & Liden, 1997), there are significant relationships between executive support and emotional attachment (Hutchinson, 1997). Rhoades and Eisenberger (2002) found that perceived organisational support increases the likelihood of employees doing their jobs with more enjoyment and being more positive. Hence, it has been determined that burnout, stress, headache, and anxiety are less common.

Organisational support effectively creates suitable conditions for employees to perform their duties and responsibilities in the best way. However, apart from other organisations, the effect of organisational support in educational institutions is not limited to this. When teachers feel supported, they contribute more towards achieving their goals and feel more secure and peaceful (Nayır, 2012). Perceived organisational support positively affects teachers' emotions towards teaching and can increase teachers' feelings of pride, pleasure, and hope (Argon & Yılmaz, 2019). Literature studies show that organisational support is positively related to teachers' perceptions of organisational support, organisational trust (Eğriboyun, 2013; Uzun, 2018), organisational identification levels (Uzun, 2018), job performances, job satisfaction, and work engagement (Chinomona & Sandada, 2014; Meriç, Çiftçi, & Yurtal, 2019; Miao, 2011; Way, Sturman, & Raab, 2010). Furthermore, it is negatively related to intentions to leave (Uzun, 2018) and organisational cynicism attitudes (Gökkyer & Türkoğlu, 2018). As a result of a meta-analysis conducted by Kasalak (2020), it was determined that teachers' perceptions of organisational support led to positive organisational outcomes such as organisational trust, organisational identification, organisational citizenship behaviors, work commitment, organisational commitment, and proactive work behavior.

Unlike traditional school leadership and the limitations of official authority on leadership, the concept of "teacher leadership" (Kılıç ve Receptoğlu, 2013) has emerged to be an essential tool for school development. School management ensures the distribution of power and authority among teachers to develop teacher leadership (Muijs & Harris, 2006). The essence of teacher leadership lies in transforming schools into learning organisations, supporting teachers to become more equipped in this process, and ensuring that schools have a more democratic climate (Beycioğlu & Aslan, 2012).

Teacher leadership includes serving teachers individually as coaches or consultants, organising the curriculum, leading the department, developing programs or materials, coordinating professional development, supporting action research, managing the distribution of materials required for teaching, and participating in decision making (Harris & Muijs, 2005). According to York-Barr and Duke (2004), teacher leadership is the process of influencing teachers' colleagues, principals, and other members of the school to improve their teaching and learning practices to increase student learning and success. Teacher leadership includes enhancing professional development and shared policies and decision-making processes. Teacher leadership aims to improve student learning and facilitate school change and development (Wenner & Campbell, 2017). According to Can (2007), teacher leadership is the ability of teachers to support the development of their colleagues by influencing the formal processes of the classroom and school, being willing, and taking an active role in planned activities throughout the school. Teacher leadership is essential for school and student success. Studies in the literature show that teacher leadership is related to academic success (Eker, 2019; Sugg, 2013). Moreover, Teacher leadership also causes an increase in teachers' organisational citizenship behaviors (Uğurlu & Yiğit, 2014), while decreasing their stress levels (Kılınç, Cemaloğlu, & Savaş, 2015).

Developing teachers' qualifications and leadership skills for their students are critical in terms of school effectiveness (Koşar, Er, Kılınç, & Koşar, 2017). It can be stated that with the development of teacher leadership, the success of schools and students

will increase (Beycioğlu & Aslan, 2012). It is necessary to provide a collaborative working environment for all individuals to learn together and strengthen teachers' self-efficacy perceptions to increase the leadership behaviors of teachers in a school (Kurt, 2016). While the supportive behaviors of the principal strengthen teacher leadership (Eker, 2019; Savaş, 2016), the existence of a supportive school climate in the school and the cooperation of teachers with their colleagues will contribute to the increase of teacher leadership behaviors (Öztürk & Şahin, 2017). According to Inanır (2020), teachers' integration with work will positively increase with a supportive school climate and teacher leadership.

Literature reviews provide limited information on the conditions necessary for teachers to exhibit leadership behaviors. Other organisational variables that are effective in teacher leadership should also be determined. Organisational support seems likely to be one of these variables because employees who perceive that they are valuable and essential to the organisation will make more effort to achieve the organisation's goals or increase its efficiency (Büyükgöze & Kavak, 2017). Organisational support can provide the organisational motivation that mobilizes employees and directs their behavior (Eisenberger et al. 1986). This organisational motivation can create the necessary environment for employees to reveal their potential leadership skills. When it comes to educational organisations, teachers motivated by the perception of organisational support are more likely to lead the process of planning and implementing instructional activities, actively managing the process, to collaborate and interacting with colleagues in the teaching process. In other words, organisational support is crucial for teacher leadership. Nonetheless, no studies on the relationship between organisational support and teacher leadership in the literature were examined.

Purpose of the Research

The main purpose of this study is to examine the relationships between teachers' perceptions of organisational support and their perceptions of teacher leadership. In line with this purpose, the problem sentence of the research is "Is there a relationship between organisational support and teacher leadership according to the opinions of teachers working in high schools?" and the answers to the following questions were sought:

1. What are the perception levels of organisational support and teacher leadership of high school teachers?
2. Do high school teachers' perceptions of organisational support and teacher leadership differ according to gender, age, professional seniority, educational status, and high school type variables?
3. Is there a significant relationship between the perception levels of organisational support and teacher leadership of high school teachers?
4. Are organisational support perception levels of high school teachers a significant predictor of their teacher leadership perceptions?

METHOD

This research was designed through the relational survey model. The explanatory and predictive correlations revealed the teachers' perceptions of organisational support and leadership. The study's independent variable is based on perceived organisational support, while the dependent variable is on teacher leadership's sub-dimensions of institutional development, professional development, and collaboration with colleagues.

Population and Sample

The population consists of 1227 teachers working in 36 state high schools in the central districts of Hatay province in the 2019-2020 academic year. Using the sample calculation formula (Büyükoztürk, Çakmak, Akgün, Karadeniz, & Demirel, 2010), it was calculated that 293 teachers from 36 public high schools should be included in the sample at a significance level of .05, and data was collected from 350 teachers from 15 public high schools. However, it was seen that the data collection tool of 52 participants was not suitable for analysis, and the data obtained from these tools were not included in the analysis. Therefore, the sample was formed through 298 randomly selected teachers from 15 schools. The demographic information of the participants is presented in Table 1 below.

Table 1. Demographic information of the participants (n = 298)

		n	%
Gender	Female	121	40.6
	Male	146	49.0
	Total	267	89.6
Age	20-30 years old	23	7.7
	31-40 years old	101	33.9
	41-50 years old	114	38.3
	51 years old and over	52	17.4
	Total	290	90.3
Professional Seniority	0-10 years	59	19.8
	11-20 years	113	37.9
	11-15 years	101	33.9
	Total	273	91.6
Educational status	Associate degree	7	2.3
	Undergraduate	219	73.5
	Graduate	46	15.4
	Total	272	91.3
High School Type	High schools that accept students without an examination	121	40.6
	High schools that accept students with an examination	145	48.7
	High schools that accept students with a special talent examination	32	10.7
	Total	298	100

Data Collection Tools

The data were collected by the “Perceived Organisational Support Scale”, “Teacher Leadership Scale”, and demographic information forms.

Perceived Organisational Support Scale (POSS): POSS developed by (Eisenberger et al. 1986) and adapted to Turkish by Akin (2008) was used to measure teachers’ perceptions of organisational support. The original scale consists of 36 items. However, within the current study, a short form of the scale consisting 16 items based on one single dimension was used. The scale is 7-point Likert type and has values in the range of “strongly disagree (1)” and “totally agree (7)”. The internal consistency coefficient of the scale was found to be .94. Confirmatory Factor Analysis (CFA) was applied to test the scale’s construct validity. The results of DFA; $X^2 = 388.47$, $df = 104$ ($p = .00$), $X^2 / sd = 3.74$, $GFI = .80$, $AGFI = .74$, $RMSEA = .086$, $NFI = .95$, $SRMR = .070$, $CFI = .96$ were determined to be within the acceptable value limits (Çokluk, Şekercioğlu, & Büyüköztürk 2012; Meydan & Şeşen, 2011; Schermelleh-Engel, Moosbrugger, & Hans, 2003).

Teacher Leadership Scale (TLS): TLS developed by Beycioğlu and Aslan (2010) was used in the study to measure teachers’ perceptions of teacher leadership. The scale consists of three sub-dimensions (institutional development, professional development, and collaboration with colleagues) and 25 items. The scale is in 5-point Likert form and takes values between “always (5)” and “never (1)”. The scale evaluates teacher leadership roles in terms of perception and expectations. In this study, only teacher leadership roles were evaluated in terms of perception. The internal consistency coefficient of the scale was calculated as .95. The internal consistency coefficient of the scale was found to be .94. The sub-dimensions were .89 for “organisational development”, .90 for “professional development”, and .81 for “collaboration with colleagues”. The construct validity was tested by Confirmatory Factor Analysis (CFA). The results of DFA; $X^2 = 608.14$, $df = 249$ ($p = .00$), $X^2 / df = 2.44$, $GFI = .82$, $AGFI = .78$, $RMSEA = .063$, $NFI = .96$, $SRMR = .066$, $CFI = .98$ were determined to be within the acceptable value limits (Çokluk, Şekercioğlu, & Büyüköztürk 2012; Meydan & Şeşen, 2011; Schermelleh-Engel, Moosbrugger, & Hans, 2003).

Analysis of Data

The missing or erroneous data and the data with extreme values (according to Z values) were analysed by statistical programs. Descriptive statistics (frequency, percentage, arithmetic mean, standard deviation, correlation coefficients) and nonparametric tests (Kruskal Wallis test and Mann Whitney U test) were used in the data analysis. Additionally, the suitability of the data for normal distribution (kurtosis, skewness, and relative multivariate kurtosis coefficients) and whether there was a problem with multicollinearity (TV and VIF values) were checked, and the predictive relationships between the variables were examined by simple linear regression analysis.

FINDINGS

The arithmetic means and standard deviation values related to organisational support and teacher leadership are given in Table 2 below.

Table 2. Teachers' perception level of organisational support and teacher leadership

Variables	\bar{X}	S.D.
Organisational support	5.76	.95
Teacher leadership (Overall)	4.22	.53
Institutional development	3.90	.72
Professional development	4.45	.48
Collaboration with colleagues	4.31	.58

When Table 2 examined, it is seen that teachers' perceptions of organisational support ($\bar{x} = 5.76$) are high (in the "I agree" option), and teachers' perceptions of teacher leadership ($\bar{x} = 4.22$) are also high (in the "always" option). Besides, when the sub-dimensions were examined, the highest score was observed within professional development ($\bar{x} = 4.45$) while the lowest within institutional development ($\bar{x} = 3.90$).

The Mann-Whitney U test results on the teachers' perception of organisational support and leadership according to gender are given in Table 3 below.

Table 3. Mann Whitney U test results of teachers' perceptions of organisational support and teacher leadership according to gender

Variables	Mean Ranks		Sum of Ranks		U	p
	Female n = 121	Male n = 146	Female n = 121	Male n = 146		
Organisational support	144.74	125.10	17513.50	18262.50	7533.50	.038
Teacher leadership	139.40	129.52	16867.00	18910.50	8179.50	.298
Institutional development	137.21	131.34	16603.00	19165.00	8444.00	.535
Professional development	141.61	127.69	17135.00	18643.00	7912.00	.141
Collaboration with colleagues	135.59	132.68	16406.00	19372.00	8641.00	.758

When Table 3 is examined, teachers' perceptions of organisational support ($U = 7533.50$; $p < .05$) show a significant difference according to gender. Accordingly, it can be stated that female teachers have more perception of organisational support than male teachers. Besides, it can be seen from Table 3 that the perceptions of teachers regarding teacher leadership and the sub-dimensions of institutional development, professional development, and collaboration with colleagues are not significantly different according to gender. In other words, male and female teachers' perceptions of their leadership roles are similar.

The Kruskal Wallis tests result on the teachers' perception of organisational support and leadership according to age are given in Table 4 below.

Table 4. Kruskal Wallis test results of teachers' perceptions of organisational support and teacher leadership according to age

Variable	Mean ranks				df	X^2	p	Significant difference
	A n = 23	B n = 101	C n = 114	D n = 52				
Organisational support	167.52	150.46	149.75	116.82	3	8.320	.040	A-D, B-D, C-D
Teacher leadership	135.17	144.09	148.33	146.59		.517	.915	
Institutional development	148.46	143.98	146.64	144.66		.088	.993	
Professional development	132.48	148.31	146.34	143.96		.703	.872	
Collaboration with colleagues	118.00	139.04	154.18	151.18		4.610	.203	

A: 20-30 age B: 21-40 age C: 41-50 age D: 51 and overage

When Table 4 is examined, it is seen that teachers' perceptions of organisational support differ significantly according to the age variable [$X^2_{(3)} = 8.320$; $p < .05$]. Mann Whitney U test was applied to determine which groups caused this difference. Accordingly, it was determined that teachers aged 51 and over had lower organisational support perceptions than teachers in the 20-30, 21-40, and 41-50 age groups. Besides, it can be seen from Table 4 above that the perceptions of teachers regarding teacher leadership and the sub-dimensions of institutional development, professional development, and collaboration with colleagues are not significantly different according to age.

The Kruskal Wallis test results on the teachers' perception of organisational support and leadership according to professional seniority are given in Table 5 below.

Table 5. Kruskal Wallis test results of teachers' perceptions of organisational support and teacher leadership according to professional seniority

Variables	Mean ranks			df	X^2	p	Significant difference
	A n = 59	B n = 113	C n = 101				
Organisational support	135.70	144.85	128.97	2	2.180	.336	-
Teacher leadership	119.55	145.42	137.78		4.181	.124	-
Institutional development	126.98	142.96	136.18		1.610	.447	-
Professional development	122.28	145.48	136.11		3.398	.183	-
Collaboration with colleagues	113.53	142.97	144.03		6.777	.034	A-B, A-C

A: 0-10 years B: 11-20 years C: 21 years and over

When Table 5 is examined, it is seen that teachers' perceptions of organisational support do not differ significantly according to professional seniority. Similarly, it can be seen from Table 5 that the perceptions of teachers regarding teacher leadership and the sub-dimensions of institutional development and professional development are not significantly different according to professional seniority. However, teachers' perceptions of collaboration with colleagues differ significantly according to the seniority variable [$\chi^2_{(2)} = 6.777$; $p < .05$]. Mann-Whitney U test was used to determine the difference between groups. Accordingly, it was determined that teachers with seniority of 0-10 years had a lower perception of collaboration with colleagues than teachers between 11-20 years and over 21 years.

The Kruskal Wallis test results on the teachers' perception of organisational support and leadership according to educational status are given in Table 6 below.

Table 6. Kruskal Wallis test results of teachers' perceptions of organisational support and teacher leadership according to educational status

Variables	Mean ranks			df	χ^2	p	Significant difference
	A n = 7	B n = 219	C n = 46				
Organisational support	91.21	138.20	135.32	2	2.434	.296	-
Teacher leadership	72.50	137.56	141.18		4.842	.089	-
Institutional development	77.64	136.31	146.38		4.659	.097	-
Professional development	89.50	137.56	146.38		2.594	.273	-
Collaboration with colleagues	64.71	139.09	135.09		6.188	.045	A-B, A-C

A: Associate degree B: Undergraduate C: Graduate

When Table 6 is examined, it is seen that teachers' perceptions of organisational support do not differ significantly according to their educational status. Similarly, it can be seen from Table 6 that the perceptions of teachers regarding teacher leadership and the sub-dimensions of institutional development and professional development are not significantly different according to the educational status. However, teachers' perceptions of collaboration with colleagues differ significantly according to the educational status. [$\chi^2_{(2)} = 6.188$; $p < .05$]. Mann-Whitney U test was used to determine the difference between groups. Accordingly, it was determined that teachers with associate degrees have a lower perception of collaboration with colleagues than teachers with undergraduate and graduate degrees.

The Kruskal Wallis test results on the teachers' perception of organisational support and leadership according to high school type are given in Table 7 below.

Table 7. Kruskal Wallis test results of teachers' perceptions of organisational support and teacher leadership according to the high school type

Variables	Mean ranks			df	χ^2	p	Significant difference
	A n = 121	B n = 145	C n = 32				
Organisational support	161.21	146.24	119.97	2	6.206	.236	A-C
Teacher leadership	158.28	143.09	145.34		.344	.344	-
Institutional development	159.38	141.38	148.94		2.888	.834	-
Professional development	153.07	147.37	145.66		.364	.408	-
Collaboration with colleagues	157.11	145.56	138.56		1.793	.045	-

A: Teachers working in high schools that accept students without an examination

B: Teachers working in high schools that accept students with an examination (LGS-High School Entrance Exam)

C: Teachers working in high schools that accept students with a special talent examination

When Table 7 is examined, teachers' perceptions of organisational support differ significantly according to the high school type [$\chi^2_{(2)} = 6.206$; $p < .05$]. Mann-Whitney U test was used to determine the difference between groups. Similarly, it was observed that teachers working in high schools that accept students without examination had a higher perception of organisational support than teachers working in high schools that accept students with aptitude tests. Besides, it can be seen from Table 7 that the perceptions of teachers regarding teacher leadership and the sub-dimensions of institutional development, professional development, and collaboration with colleagues are not significantly different according to the high school type.

Correlation analysis results regarding organisational support and teacher leadership are presented in Table 8 below.

Table 8. Correlation coefficients for organisational support and teacher leadership

Variables	1	2	3	4	5
1. Organisational support	-	.444**	.434**	.391**	.318**
2. Teacher leadership		-	.924**	.892**	.816**
3. Institutional development			-	.692**	.671**
4. Professional development				-	.646**
5. Collaboration with colleagues					-

When Table 8 is examined, there is a moderate, positively significant relationship ($r = .444$, $p < .01$) between teachers' perceptions of organisational support and teacher leadership. In addition, there is a moderate, positively significant relationship

between organisational support and institutional development ($r = .434, p < .01$); professional development ($r = .391, p < .01$), collaboration with colleagues, and organisational support ($r = .318, p < .01$). Accordingly, it can be stated that if teachers' perceptions of organisational support increase, their perceptions of teacher leadership towards institutional development, professional development, and collaboration with colleagues will increase.

The simple linear regression analysis results for predicting the sub-dimensions of teacher leadership are presented in Table 9 below.

Table 9. Simple linear regression analysis for predicting the sub-dimensions of teacher leadership (n= 298)

Variable	Institutional development ^a			Professional development ^b			Collaboration with colleagues ^c		
	β	t	p	β	t	p	β	t	p
Constant	-	8.809	.000	-	20.714	.000	-	16.322	.000
Organisational support	.434	8.295	.000	.391	7.299	.000	.318	5.780	.000

^a $R = .434, R^2 = .189, F_{(1-296)} = 68.812, p = .000$

^b $R = .391, R^2 = .153, F_{(1-296)} = 53.280, p = .000$

^c $R = .318, R^2 = .101, F_{(1-296)} = 33.408, p = .000$

When Table 9 is examined, significant relationships are observed between organisational support and institutional development ($R = .434, R^2 = .189$), professional development ($R = .391, R^2 = .153$), and collaboration with colleagues ($R = .318, R^2 = .101$). It is seen that organisational support is a significant predictor of institutional development ($F_{(1-296)} = 68.812, p < .05$), professional development ($F_{(1-296)} = 53.280, p < .05$), and collaboration with colleagues ($F_{(1-296)} = 33.408, p < .05$). Organisational support explains 19%, 15%, and 10% of institutional development, professional development, and collaboration with colleagues, respectively.

DISCUSSION and RECOMMENDATIONS

We found that the participant teachers had a high level of organisational support perception. The findings of the research conducted by Argon and Yılmaz (2019), Argon and Ekinci (2017), Eğriboyun (2013), Geçer (2015), Nartgün and Kalay (2014), Terzi and Çelik (2016) show consistency with this finding. According to the research results, it can be said that teachers' perceptions of teacher leadership are high. In other words, it can be stated that teachers create a positive classroom climate by planning activities to improve student learning in the classroom and aim to develop a learning culture at school by working with their colleagues. This finding is similar to the findings of studies conducted by Aslan, Çalık, and Er (2019), Beycioğlu and Aslan (2012), Kılınç and Receptoğlu (2013), Öztürk and Şahin (2017), Yılmaz (2018) and Yılmaz, Oğuz, and Altinkurt (2017). It was determined that the teachers had high professional development perceptions and low institutional development perceptions. This finding is similar to the research findings of Beycioğlu and Aslan (2012), Savaş (2016), Yılmaz, Oğuz, and Altinkurt (2017) and Yılmaz (2018). According to the research findings, teacher leadership is necessary for professional development. Accordingly, teachers consider behaviors including the use of technology, learning and using different teaching methods, and following the developments in their field are essential in terms of educational quality. However, despite their efforts to increase the quality of education in the classroom, it can be stated that their participation in studies based on school development is weaker. According to Balyer (2016), teacher leaders are always at the forefront of participation in the decisions taken at school, the suggestions they present at meetings, and the planning of social activities at the school. In summary, it can be stated that the institutional development dimension of teacher leadership is at a lower level than professional development and colleague cooperation since it expresses that teachers have multidimensional characteristics.

Teachers' perceptions of organisational support show a significant difference according to gender. Accordingly, female teachers have a higher perception of organisational support than male teachers. Different results have been reached in the studies conducted in the literature. In the studies conducted by Eğriboyun (2013), Argon and Ekinci (2017), Büyükgöze and Kavak (2017), Turan-Dallı (2018), and Uğur (2017), teachers' perceptions of organisational support do not differ significantly according to gender. However, in the studies conducted by Gül (2010) and Meriç, Öztürk Çiftçi, and Yurtal (2019), teachers' perceptions of organisational support differ significantly according to gender, and it was found that male teachers' perceptions of organisational support were higher compared to female teachers. Nayır (2011) found that male teachers' perceptions of management support were higher than female teachers. On the other hand, a meta-analysis study by Rhoades and Eisenberger (2002) found a weak and significant relationship between gender and the perception of organisational support. In this context, some findings are similar or different from the findings of this study in the literature. These differences are thought to stem from the difference in the study's sample group. Eğriboyun (2013), Büyükgöze and Kavak (2017), Turan-Dallı (2018), and Gül (2010) conducted their studies on a secondary education sample; Argon and Ekinci (2017), Meriç, Öztürk Çiftçi, and Yurtal (2019) Uğur (2017), and Nayır (2011) conducted their studies on the primary school sample. This research was conducted on a secondary education sample consisting of five high school types (Anatolian High School, Vocational and Technical Anatolian High School, Fine Arts High School, Sports High School, Science High School). In this respect, female teachers' reason for having a higher perception of organisational support than male teachers may differ in the sample group.

We observed that the perceptions of teachers regarding teacher leadership and the sub-dimensions of institutional development, professional development, and collaboration with colleagues did not significantly differ according to gender. In

other words, the teacher leadership perceptions of male and female teachers are at a similar level. This finding and the research findings of Ovacıklı (2018), Kılınç and Repepoğlu (2013), Yılmaz, Oğuz and Altinkurt (2016), Beycioğlu and Aslan (2012), and Yılmaz (2018) overlap. On the other hand, it is stated in the literature that the behaviors of female and male employees may differ within the framework of the concept of "gender-role spillover," which means the transfer of gender-based behavioral expectations to the workplace (Gutek, & Morasch, 1982). A meta-analysis study conducted by Eagly and Johnson (1990) revealed that leadership styles differ according to gender. They attributed this situation to expectations, behavior, and roles that differ according to gender. However, the present study differs in terms of the sample. The sample of Eagly and Johnson's (1990) study is probably the managers chosen by their institutions according to specific criteria. In contrast, the present study is formed by teachers and focuses on teachers' perceptions of how much they put themselves in leadership positions and to what extent they display leadership roles. Unlike administrators, it can be said that conditions of entering the teaching profession do not differ according to gender, reducing the possibility of the leadership roles differing by gender.

We found that teachers' perceptions of organisational support differed significantly according to the age variable. Accordingly, it was observed that teachers in the age group 51 and over had a lower perception of organisational support than teachers in the 20-30, 21-40, and 41-50 age group. In other words, it can be stated that as the age of teachers increases, their perceptions of organisational support decrease. This finding coincides with the research findings conducted by Derinbay (2011) and Yoshimura (2003). In Derinbay's (2011) research, teachers' perceptions of organisational support, administrative support and justice were higher in younger age group teachers. According to Yoshimura (2003), the organisational support perceptions of older employees are lower than those of younger employees. It can be stated that young teachers need to learn more about the school's functioning and organisational culture and be guided and informed more, and thus they receive more organisational support. It can be said that teachers need organisational support less in the process as their professional experience and knowledge increase with age. The literature has reached different results on whether teachers' perceptions of organisational support differ significantly according to the age variable. In the studies conducted by Eğriboyun (2013), Erkol (2015), Geçer (2015), and Uğur (2017), it was determined that teachers' perceptions of organisational support did not differ significantly between the age variable. This difference in research results may be because the studies were conducted at different education levels and with different sample sizes.

Teachers' perceptions of teacher leadership in general and sub-dimensions of institutional development, professional development, and peer collaboration do not differ significantly by age. In other words, teacher leadership perceptions of teachers from different age groups are similar. Teacher leadership is an understanding based on the development of skills that will contribute to the professional learning skills of teachers of all age groups in the institution, colleague relations, and the school's development. Therefore, it can be stated that teachers' perceptions of teacher leadership are similar regardless of age. In the literature, there are limited numbers of empirical studies examining teachers' perceptions of teacher leadership according to the age variable, and different findings have emerged in the studies. In the study conducted by Akdoğan (2021), there are significant differences in teachers' perceptions of teacher leadership. The perceptions of the teachers aged 41-50 and those aged 51 and over are higher than those in the 20-30 age range. The study conducted by Gülbahar (2017) determined that the 36-40 age group teachers' perceptions of teacher leadership in the professional development dimension were different and higher than the 26-30 age group teachers' perceptions of teacher leadership. The study conducted by Önder and Küpeli (2018) determined that teachers aged 30 and younger had higher perceptions of teacher leadership. The study conducted by Kılınç and Repepoğlu (2013), determined that teachers' perceptions of teacher leadership did not differ significantly in terms of professional development and cooperation with colleagues according to the age variable. Still, there was a significant difference in the dimension of institutional development. This difference may be related to the studies conducted at different education levels and with different sample sizes.

We concluded that teachers' perceptions of organisational support did not differ significantly according to seniority. In other words, organisational support perceptions of teachers with different seniority are similar. This finding corresponds to the findings of the studies conducted by Erkol (2015), Eğriboyun (2013), Gül (2010), Nartgün and Kalay (2014), Terzi and Çelik (2016), and Turan-Dallı (2018). In this study, teachers' perceptions of teacher leadership's professional development and institutional development dimensions do not differ significantly according to the seniority variable; on the other hand, their perceptions regarding the collaboration with colleagues' dimension differ significantly according to the seniority variable. We found that teachers with a seniority of 0-10 years have a lower perception of peer collaboration than teachers with a seniority of 11-20 years and over 21 years. This may be because teachers develop cooperation and solidarity among themselves in the process. It is natural for teachers to increase their professional knowledge and experience depending on their professional seniority. Thus, the desire of senior teachers to share their professional knowledge and experience with their colleagues, who are relatively less senior than themselves, may have led to higher perceptions of colleague cooperation. Some studies in the literature show similarities or differences with these research findings. In the studies conducted by Yılmaz (2018) and Yılmaz, Oğuz, and Altinkurt (2017), no significant difference was found between perceptions of teacher leadership according to professional seniority. The study conducted by Gülbahar (2017) determined that the professional development perceptions of teachers with 11-15 and 16-20 years of seniority were significantly higher than the professional development perceptions of teachers with 6-10 years of seniority. In the study conducted by Kılınç and Repepoğlu (2013), it was determined that less experienced teachers with 1-5 years of seniority had higher perceptions of the colleague cooperation dimension of teacher leadership. The study conducted by Beycioğlu and Aslan (2012) determined that although all sub-dimensions of teacher leadership differ significantly according to the variable of

professional seniority, the perceptions of teachers with a seniority of 21 years and above are higher than the perceptions of other teachers. This difference may be because the studies were conducted at different educational levels.

We determined that teachers' perceptions of organisational support did not differ significantly according to educational status. In other words, the perceptions of organisational support of teachers with different education levels are similar. This finding of the study overlaps with the findings of the studies conducted by Büyükgöze and Kavak (2017), Kılınç (2019), Meriç, Öztürk Çiftçi and Yurtal (2019), Nartgün and Kalay (2014), and Uğur (2017). We observed that teachers' perceptions of teacher leadership in general and sub-dimensions of institutional development and professional development did not show a significant difference according to the variable of educational status. However, teachers' perceptions of the collaboration with colleagues dimension of teacher leadership differ significantly according to educational status. Accordingly, it has been determined that teachers with an associate degree have a lower perception of colleague cooperation than teachers with undergraduate and graduate degrees. Accordingly, it can be stated that as the level of education increases, cooperation and solidarity among teachers increase. This may be because teachers with associate degrees go through a shorter training program and consequently develop less interaction and cooperation. Studies by Beycioğlu (2009), Yılmaz (2018), and Dinçer (2017) reveal that teachers' perceptions of teacher leadership do not differ significantly according to the variable of educational status.

We determined that teachers' perceptions of organisational support differed significantly according to the high school's type variable. It has been observed that teachers working in schools that accept students without examination have a higher perception of organisational support than teachers working in schools that accept students with aptitude tests. Considering that teachers working in schools that accept students without exams, deal with disciplinary problems, administrative affairs, and work in more crowded classrooms, it may seem natural that they need more organisational support. The schools that accept students with the talent exam are the Fine Arts High School and the Sports High School. Unlike other schools, in high schools that accept students with aptitude tests, it is crucial to create the necessary physical environments for teachers to reach the course's objectives and develop the skills of their students. For this reason, the organisational support of teachers in these schools becomes more important.

We found that teachers' perceptions of overall teacher leadership and institutional development, professional development and collaboration with colleagues did not differ significantly according to the variable of high school type. In other words, teacher leadership perceptions of teachers working in high schools that accept students differently are similar. In the studies conducted in the literature, teachers' perceptions of teacher leadership were examined from different angles according to the high school type variable. Accordingly, in the study conducted by Gül (2010), it was determined that the organisational support perceptions of teachers in private high schools were higher than those in public high schools. In the study conducted by Geçer (2015), it is stated that teachers working in Anatolian High Schools have higher organisational support perceptions than other types of high schools. The study conducted by Önder and Küpeli (2013) revealed that teachers' perceptions of teacher leadership differed significantly in all dimensions according to the school type. They also stated that the perceptions of teacher leadership of the participants working in science and social sciences high schools were higher than those working in other high schools. Similarly, Savaş (2016) determined that teachers' perceptions of the institutional development dimension of teacher leadership differed significantly according to the type of school, and teachers working in academic high schools had higher perceptions of teacher leadership than vocational high school teachers. In this study, the teacher leadership perceptions of teachers working in different high school types are similar (related to sample diversity and size).

There is a moderate, positive, and significant relationship between teachers' perceptions of organisational support and teacher leadership. In addition, there are moderately positive and significant relationships between institutional development, professional development, collaboration with colleagues, and organisational support. Accordingly, it can be stated that if teachers' perceptions of organisational support increase, teachers' perceptions of teacher leadership's dimensions of institutional development, professional development, and collaboration with colleagues will increase. It can be said that with perceived organisational support, teachers will make more effort to achieve the school's goals, and they will be better motivated to do their work. According to Tanrıverdi and Kılıç (2016), organisational support has a reducing effect on the level of alienation of the individual from the organisation. As organisational support increases, job satisfaction, emotional commitment, and performance increase (Rhoades & Eisenberger, 2002). According to Berg and Zoellick (2019), one of the essential elements of teacher leadership is the perception of support. It is necessary to provide opportunities for teachers to develop their professional development and leadership skills and support teachers in working with and getting help from school principals. In the research conducted by Araşkal and Kılınç (2019), it was determined that the inadequacy of administrative support is a problem faced by teacher leaders. However, teacher leaders can take more responsibility and risk when they get the support of school principals (Araşkal & Kılınç, 2019). According to Can (2006), school principals should first create an environment that encourages leadership and provides and supports teachers with self-development opportunities to develop teacher leaders.

We determined that organisational support and teacher leadership were significant predictors of institutional development, professional development, and collaboration with colleagues. Accordingly, organisational support explains 18% of organisational development, 15% professional development, and 10% collaboration with colleagues. In the light of these findings, it can be stated that organisational support affects teacher leadership. Teachers, who feel valued and cared for by the organisation, will strive to improve their teaching activities to increase student learning at school and influence and lead their colleagues in this regard. According to Öztürk (2017), creating a supportive school culture by encouraging teacher leadership can significantly contribute to

the emergence and development of teacher leadership. In this direction, some studies can be done to create a culture of teacher leadership at school. For example, greater participation in teacher leadership can be achieved by creating opportunities for teachers to participate in decision-making processes and support professional development opportunities. In short, school administrations should develop a positive relationship with teachers based on cooperation. According to Harris and Muijs (2005), teachers will engage in more activities when they work together in solidarity and cooperation with their colleagues and are supported. In this way, teachers can have systematic opportunities to cooperate with their colleagues. Thus, collective learning increases and teacher leaders can better contribute to the professional development of their colleagues (Rutherford, 2006). As a result, it is thought that teacher leadership can be improved by strengthening organisational learning in schools, supporting teachers to create a positive school climate, revealing leadership skills, and creating a culture of learning together.

This study examined the relationship between organisational support and teacher leadership perceptions of different high school types of teachers. Studies could be conducted using different variables at different education levels to contribute to the field in this context. Furthermore, we argue that there is a need for studies to determine the factors that will increase the perception of organisational support, examine the results of organisational support, and the factors that will affect teacher leadership.

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Statements of publication ethics

We hereby declare that the study has no ethical issues and that research and publication ethics have been carefully observed.

Ethics Committee Approval Information

In this study, all rules stated to be followed within the scope of "Higher Education Institutions Scientific Research and Publication Ethics Directive" were followed. The second part of the directive is "contradictory to the Scientific Research and Publication Ethics Actions" title was not carried out in any of the actions specified below.

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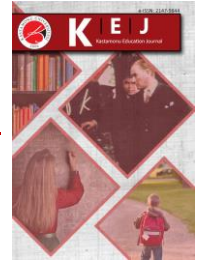
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| Research Article / Araştırma Makalesi |

A Study on Developing an Achievement Test for Fine Arts High School Guitar Lessons

Güzel Sanatlar Lisesi Gitar Derslerine Yönelik Başarı Testi Geliştirme Çalışması

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Keywords

Achievement Test
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Abstract

Purpose: This study aims to develop achievement tests for 9th, 10th, 11th and 12th-grade guitar lessons with high validity and reliability, which can be used in guitar education in music departments of Fine Arts High Schools.

Design/Methodology/Approach: In this study, which was carried out using the survey design, one of the quantitative research methods, the units, subjects and outcomes of the guitar lessons in the curriculum of the Fine Arts High School where this study was carried out were examined along with the lectures and textbooks, and four different achievement tests were developed for each grade. The achievement test for 9th graders consisted of 40 items, while the 10th, 11th and 12th had 35 items. Expert opinions were taken for the design, scope and structure validity of the prepared tests and corrections were made in the test items in line with the feedback from the experts. The tests were applied with 79 guitar students studying at seven different Fine Arts High Schools in 2016-2017.

Findings: The data collected due to the test application were analyzed. The achievement test of 9th grade, which initially consisted of 40 items, was finalized to have 28 items, the reliability coefficient was $\alpha = .912$, the average item difficulty index was $\bar{p} = 0.59$. The achievement test for the 10th-grade guitar lesson, which initially consisted of 35 items, was revised to have 19 items; in the end, the reliability coefficient was $\alpha = .879$, the average item difficulty index was $\bar{p} = 0.55$. The achievement test for the 11th-grade guitar lesson was prepared as 35 items, but the number of final items was 25, the reliability coefficient was $\alpha = .868$, the average item difficulty index was $\bar{p} = 0.60$. The 12th-grade guitar lesson achievement test was prepared as 35 items; the number of final items was 18, the reliability coefficient was $\alpha = .865$, and the average item difficulty index was $\bar{p} = 0.50$.

Highlights: All achievement tests developed for guitar training were conducted at the undergraduate level when the literature was examined. It is thought that this study will contribute to the field in the secondary education level Fine Arts High School instrument training in the field of guitar lessons and will positively affect the quality of the guitar lessons at Fine Arts High Schools.

Öz

Çalışmanın amacı: Bu çalışmada, Güzel Sanatlar Liseleri (GSL) Müzik Bölümü'nde gerçekleştirilen gitar eğitiminde kullanılabilecek, geçerliği ve güvenilirliği yüksek, 9, 10, 11 ve 12. sınıf gitar derslerine yönelik başarı testlerinin geliştirilmesi amaçlanmıştır.

Materyal ve Yöntem: Nicel araştırma yöntemlerinden tarama deseni kullanılarak gerçekleştirilen bu çalışmada, uygulamanın gerçekleştirildiği GSL'de 2016-2017 eğitim-öğretim yılında uygulanan Gitar Dersi Öğretim Programı ünite, konu ve kazanımları ile 9, 10, 11 ve 12. sınıf gitar ders kitaplarında yer alan ders anlatımları incelenerek 9. sınıflar için 40, 10, 11 ve 12. sınıflar için 35'er maddeden oluşan 4 adet başarı testi hazırlanmıştır. Hazırlanan testlerin görünüş, kapsam ve yapı geçerliği için uzman görüşleri alınmış, alınan görüşler doğrultusunda test maddelerinde gerekli düzeltmeler yapılarak 2016-2017 eğitim-öğretim yılında 7 GSL'de öğrenim gören 79 gitar öğrencisiyle testin uygulaması gerçekleştirilmiştir.

Bulgular: Test uygulaması sonucunda toplanan veriler analiz edilmiş ve test geliştirme süreci sonunda 40 madde olarak hazırlanan 9. sınıf gitar dersi başarı testinin; nihai madde sayısı 28, güvenilirlik katsayısı $\alpha = .912$, ortalama madde güçlük indeksi $\bar{p} = 0.59$, 35 madde olarak hazırlanan 10. sınıf gitar dersi başarı testinin; nihai madde sayısı 19, güvenilirlik katsayısı $\alpha = .879$, ortalama madde güçlük indeksi $\bar{p} = 0.55$, 35 madde olarak hazırlanan 11. sınıf gitar dersi başarı testinin; nihai madde sayısı 25, güvenilirlik katsayısı $\alpha = .868$, ortalama madde güçlük indeksi $\bar{p} = 0.60$ ve 35 madde olarak hazırlanan 12. sınıf gitar dersi başarı testinin; nihai madde sayısı 18, güvenilirlik katsayısı $\alpha = .865$, ortalama madde güçlük indeksi $\bar{p} = 0.50$ olarak bulunmuştur.

Önemli Vurgular: Alan yazın incelendiğinde gitar eğitimine yönelik geliştirilen tüm başarı testleri lisans düzeyinde gerçekleştirilmiştir. Yapılan bu araştırmanın ortaöğretim düzeyinde GSL çalgı eğitimi gitar dersi özelinde alana katkı sağlayacağı ve GSL gitar derslerinin niteliğini olumlu yönde etkileyeceği düşünülmektedir.

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INTRODUCTION

Problem

Schools constitute one of the most crucial areas in the realization of education, which is generally defined as creating planned and programmed behavioral change in people for specific purposes. Schools are obliged to implement their educational programs meticulously to realize their goals within their current objectives and bring about the behavioral changes they envision. Educational programs, which can be stated as the foundation of schools, ensure that educational practices are carried out within a specific plan and control (Erden, 2009, p. 19). Education begins with an objective, continues with teaching and instruction within the process, and is completed with evaluation (Fidan & Erden, 1998, p. 19).

In education, in terms of increasing the effectiveness of the education, it is of great importance to take precautions and make the decision on issues such as the students' level of knowledge and learning, success, the extent to which they benefit from the education, what are the missing or failed points and so on (Turgut, 1984, p.1). It can be said that education is in a close relationship with control, and evaluation is one of the basic procedures that we encounter in all areas of education.

In "Bloom's Taxonomy," which was developed by Bloom to measure the cognitive development of students, the cognitive development of an individual is divided into 6 steps starting from "knowledge," which is the lowest level of remembering existing knowledge, "comprehension," "application," "analysis," "synthesis" and "evaluation" (Ogan Bekiroğlu, 2004, p.18). The background knowledge of the students is vital in the education process. At this point, achievement tests are among the measurement tools frequently used in education and training processes. Achievement tests are an essential tool in revealing the student's level of knowledge and learning deficiencies. A large number of questions in the achievement tests allows the measurement and evaluation of the achievements in the program. Özçelik (1998) defines multiple-choice tests as the most excellent measurement tool found to date (cited in İpek Akbulut & Çepni, 2013, p. 20).

As in every field of education, assessment and evaluation studies regarding the effectiveness of education have gained importance in programs applied in Fine Arts High Schools. In these institutions, which aim to direct students to vocational music education, besides the measurement tools related to the performance-based parts of the instrument field, there is also a need for measurement tools that support the lessons, especially for their theoretical knowledge. How students are evaluated is essential and constitutes the problem situation of this research. Based on this problem, it is aimed to achieve the following purpose.

Purpose of the Research

This study, it is aimed to develop achievement tests that have high validity and reliability and serve to improve the success of the lesson for 9th, 10th, 11th and 12th-grade guitar lessons in music departments of Fine Arts High Schools.

These tests are considered important in monitoring the students' current development and providing guidance that may be required. It can be said that the research will contribute to the field since there have not been any achievement test studies conducted in the field of guitar education at the high school level in the literature.

The study was based on Fine Arts High Schools (2009) and the 2015-2016 academic year guitar textbooks prepared in line with this program. When the guitar lesson curriculum updated in 2016 and 2018 and the guitar textbooks prepared in line with this program (2019-First Edition) are examined, it is seen that there are structural changes in the guitar curriculum, but the content of the Fine Arts High School level guitar lesson subjects are relatively similar. In this context, the developed achievement tests are essential in adapting to the updated guitar teaching program and guitar textbooks.

METHODOLOGY

Research Model

In this study, survey model, which is one of the quantitative research methods, was used. Survey model enables numerical description of trends, attitudes or views across the universe through studies performed on a sample selected from a population (Creswell, 2017, p. 155).

In the study, it is aimed to develop valid and reliable achievement tests that can measure the success of the students who receive guitar education in Fine Arts High Schools. According to Tan (2007), there are six stages to pay attention while developing an achievement test to measure success. These can be listed as follows: 1. Defining the universe of behaviors to be measured exactly, 2. Determining the sample of behaviors to be measured, 3. Designing the measurement tool, 4. Pilot application or expert opinion, 5. Application and item analysis, and 6. Final test.

During the development phase of achievement tests for 9th, 10th, 11th and 12th grade guitar lessons, the guitar lesson curriculum and guitar textbooks were examined in order to determine the universe and sample of the behaviors to be measured. The outcomes of the subjects were determined; measurement tools were created in line with the sample selected from the determined outcomes. In order to evaluate the appropriateness of the tests in terms of design, scope and structure validity, they were presented to the opinion of 7 academic guitar educators, who are experts in their field, and the necessary corrections were made and the test application started. The data required to create achievement tests were collected as a result of the application and the item analyzes were made. As a result of the analysis, the eliminated items were removed from the test and the remaining

items were presented to expert opinion again to determine whether they could be used in the test, and their validity and reliability were ensured in line with the opinions received, and 4 achievement tests were developed for 9th, 10th, 11th and 12th grade guitar lessons.

Sample of the Study

In this study, the sample consisted of 79 students who received guitar training in 9th, 10th, 11th and 12th grades in 7 Fine Arts High Schools (FAHS) in Istanbul, İzmir, Muğla and Mersin provinces in the 2016-2017 academic year. The detailed information about the sample is shown in Table 1.

Table 1. The High Schools and The Number of Students in the Sample

	Number of the Students				Total
	9 th Grade	10 th Grade	11 th Grade	12 th Grade	
Aşık Veysel FAHS	-	2	1	3	6
Avni Akyol FAHS	4	3	5	1	13
Aydın Doğan FAHS	2	6	6	3	17
Işıl Saygın FAHS	4	2	4	4	14
Muğla FAHS	1	5	4	2	12
Nevit Kodallı FAHS	4	2	5	1	12
Pera FAHS	3	1	1	-	5
Total	18	21	26	14	79

As seen in Table 1, Aşık Veysel FAHS has 6, Avni Akyol FAHS has 13, Aydın Doğan FAHS has 17, Işıl Saygın FAHS has 14, Muğla FAHS has 12, Nevit Kodallı FAHS has 12 and Pera FAHS has 5 students taking guitar lessons. Of the students who take guitar lessons in these schools, 18 are in the 9th grade, 21 are in the 10th grade, 26 are in the 11th grade and 14 are in the 12th grade. The total number of students taking guitar lessons in the schools where the research was conducted is 79.

Data Collection and Analysis

In this study, 4 achievement tests for 9th, 10th, 11th and 12th grade guitar lessons were prepared as a data collection tool. Achievement tests prepared within the scope of the research were prepared in line with the units, subjects and outcomes in the guitar lesson curriculum and by referring to the guitar textbooks used in the MEB (Ministry of National Education) 2016-2017 academic year guitar lessons and given in Table 2.

Table 2. Textbooks Used in Turkish and western music instruments (guitar) lessons

Books	Publisher	Edition
Turkish and Western Music Instruments Guitar Coursebooks – 9 th Grade	Ministry of National Education / Coursebooks	6 th Edition (2015)
Turkish and Western Music Instruments Guitar Coursebooks – 10 th Grade	Ministry of National Education / Coursebooks	1 st Edition (2015)
Turkish and Western Music Instruments Guitar Coursebooks – 11 th Grade	Ministry of National Education / Coursebooks	1 st Edition (2015)
Turkish and Western Music Instruments Guitar Coursebooks – 12 th Grade	Ministry of National Education / Coursebooks	1 st Edition (2015)

The opinions of seven academic guitar educators in their fields were taken for the design, scope and structure validity of the tests prepared. In addition, some statistical processes were applied for the validity and reliability analysis of the tests. In order to calculate the validity of a test, the item difficulty (p) and item discrimination (D) index values of the items must be found, while in order to calculate the reliability, the Cronbach's Alpha (α) coefficient must be found.

Regarding the validity of the test; The scores of the students (number of correct answers) were sorted from high to low, and two groups were formed where 27% of the students were in the lower group, and 27% were in the upper group according to the score order. Item difficulty (p) and item discrimination (D) indices were calculated according to the lower and upper groups. As the item difficulty index value approaches 1, it means that the item is accessible, it becomes difficult as it approaches 0, and that it is around 0.50 means that the item is medium (Atılğan, 2009, cited in İpek Akbulut and Çepni, 2013, p.221). Generally, the difficulty index value is expected to be 0.50, but the difficulty indexes of all items within the scope of the measurement tool are not prepared as 0.50. Instead, complex, easy and medium-hard items should be sprinkled into the measuring tool (Hasaңebi, Terzi & Küçük, 2020, p. 225). If the test's average item difficulty index (\bar{p}) is less than 0.50, it shows that the test is difficult for the students, and if it is above 0.50, the test is easy for students. Accordingly, it is ideal for a test to have an average difficulty index of around 0.50 (medium difficulty) (Tekin, 2010, cited in Demir, Kızılay, & Bektaş, 2015 p. 222).

The discrimination index is the degree to which an item differentiates between high- and low-level respondents; that is, it is the measure of the item's ability to distinguish between knowing and unknowing (Hasaңebi, Terzi, & Küçük, 2020, p. 225). Item distinctiveness index value ranging from -1 to +1; It states that items below 0.20 are excluded from the test, items between 0.20-0.29 can be used or corrected in necessary cases, items between 0.30-0.39 are pretty good, items 0.40 and above are delicious. (Turgut, 1992, cited in Gönen, Kocakaya & Kocakaya, 2011, p.44).

Considering the reliability of the test, it is stated that according to Cronbach's Alpha which ranges between 0 to 1, the items between 0.40-0.60 have low reliability, items between 0.60-0.90 are pretty reliable, and items above 0.90 are highly reliable. (Can, 2014, cited in Demir, Kızılay, & Bektaş, 2015, p. 226).

For the reliability analysis of the test, SPSS 21 program was used. The items were eliminated with the item difficulty and item discrimination analysis of the data obtained from the test application and the expert opinions. The final tests were created by calculating the remaining items' Cronbach's Alpha (α) coefficient.

Test Development Process

For the tests prepared, the unit, subject, and outcomes in the guitar lesson curriculum and the lectures in the 9th, 10th, 11th and 12th-grade guitar textbooks were examined, and as a result of the examination, it has been observed that it was built on 4 learning areas under the names of the "Basics of Playing Guitar," "Scales, Cadences, Studies, Works," "Periods in Guitar Music" and "Guitar Vocabulary." It has been concluded that the acquisitions in the field of learning "Guitar Vocabulary" among these learning areas are based entirely on performance, and that performance is also included mainly in other learning areas. Accordingly, performance-based outcomes were excluded from the scope of the prepared tests. The four achievement tests (40 items for 9th grade and 35 items for 10th, 11th and 12th grades) were prepared by taking the outcomes towards theoretical knowledge into consideration. The distributions of the prepared test items for the units and subjects included in the Guitar Lesson Curriculum are shown in Tables 3, 4, 5 and 6.

Table 3. Item Distribution for 9th Grade Guitar Lesson Program

Area	Unit	Subject	Number of Items
Basics of Playing Guitar	Basics and History of Guitar	1. History of the Guitar 2. Structure and Parts of the Guitar 3. Nails and Care 4. Basic Signs Used in Writing Guitar Music	7
	Sitting, Grip and Right-Hand Technique in Playing Guitar	1. Sitting with the Guitar 2. Holding the Guitar 3. Right Hand Technique 4. Free Stroke (Tirando) 5. Arpeggio Technique	9
	Left Hand Technique and Compatibility with Right Hand	1. Left Hand Technique 2. Left Hand Independence Studies 3. The Harmony of Right and Left Hand in Playing Guitar 4. Rest Stroke (Apoyando)	3
	Position I	1. Trebles in Position I 2. Bases in Position I 3. Double Voice Exercises in Position I	4
	Two-Part (Bass-Tune Lines) Guitar Music	1. Bass Line Holding Sound, Tune Line Movement 2. Tune Line Holding Sound, Bass Line Movement 3. Movement in Both Lines	1
	Guitar Techniques	Legato Techniques • Ascending slurs • Descending slurs	3
Scales, Cadences, Studies, Works	Major Scale Cadence Studies • C Major • G Major • F Major	1. Scale Studies in Major and Minor Tones 2. Cadences in Major and Minor Tones 3. Studies in Major-Minor Tones 4. Works in Major and Minor Tones	7
	Minor Scale Cadence Studies • A Minor • E Minor • D Minor Maqam Scale Studies • Rast • Kürdi • Huseyni	1. Maqam Scale Studies 2. Maqam Studies 3. Maqam Works	3
Periods in Guitar Music	Renaissance Period	1. Renaissance Period Musical Form Features 2. Renaissance Composers 3. Renaissance Period Artifacts	3

Table 4. Item Distribution for 10th Grade Guitar Lesson Program

Area	Unit	Subject	Number of Items
Basics of Playing Guitar	Speed Change in Guitar Playing	1. The Importance of Speed in Guitar Playing 2. Playing Studies by Speed 3. Playing Artifacts According to Their Speed	5
	Loudness and Loudness Change in Guitar Playing	1. The Importance of Soundness in Guitar Playing 2. Playing Studies According to Their Intensity 3. Playing Works According to Their Intensity	3
	Position II Position III Position V	In Positions II, III and V • Trebles • Basses • Dual Voice Studies	7
	Small Barre Big Barre	1. Small Barre 2. Big Barre	3
	Ornamental Playing Techniques	1. Multiplication 2. Mordan 3. Grupetto 4. Trill 5. Glissando	6
Scales, Cadences, Studies, Works	Major Scale Cadence-Studies • D Major • B Flat Major	1. Scale Studies in Major and Minor Tones 2. Cadences in Major-Minor Tones 3. Studies in Major-Minor Tones 4. Works in Major and Minor Tones	5
	Minor Scale Cadence-Studies • B Minor • G Minor Maqam Scale Studies • Hicaz • Nikriz • Nihavent	1. Maqam Scale Studies 2. Maqam Studies 3. Maqam Works	3
Periods in Guitar Music	Baroque Period	1. Baroque Period Musical Form Characteristics 2. Baroque Composers 3. Baroque Period Works	3

Table 5. Item Distribution for 11th Grade Guitar Lesson Program

Area	Unit	Subject	Number of Items
Basic of Playing Guitar	Position VII Position IX	In Position VII and IX : • Trebles • Basses • Dual Voice Studies	10
	Guitar Techniques	1. Tremolo Technique 2. Flageolet Technique 3. Pizzicato Technique	8
Scales, Cadences, Studies, Works	Major Scale Cadence-Studies • G Major • E Flat Major	1. Scale Studies in Major and Minor Tones 2. Cadences in Major-Minor Tones 3. Studies in Major-Minor Tones 4. Works in Major and Minor Tones	10
	Minor Scale Cadence-Studies • F Sharp Minor • C Minor Maqam Scale Studies • Hicaz • Nikriz • Nihavent	1. Maqam Scale Studies 2. Maqam Studies 3. Maqam Works	4
Periods in Guitar Music	Classical Period	1. Classical Period Musical Form Characteristics 2. Classical Period Composers 3. Classical Period Artifacts	3

Table 6. Item Distribution for 12th Grade Guitar Lesson Program

Area	Unit	Subject	Number of Items
Basic of Playing Guitar	Guitar Techniques	1. Forward-Back Kicks	7
		2. Rasgueado Technique	
		3. Tambora Technique	
Scales, Cadences, Studies, Works	Major Scale	1. Scale Studies in Major and Minor Tones 2. Cadences in Major-Minor Tones 3. Studies in Major-Minor Tones 4. Works in Major and Minor Tones	14
	Cadence Studies		
	• E Major		
	• A Flat Major		
Scales, Cadences, Studies, Works	Minor Scale	1. Maqam Scale Studies 2. Maqam Studies 3. Maqam Works	5
	Cadence Studies		
	• C Sharp Minor		
	• F Minor		
Scales, Cadences, Studies, Works	Maqam Scale Studies	1. Classical Period Musical Form Characteristics 2. Classical Period Composers 3. Classical Period Artifacts 4. Contemporary Musical Form Characteristics 5. Contemporary Composers 6. Works of the Contemporary Period	9
	• Karcıgar		
	• Saba		
	• Saba		

For the design, scope and structure validity of the prepared tests, the opinions of 7 academic guitar educators, who are experts in their fields, were taken and the test items were corrected according to the opinions received and the test application was started. The achievement tests prepared were applied to 79 guitar students in 7 FAHSs. The data collected as a result of the application were analyzed within the scope of validity and reliability analysis, and the findings were revealed as a result of the analysis. At the end of the test development process, the 9th Grade Guitar Course Achievement Test consisting of 28 items, the 10th Grade Guitar Lesson Achievement Test consisting of 19 items, the 11th Grade Guitar Lesson Achievement Test consisting of 25 items and the 12th Grade Guitar Lesson Achievement Test consisting of 18 items were developed.

FINDINGS AND COMMENTS

Item difficulty (p) and item discrimination (D) indices were calculated to ensure the validity of the items in the achievement tests and the values obtained are shown in Tables 7, 8, 9 and 10.

Table 7. Item difficulty and item discrimination index values for 9th grade guitar lesson achievement test items

Item No.	Groups	p	D	Item No.	Groups	p	D
1	UG 4	0,8	-	21	UG 0	0,2	-0,4
	LG 4				LG 2		
2	UG 3	0,4	0,4	22	UG 3	0,3	0,6
	LG 1				LG 0		
3	UG 4	0,6	0,4	23	UG 5	0,8	0,4
	LG 2				LG 3		
4	UG 5	1	-	24	UG 5	0,6	0,8
	LG 5				LG 1		
5	UG 5	0,9	0,2	25	UG 5	0,5	1
	LG 4				LG 0		
6	UG 5	0,8	0,4	26	UG 4	0,7	0,2
	LG 3				LG 3		
7	UG 4	0,6	0,4	27	UG 5	0,8	0,4
	LG 2				LG 3		
8	UG 5	0,8	0,4	28	UG 5	0,9	0,2
	LG 3				LG 4		
9	UG 4	0,6	0,4	29	UG 4	0,4	0,8
	LG 2				LG 0		
10	UG 3	0,4	0,4	30	UG 5	0,7	0,6
	LG 1				LG 2		
11	UG 5	1	-	31	UG 4	0,6	0,4
	LG 5				LG 2		
12	UG 5	0,7	0,6	32	UG 5	0,9	0,2
	LG 2				LG 4		
13	UG 5	0,8	0,4	33	UG 5	0,6	0,8
	LG 3				LG 1		
14	UG 5	0,6	0,8	34	UG 4	0,6	0,4
	LG 1				LG 2		
15	UG 5	1	-	35	UG 5	1	-
	LG 5				LG 5		

16	UG 5	0,5	1	36	UG 4	0,6	0,4
	LG 0				LG 2		
17	UG 5	0,6	0,8	37	UG 5	0,6	0,8
	LG 1				LG 1		
18	UG 5	0,9	0,2	38	UG 4	0,4	0,8
	LG 4				LG 0		
19	UG 2	0,2	0,4	39	UG 4	0,5	0,6
	LG 0				LG 1		
20	UG 5	0,6	0,8	40	UG 4	0,4	0,8
	LG 1				LG 0		

*LG stands for Lower Groups, UG stands for Upper Groups.

According to the item difficulty and item discrimination index values given in Table 7, the discrimination power of the 1st, 4th, 11th, 15th, 21st and 35th items in the test was found below 0.20 and these items were excluded from the test. In line with the expert opinions, it was decided to use the 18th, 26th and 28th items among the items 5, 18, 26, 28 and 32, which have a discriminative power of 0.20-0.29, in the same way. It was concluded that the discrimination power of 29 items with a discriminative power of 0.40 and above was very good. As a result of the reliability analysis of the 32 items remaining in the test, items 3, 10, 13 and 19 were removed from the test and a 9th Grade Guitar Lesson Achievement Test consisting of 28 items with a reliability coefficient of $\alpha = .912$ was developed. The average item difficulty index of the test was found to be $\bar{p} = 0.59$. According to this result, it can be said that a medium difficulty test was created. As a result of expert opinions and analyzes obtained, it can be said that the developed achievement test is valid and reliable enough to measure students' success.

Table 8. Item difficulty and item discrimination index values for 10th grade guitar lesson achievement test items

Item No.	Groups	p	D	Item No.	Groups	P	D
1	UG 5	0,75	0,166	19	UG 2	0,25	0,166
	LG 4				LG 1		
2	UG 6	0,75	0,5	20	UG 1	0,0833	0,166
	LG 3				LG 0		
3	UG 6	0,583	0,833	21	UG 5	0,583	0,5
	LG 1				LG 2		
4	UG 4	0,5	0,333	22	UG 5	0,5	0,666
	LG 2				LG 1		
5	UG 5	0,666	0,333	23	UG 3	0,333	0,333
	LG 3				LG 1		
6	UG 3	0,5	-	24	UG 6	0,583	0,833
	LG 3				LG 1		
7	UG 4	0,333	0,666	25	UG 3	0,416	0,166
	LG 0				LG 2		
8	UG 6	0,75	0,5	26	UG 1	0,0833	0,166
	LG 3				LG 0		
9	UG 6	0,916	0,166	27	UG 1	0,166	-
	LG 5				LG 1		
10	UG 5	0,5	0,666	28	UG 6	0,75	0,5
	LG 1				LG 3		
11	UG 4	0,583	0,166	29	UG 3	0,25	0,5
	LG 3				LG 0		
12	UG 6	0,583	0,833	30	UG 5	0,416	0,833
	LG 1				LG 0		
13	UG 6	0,833	0,333	31	UG 6	0,666	0,666
	LG 4				LG 2		
14	UG 5	0,75	0,166	32	UG 4	0,583	0,166
	LG 4				LG 3		
15	UG 6	0,666	0,666	33	UG 4	0,416	0,5
	LG 2				LG 1		
16	UG 2	0,333	-	34	UG 4	0,333	0,666
	LG 2				LG 0		
17	UG 4	0,416	0,5	35	UG 2	0,25	0,166
	LG 1				LG 1		
18	UG 5	0,583	0,5				
	LG 2						

According to the item difficulty and item discrimination index values given in Table 8, the discrimination power of items 1, 6, 9, 11, 14, 16, 19, 20, 25, 26, 27, 32 and 35 in the test was found to be less than 0, 20 and these items were excluded from the test. It was concluded that 4 items with a discriminant power of 0.30-0.39 were quite good, and 18 items with a discriminant power of 0.40 and above were very good. As a result of the reliability analysis of the remaining 22 items in the test, items 2, 4, and 23 were removed from the test and a 10th Grade Guitar Lesson Achievement Test consisting of 19 items with a reliability coefficient of $\alpha = .879$ was developed. The average item difficulty index of the test was found to be $\bar{p} = 0.55$. According to this result, it can be said that a medium difficulty test was created. As a result of the expert opinions and analyzes obtained, it can be said that the developed achievement test is valid and reliable enough to measure the success of the students.

Table 9. Item difficulty and item discrimination index values for 11th grade guitar lesson achievement test items

Item No.	Groups	p	D	Item No.	Groups	P	D
1	UG 7 LG 2	0,642	0,714	19	UG 7 LG 0	0,5	1
2	UG 7 LG 7	1	-	20	UG 4 LG 3	0,5	0,142
3	UG 5 LG 1	0,428	0,571	21	UG 7 LG 5	0,857	0,285
4	UG 5 LG 3	0,571	0,285	22	UG 6 LG 3	0,642	0,428
5	UG 6 LG 4	0,714	0,285	23	UG 5 LG 2	0,5	0,428
6	UG 6 LG 2	0,571	0,571	24	UG 4 LG 1	0,357	0,428
7	UG 6 LG 3	0,642	0,428	25	UG 6 LG 2	0,571	0,571
8	UG 6 LG 2	0,571	0,571	26	UG 7 LG 3	,714	0,571
9	UG 3 LG 0	0,214	0,428	27	UG 3 LG 2	0,357	0,142
10	UG 5 LG 5	0,714	-	28	UG 2 LG 1	0,214	0,142
11	UG 7 LG 2	0,642	0,714	29	UG 7 LG 4	0,785	0,428
12	UG 7 LG 2	0,642	0,714	30	UG 6 LG 4	0,714	0,285
13	UG 6 LG 2	0,571	0,571	31	UG 6 LG 3	0,642	0,428
14	UG 7 LG 2	0,642	0,714	32	UG 4 LG 1	0,357	0,428
15	UG 7 LG 5	0,857	0,285	33	UG 4 LG 1	0,357	0,428
16	UG 7 LG 5	0,857	0,285	34	UG 4 LG 2	0,428	0,285
17	UG 7 LG 2	0,642	0,714	35	UG 4 LG 3	0,5	0,142
18	UG 7 LG 3	0,714	0,571				

According to the item difficulty and item discrimination index values given in Table 9, the discrimination power of the 2, 10, 20, 27, 28 and 35th items in the test was found below 0.20 and these items were excluded from the test. In line with the expert opinions received, it was decided to use items 5, 15, 16 and 21 of the 4th, 5th, 15th, 16th, 21st, 30th and 34th items, which have a discriminative power of 0.20-0.29, in the same way. It was concluded that 22 items with a discriminative power of 0.40 and above were very good. As a result of the reliability analysis of the remaining 26 items in the test, the 13th item was removed from the test and the 11th Grade Guitar Course Achievement Test consisting of 25 items with a coefficient value of $\alpha = ,868$ was developed. The average item difficulty index of the test was found to be $\bar{p} = 0.60$. According to this result, it can be said that a medium difficulty test was created. As a result of expert opinions and analyzes obtained, it can be said that the developed achievement test is valid and reliable enough to measure students' success.

Table 10. Item difficulty and item discrimination index values for 12th grade guitar lesson achievement test items

Item No.	Groups	p	D	Item No.	Groups	P	D
1	UG 1	0,125	0,25	19	UG 0	-	-
	LG 0						
2	UG 4	0,75	0,5	20	UG 4	0,5	1
	LG 2						
3	UG 3	0,375	0,75	21	UG 4	0,75	0,5
	LG 0						
4	UG 4	0,625	0,75	22	UG 4	0,875	0,25
	LG 1						
5	UG 3	0,875	-0,25	23	UG 2	0,75	-0,5
	LG 4						
6	UG 4	1	-	24	UG 1	0,125	0,25
	LG 4						
7	UG 4	1	-	25	UG 4	0,75	0,5
	LG 4						
8	UG 4	0,75	0,5	26	UG 0	-	-
	LG 2						
9	UG 1	0,25	-	27	UG 1	0,125	0,25
	LG 1						
10	UG 4	0,75	0,5	28	UG 3	0,5	0,5
	LG 2						
11	UG 4	1	-	29	UG 0	0,125	-0,25
	LG 4						
12	UG 4	1	-	30	UG 3	0,375	0,75
	LG 4						
13	UG 4	0,5	1	31	UG 0	-	-
	LG 0						
14	UG 2	0,625	-0,25	32	UG 4	0,5	1
	LG 3						
15	UG 3	0,75	-	33	UG 3	0,625	0,25
	LG 3						
16	UG 0	-	-	34	UG 2	0,5	-
	LG 0						
17	UG 1	0,125	0,25	35	UG 3	0,5	0,5
	LG 0						
18	UG 2	0,375	0,25		LG 1		
	LG 1						

According to the item difficulty and item discrimination index values given in Table 10, the efficacy of items 5, 6, 7, 9, 11, 12, 14, 15, 16, 19, 23, 26, 29, 31 and 34 in the test were found below 0.20 and these items were excluded from the test. In line with the expert opinions received, it was decided to use items 1, 17, 22, 24 and 27 of the items 1, 17, 18, 22, 24, 27 and 33, which have a discriminative power between 0.20 and 0.29. It was concluded that 13 items with a discriminative power of 0.40 and above were very good. As a result of the reliability analysis of the remaining 18 items in the test, the 12th Grade Guitar Course Achievement Test, consisting of 18 items with a coefficient of $\alpha = ,865$, was developed. The average item difficulty index of the test was found to be $\bar{p} = 0.50$. According to this result, it can be said that a medium difficulty test was created. As a result of expert opinions and analyzes obtained, it can be said that the developed achievement test is valid and highly reliable to measure students' success.

The item distribution of the items in the final achievement tests developed after the validity and reliability analysis for the units and subjects of the guitar lesson teaching program is shown in Tables 11, 12, 13, and 14.

Table 11. Item distribution for the units and subjects of the guitar lesson teaching program of the 9th grade final achievement test

Learning Area	Unit	Subject	Number of Items Prepared	Numbers of the Items Remained in the Test
Basics of Playing Guitar	Basics and History of Guitar	1. History of the Guitar 2. Structure and Parts of the Guitar 3. Nails and Care 4. Basic Signs Used in Writing Guitar Music	7	2, 6, 7, 8, 9
	Sitting, Grip and Right Hand Technique in Playing Guitar	1. Sitting with the Guitar 2. Holding the Guitar 3. Right Hand Technique 4. Free Stroke (Tirando) 5. Arpeggio Technique	9	12, 14, 24
	Left Hand Technique and Compatibility with Right Hand	1. Left Hand Technique 2. Left Hand Independence Studies 3. The Harmony of Right and Left Hand in Playing Guitar 4. Rest Stroke (Apoyando)	3	17, 18
	Position I	1. Trebles in Position I 2. Basses in Position I 3. Dual Voice Studies in Position I	4	16, 20, 22
	Two-Part (Bass-Tune Lines) Guitar Music	1. Bass Line Holding Sound, Tune Line Movement 2. Tune Line Holding Sound, Bass Line Movement 3. Movement in Both Lines	1	23
	Guitar Techniques	Legato Techniques • Ascending slurs • Descending slurs	3	25, 26, 31
Scales Cadences Studies Works	Major Scale Cadence-Study-Work • C Major • G Major • F Major	1. Scale Studies in Major and Minor Tones 2. Cadences in Major and Minor Tones 3. Studies in Major-Minor Tones 4. Works in Major and Minor Tones	7	27, 28, 29, 33, 34
	Minor Scale Cadence-Study-Work • A Minor • E Minor • D Minor			
	Maqam Scale Studies • Rast • Kürdi • Huseyni	1. Maqam Scale Studies 2. Maqam Studies 3. Maqam Works	3	30, 36, 37
Periods in Guitar Music	Renaissance Period	1. Renaissance Period Musical Form Features 2. Renaissance Period Composers 3. Renaissance Period Musical Works	3	38, 39, 40

Table 12. Item distribution for the units and subjects of the guitar lesson teaching program of the 10th grade final achievement test

Learning Area	Unit	Subject	Number of Items Prepared	Numbers of the Items Remained in the Test
Basics of Playing Guitar	Speed Change in Guitar Playing	1. The Importance of Speed in Guitar Playing 2. Playing Studies by Speed 3. Playing Artifacts According to Their Speed	5	3, 5
	Loudness and Loudness Change in Guitar Playing	1. The Importance of Soundness in Guitar Playing 2. Playing Studies According to Their Intensity 3. Playing Works According to Their Intensity	3	7, 8, 10
	Position II Position III Position V	In Position II, III and V: • Trebles • Basses • Dual Voice Studies	7	12, 15, 18, 21
	Small Barre Big Barre	1. Small Barre 2. Big Barre	3	13
	Ornamental Playing Techniques	1. Multiplication 2. Mordan 3. Gruppetto 4. Trill 5. Glissando	6	17, 22, 24
Scales Cadences Studies Works	Major Scale Cadence-Study-Work • D Major • B Flat Major	1. Scale Studies in Major and Minor Tones 2. Cadences in Major-Minor Tones 3. Studies in Major-Minor Tones 4. Works in Major and Minor Tones	5	28, 29, 30, 31
	Minor Scale Cadence-Study-Work • B Minor • G Minor Maqam Scale Studies • Hicaz • Nikriz • Nihavent	1. Maqam Scale Studies 2. Maqam Studies 3. Maqam Works	3	-
Periods in Guitar Music	Baroque Period	1. Baroque Period Musical Form Characteristics 2. Baroque Composers 3. Baroque Period Works	3	33, 34

Table 13. Item distribution for the units and subjects of the guitar lesson teaching program of the 11th grade final achievement test

Learning Area	Unit	Subject	Number of Items Prepared	Numbers of the Items Remained in the Test
Basics of Playing Guitar	Position VII Position IX	In Positions VII and IX: • Trebles • Basses • Dual Voice Studies	10	1, 5, 6, 7, 8, 17, 19
	Guitar Techniques	1. Tremolo Technique 2. Flageolet Technique 3. Pizzicato Technique	8	3, 9, 11, 12, 15, 16
Scales Cadences Studies Works	Major Scale Cadence-Study-Work • A Major • E Flat Major	1. Scale Studies in Major and Minor Tones 2. Cadences in Major-Minor Tones 3. Studies in Major-Minor Tones 4. Works in Major and Minor Tones	10	14, 18, 21, 22, 25, 26, 29, 31, 32
	Minor Scale Cadence-Study-Work • F Sharp Minor • C Minor Maqam Scale Studies • Hicaz • Nikriz • Nihavent	1. Maqam Scale Studies 2. Maqam Studies 3. Maqam Works	4	23, 24,
Periods in Guitar Music	Classical Period	1. Classical Period Musical Form Characteristics 2. Classical Period Composers 3. Classical Period Artifacts	3	33

Table 14. Item distribution for the units and subjects of the guitar lesson teaching program of the 12th grade final achievement test

Learning Area	Unit	Subject	Number of Items Prepared	Numbers of the Items Remained in the Test
Basics of Playing Guitar	Guitar Techniques	1. Up-Down Stroke	7	1, 2, 3, 4
		2. Rasgueado Technique		
3. Tambora Technique				
Scales Cadences Studies Works	Major Scale	1. Scale Studies in Major and Minor Tones 2. Cadences in Major-Minor Tones 3. Studies in Major-Minor Tones 4. Works in Major and Minor Tones	14	10, 13, 20, 21, 22, 24, 25
	Cadence-Study-Work			
	• E Major			
	• A Flat Major			
Scales Cadences Studies Works	Minor Scale	1. Maqam Scale Studies 2. Maqam Studies 3. Maqam Works	5	17, 27
	Cadence-Study-Work			
	• C Sharp Minor			
	• F Minor			
Periods in Guitar Music	Maqam Scale Studies	1. Classical Period Musical Form Characteristics 2. Classical Period Composers 3. Classical Period Artifacts 4. Contemporary Musical Form Characteristics 5. Contemporary Composers 6. Works of the Contemporary Period	9	8, 28, 30, 32, 35
	• Karcıgar			
	• Saba			
	Romantic Period			
	Contemporary Period			

In Tables 11, 12, 13, and 14, in the final achievement tests developed for the Fine Arts High School guitar teaching program 9, 10, 11 and 12th grades, it is seen that the items within the scope of the 10th grade “Maqam Scale, Study, Work” unit and subject cannot be included and there are items for all other units and subjects.

RESULTS AND DISCUSSION

In music education, an essential element of the education field, and instrument education, which is one of its building blocks, measurement and evaluation processes are mainly based on performance. Although instrument training is based on performance, there are many theoretical aspects within the scope of the course. It is thought that achievement tests are considered to be an effective tool to understand whether the learning about theoretical knowledge has been realized or not.

Based on these considerations, this study aimed to develop achievement tests with high validity and reliability, which will improve the success of the Fine Arts High School guitar lesson students and measure the students' theoretical knowledge in the guitar lesson. With this aim, by examining the guitar lesson curriculum and guitar textbooks, 4 achievement tests were prepared for 9th, 10th, 11th and 12th-grade guitar lessons. During the development phase of the tests, 35 items were prepared for the 10th, 11th and 12th grades and 40 items were developed for the 9th grade and presented to the expert opinion, and the necessary corrections were made, and the tests were applied. The data collected as a result of the application were analyzed, and at the end of the test development process, the test for 9th grade consisted of 28 items, the 10th test consisting of 19 items, the 11th-grade test consisting of 25 items, and the 12th-grade test consisting of 18 items have been developed.

After the analysis made in the research, the 9th-grade guitar lesson achievement test was prepared as 40 items; the final number of items was 28, the reliability coefficient was $\alpha = .912$, and the average item difficulty index was $\bar{p} = 0.59$. The 10th-grade guitar lesson achievement test was prepared as 35 items; the number of final items was 19, the reliability coefficient as $\alpha = .879$, and the average item difficulty index as $\bar{p} = 0.55$. The 11th-grade guitar lesson achievement test was prepared as 35 items; the number of final items was 25, the reliability coefficient as $\alpha = .868$, and the average item difficulty index as $\bar{p} = 0.60$. The 12th-grade guitar lesson achievement test was prepared as 35 items; the number of final items was 18, the reliability coefficient was $\alpha = .865$, and the average item difficulty index was $\bar{p} = 0.50$.

When the literature is examined, the measurement tools introduced within the scope of instrument training are mainly based on performance, motivation, anxiety, attitude, motivation, self-efficacy and so on (Öztürk & Güdek, 2016; Akçay & Yener, 2019; Çiftçi and Kurtulmuş, 2010; Afacan & Çilden, 2020; Pirlibeyoğlu, 2015; Gün Duru, 2013; Dalkıran, 2008; Çoban and Çalışkan, 2019; Nalbantoğlu, 2007; Nacakcı and Dalkıran, 2011; Tufan and Güdek, 2008; Bakıoğlu and Kurtuldu, 2015; Yalçınkaya and Eldemir, 2013; Girgin, 2015 (a); Girgin, 2015 (b); Girgin, 2015 (c); Girgin, 2016 ; Soycan & Hamzaoğlu Birer, 2018; Şen & Özdemir, 2017; Çalışkan, 2008; Tepe, 2010; Yıldırım, 2010; Dönmez, 2019; Şeker, 2016; Turan Engin, 2019).

Reviewing the related literature, various studies on the achievement tests developed on instrument training were found. An achievement test was prepared by Özdemir (2014) consisting of 45 items for undergraduate level guitar education. In that test, the number of final items was 38, and the reliability coefficient was $\alpha = .796$. Another achievement test was prepared by Yokuş (2009) as 58 items for undergraduate level guitar education. The number of final items was 42, and the reliability coefficient $\alpha = .779$. The achievement test prepared by Can (2009) had 67 items and intended undergraduate level guitar education. In his test, the number of final items was 34, and the reliability coefficient was $\alpha = .84$. There is another achievement test intended for undergraduate piano education by Yokuş (2010), which consisted of 58 items. In this test, the number of final items was 47, and

the reliability coefficient was $\alpha = .709$. The achievement test prepared by Demirtaş (2017) had 41 items for undergraduate piano education, and the number of final items was 22 while the reliability coefficient was $\alpha = .71$, and the average item difficulty index was $\bar{p} = 0.59$. In the achievement test prepared by Kardeş and Onuray Eğilmez (2017) as 40 items for undergraduate level piano education; the final number of items was 32, the reliability coefficient was $\alpha = .894$, and the average item difficulty index was $\bar{p} = 0.56$. In the achievement test prepared by Şen and Özdemir (2017) as 65 items for all classes for secondary education level cello education; the number of final items was 61, and the reliability coefficient was $\alpha = .915$. In another achievement test prepared by Yıldız and Gürşen Otacıoğlu (2017) as 72 items for secondary education level flute education; the number of final items was 49, the reliability coefficient was $\alpha = .89$, and the average item difficulty index was $\bar{p} = 0.62$. Last but not least, in the achievement test prepared by Altıntaş (2007) as 38 items for primary education level mandolin education; the number of final items was found to be 38, the reliability coefficient as $\alpha = .979$, and the average item difficulty index as $\bar{p} = 0.55$.

It can be said that the achievement tests developed in this research and in other studies in the literature are valid and reliable enough to measure students' success (Özdemir, 2014; Yokuş, 2009; Yokuş, 2010; Demirtaş, 2017; Can, 2009; Kardeş & Onuray Eğilmez, 2017; Şen and Özdemir, 2017; Altıntaş, 2007; Yıldız and Gürşen Otacıoğlu, 2017). When the literature is examined, the achievement test developed by Altıntaş (2007) for mandolin education within the scope of instrument training at primary education level, and the achievement test developed by Şen and Özdemir (2017) for violoncello education, and the test developed by Yıldız and Gürşen Otacıoğlu (2017) for flute education, it is seen that the test is carried out at secondary education level. All other studies are carried out at the undergraduate level. In addition, all achievement tests developed for guitar training were carried out at the undergraduate level. In this context, this study will contribute to the field in the secondary education level Fine Arts High School instrument training in the field of guitar lessons and will positively affect the quality of the guitar lessons at Fine Arts High Schools.

SUGGESTIONS

1. Through the agency of the results obtained from this research, the suggestions can be listed as follows:
2. It is required to develop achievement tests for Fine Arts High School guitar lessons with more valuable and reliable items.
3. Achievement tests by the updated curriculum and textbooks of fine arts school guitar lessons should be developed.
4. Developing an achievement test for guitar education at the graduate level is recommended.

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Statements of publication ethics

The data for this study was collected in the 2016-2017 academic year. We hereby declare that the study has not unethical issues and that research and publication ethics have been observed carefully.

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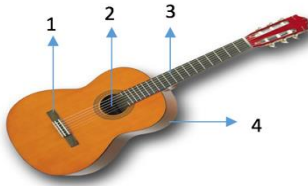
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APPENDIX -1

9. Sınıf Gitar Dersi Başarı Testi

- Aşağıdaki seçeneklerin hangisinde gitarın gelişimi ile ilgili bilgi **yanlıştır**?
 - Gitar benzeri çalgılar ilk kez MÖ 1000 yılında kullanılmıştır.
 - Gitarın gelişiminde İspanya'nın önemli katkıları olmuştur.
 - Lavta ve Vihuela gitarın öncüsü sayılabilecek telli çalgılardandır.
 - Gitarın Avrupa'ya yayılmasında Arapların etkisi olmuştur.
- Aşağıdaki fotoğrafta 1,2,3 ve 4 rakamları ile belirtilen bölümler sırasıyla hangi seçenekte **doğru** verilmiştir?

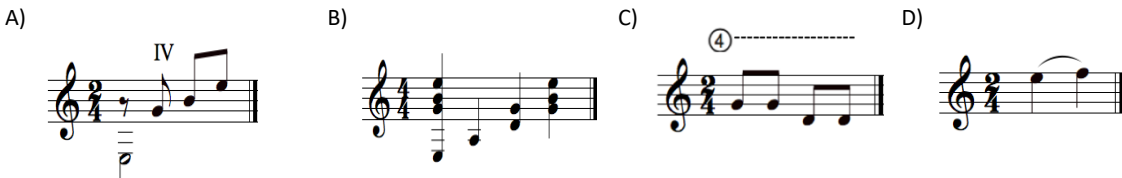


- Köprü - Ses deliği - Fret - Üst küçük kavis
- Alt Eşik - Ses deliği - Roset - Alt küçük kavis
- Alt Eşik - Ses deliği - Roset - Üst küçük kavis
- Köprü - Ses deliği - Fret - Alt küçük kavis

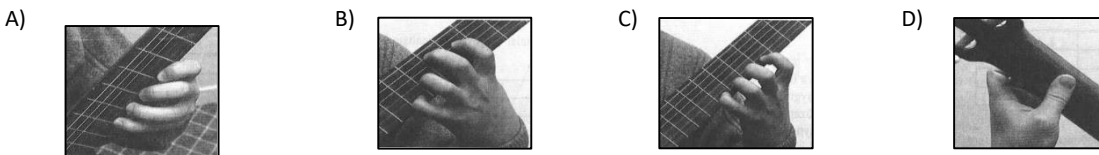
- Klasik gitar müziği yazımında sağ el işaret parmağı aşağıdaki seçeneklerin hangisi ile ifade edilir?
 - Indecisio
 - Medius
 - Mediante
 - Index
- Klasik gitar müziği yazımında "a" ile gösterilen parmak aşağıdaki seçeneklerin hangisinde **doğru** verilmiştir?
 - Sağ el orta parmağı
 - Sağ el serçe parmağı
 - Sağ el yüzük parmağı
 - Sol el baş parmağı
- Aşağıdaki seçeneklerin hangisi klasik gitar müziği yazımında **kullanılmaz**?
 - 5
 - V
 - x
 - 0
- Sağ el parmaklarının telleri çekmesi ve üstteki tele dokunmadan avuç içine doğru yönelmesine ne ad verilir?
 - Apoyando
 - Tirando
 - Legato
 - Tambora
- Arpej çalarken tekniği kullanılır.
 - Rasgueado
 - Tambora
 - Apoyando
 - Tirando
- Aşağıdaki 3'lü aralıklardan hangisi I. pozisyonda **çalınamaz**?
 - A)
 - B)
 - C)
 - D)



- Aşağıdaki seçeneklerin hangisi sol el kullanımını **gerektirmez**?



- Aşağıdaki seçeneklerin hangisinde klasik gitar sol el tekniği **yanlış** verilmiştir?



- Sağ el parmaklarının tele vurduktan sonra diğer tele dayanması ile uygulanan tekniğe ne ad verilir?
 - Pizzicato
 - Legato
 - Apoyando
 - Tirando

12. Aşağıdaki aralıklardan hangisi I. pozisyona ait **değildir**?

A) B) C) D)

13. Aşağıdaki seçeneklerin hangisinde iki partili gitar müziği için verilen bilgi **yanlıştır**?

- A) Bas ve ezgi partisi üst üste yazılır.
 B) Üst partinin nota sapları yukarı doğru, alt partinin nota sapları aşağı doğru çekilir.
 C) Üst partideki notalar bas partisi alt partideki notalar ezgi partisidir.
 D) Bas ve ezgi partileri tutan ve yürüyücü melodilerden oluşur.

14. Aşağıda yazılı olan notaların sağ el parmak sıralaması seçeneklerin hangisinde **doğru** verilmiştir?

- A) p-a-m-i-a-m-ı B) p-a-m-i-m-a-i-m C) p-a-m-i-a-m-i-a D) p-a-m-i-a-m-i-m

15. Farklı yükseklikteki iki notanın (ya da notaların) birbirinden ayrılmadan çalınmasına ne ad verilir?

- A) Apoyando B) Glisando C) Tirando D) Legato

16. İnce notadan sonra gelen kalın notanın ince notaya bağlanmasına ne ad verilir?

- A) İnci bağ B) Çıkıcı bağ C) Uzatma bağı D) Tutan ses

17. Birbirine komşu sekiz sesin art arda sıralanmasına ne ad verilir?

- A) Kadans B) Majör C) Minör D) Dizi

18. “2 tam ses + 1 yarım ses + 3 tam ses + 1 yarım ses” in art arda gelmesi ile oluşan yapıya ne ad verilir?

- A) Majör B) Minör C) Kadans D) Akor

19. Armonik mi minör dizisi aşağıdaki seçeneklerin hangisinde **doğru** verilmiştir?

A) B) C) D)

20. Aşağıdaki donanıma ait majör ve minör ton seçeneklerin hangisinde **doğru** verilmiştir?

- A) Do majör-La minör B) Sol majör-Mi minör C) Fa majör-Re minör D) Re majör-Si minör

21. Kalın notadan sonra gelen ince notanın kalın notaya bağlanmasına ne ad verilir?

- A) İnci bağ B) Çıkıcı bağ C) Uzatma bağı D) Tutan ses

22. Aşağıdaki seçeneklerin hangisinde “Tam Kadans” sıralaması **doğru** verilmiştir?

- A) Tonic-Subdominant-Tonic B) Tonic-Dominant-Tonic
 C) Tonic-Subdominant- Dominant-Tonic D) Tonic-Dominant-Subdominant-Tonic

23. Do majör tonunda plagal kadans aşağıdaki seçeneklerin hangisinde **doğru** verilmiştir?

A) B) C) D)

24. Rast makamı dizisi aşağıdaki seçeneklerin hangisinde **doğru** verilmiştir?

A) B) C) D)

25. Kürdi makamını oluşturan dörtlü ve beşli isimleri aşağıdaki seçeneklerin hangisinde **doğru** verilmiştir?
 A) Kürdi dörtlüsü + Buselik beşlisi
 B) Kürdi dörtlüsü + Rast beşlisi
 C) Kürdi dörtlüsü + Hüseyini beşlisi
 D) Kürdi dörtlüsü + Kürdi beşlisi
26. Aşağıdaki seçeneklerin hangisi Rönesans Dönemi eserlerinin özelliklerinden **değildir**?
 A) Kilise modlarından, majör- minör akor sistemine geçişin temelleri atılmıştır.
 B) Bağımsız bir çalgı müziği stili gelişmiştir.
 C) Hümanizm düşüncesi müziğe yansımıştır.
 D) Dini müzik önem kazanmıştır.
27. Aşağıdaki seçeneklerin hangisi Rönesans Dönemi bestecilerinden **değildir**?
 A) Alonso de MUDARRA B) Luis de NARVAEZ C) Luis MILAN D) Robert de VISEE
28. Aşağıdaki seçeneklerin hangisi Rönesans Dönemi şarkı formlarından **değildir**?
 A) Courante B) Galliarde C) Folias D) Pavane

APPENDIX -2

10. Sınıf Gitar Dersi Başarı Testi

1. Aşağıdaki hız terimleri hangi seçenekte yavaştan hızlıya doğru sıralanmıştır?
 I. Moderato
 II. Andante
 III. Larghetto
 IV. Adagio
 A) I-II-III-IV B) III-IV-I-II C) III-IV-II-I D) I-II-IV-III
2. Aşağıdaki seçeneklerin hangisinde ritmin giderek yavaşlaması gerektiğini belirten terim **doğru** verilmiştir?
 A) Ritardando B) Crescendo C) Decrescendo D) Accelerando
- Aşağıda verilen cümlelerdeki boş bırakılan yerlere uygun olan seçeneği işaretleyiniz.
3. Müzikte küçülerek, azalarak ve gittikçe sönükleşerek seslendirmeye.....denir.
 A) Crescendo B) Ritardando C) Diminuendo D) Rallentando
4. Ses şiddetini derece derece artırmak gerektiğini belirten müzik terimine.....denir.
 A) Crescendo B) Decrescendo C) Accelerando D) Fortissimo
5. Aşağıdaki gürlük terimleri hangi seçenekte hafiften kuvvetliye doğru sıralanmıştır?
 I. Mezzo piano
 II. Mezzo forte
 III. Piano
 IV. Forte
 A) III-I-IV-II B) I-III-II-IV C) III-I-II-IV D) I-III-IV-II
6. V. pozisyonda çalınabilecek en tiz (ince) nota aşağıdaki seçeneklerin hangisinde **doğru** verilmiştir?
 A) B) C) D)



7. Küçük bare işareti aşağıdaki seçeneklerin hangisinde **doğru** verilmiştir?
 A) DC B) ϕ C) KB D) C
8. III. pozisyonda farklı oktavlardan kaç tane "sol" notası çalınabilir?
 A) 1 B) 2 C) 3 D) 4
9. (∞) Parantez içerisinde verilen süsleme işaretinin adı hangi seçenekte **doğru** verilmiştir?
 A) Grupetto B) Mordan C) Glissando D) Trill

10. Dördüncü teldeki "fa#" ve "sol" notaları III. pozisyonda hangi parmak numaraları ile çalınır?

- A) 1-2 B) 1-3 C) 2-3 D) 3-4

11. Aşağıdaki notaların çalındığı pozisyon hangi seçenekte **doğru** verilmiştir?

③-----②-----



- A) I. pozisyon B) II. pozisyon C) III. pozisyon D) V. pozisyon

12. (♯) Parantez içerisinde verilen süsleme işaretinin adı hangi seçenekte **doğru** verilmiştir?

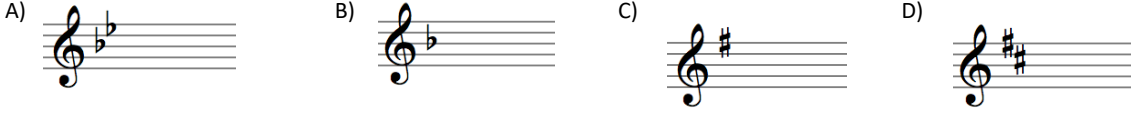
- A) Yukarı (üst) mordan B) Aşağı (alt) mordan C) Grupetto D) Glissando

13. Aşağıdaki süsleme işaretine verilen ad hangi seçenekte **doğru** verilmiştir?



- A) Apoyando B) Glissando C) Trill D) Abanti

14. Re majör dizisinin aldığı ses değıştirici işaret ya da işaretler aşağıdaki seçeneklerin hangisinde **doğru** verilmiştir?



15. Si minör tonunda plagal kadans aşağıdaki seçeneklerin hangisinde **doğru** verilmiştir?

A) B)

C) D)

16. Armonik sol minör dizisi aşağıdaki seçeneklerin hangisinde **doğru** verilmiştir?

A) B)

C) D)

17. Aşağıdaki donanıma ait majör ve minör ton hangi seçenekte **doğru** verilmiştir?



- A) Si bemol majör-Sol minör B) Sol majör-Mi minör C) Fa majör-Re minör D) Re majör-Si minör

18. Aşağıdaki seçeneklerden hangisi Barok Dönem eserlerinin özelliklerinden **değildir**?

- A) Majör ve minör tonların yaygın kullanımına geçilmiştir.
B) İlk kez gürlük terim ve işaretleri kullanılmıştır.
C) Hümanizm düşüncesi müziğe bu dönemde yansımıştır.
D) Müzikte abartı ve süslemenin hakim olduğu bir dönem yaşanmıştır.

19. Aşağıdaki seçeneklerden hangisi Barok Dönem bestecilerinden **değildir**?

- A) Gaspar SANZ B) Luis MILAN C) Robert de VISEE D) Domenico SCARLATTI

APPENDIX -3

11. Sınıf Gitar Dersi Başarı Testi

1. Aşağıdaki aralıklardan hangisi VII. pozisyonda çalınmaz?
A) B) C) D)



2. Aşağıdaki seçeneklerde belirtilen perdelerin hangisinden doğal flageolet sesi elde edilemez?
A) V. perde B) VII. perde C) IX. perde D) XI. perde
3. Aşağıdaki notalar VII. pozisyonda hangi telde çalınabilir?



- A) 3. tel B) 4. tel C) 5. tel D) 6. tel
4. IX. pozisyonda çalınabilecek en pes (kalın) nota aşağıdaki seçeneklerin hangisinde doğru verilmiştir?
A) B) C) D)



5. IX. pozisyonda farklı oktavlardan kaç tane "re" notası çalınabilir?
A) 1 B) 2 C) 3 D) 4

Aşağıda verilen cümlelerdeki boş bırakılan yerlere uygun olan seçeneği işaretleyiniz.

6. 4. parmağın XII. perde üzerinde bulunduğu konuma.....denir.
A) Capo B) Bare C) VIII. pozisyon D) IX. pozisyon
7. Uzayan ses etkisi elde etmek için kullanılan tekniğe.....denir.
A) Flageolet B) Tremolo C) Pizzicato D) Glisando
8. Asıl ses yerine o sesin doğuşkanlarının duyulmasını sağlayan tekniğe.....denir.
A) Flageolet B) Trill C) Glisando D) Pizzicato
9. Aşağıda yazılışı verilen notaların seslendirilişi hangi seçenekte doğru verilmiştir?



- A) B) C) D)
-

10. Aşağıdaki donanımına ait minör ton hangi seçenekte doğru verilmiştir?



- A) Sol minör B) Mi bemol minör C) Do minör D) Re minör
11. Pizzicato tekniğinin nota yazımında kullanılan kısaltması hangi seçenekte doğru verilmiştir?
A) p B) pzc C) pizz. D) pc

12. Aşağıda gösterilen nota şekline verilen isim hangi seçenekte **doğru** verilmiştir?

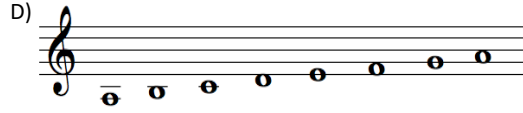
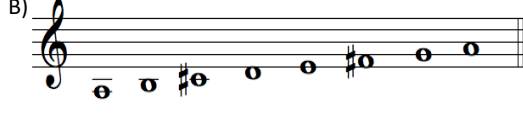


- A) Flageolet B) Pizzicato C) Glisando D) Tremolo

13. Dördüncü teldeki "si" ve "do" notaları VII. pozisyonda hangi parmak numaraları ile çalınır?

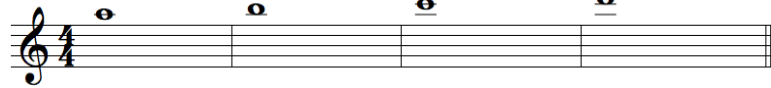
- A) 1-2 B) 1-3 C) 2-3 D) 3-4

14. La majör dizisi aşağıdaki seçeneklerin hangisinde **doğru** verilmiştir?

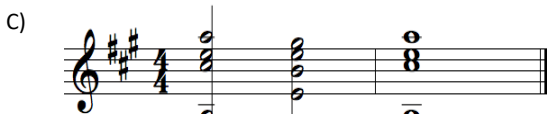


15. VII. pozisyonda çalınabilecek en tiz (ince) nota aşağıdaki seçeneklerin hangisinde **doğru** verilmiştir?

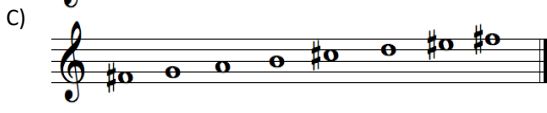
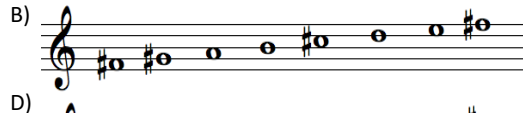
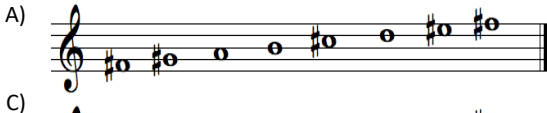
- A) B) C) D)



16. La majör tonunda plagal kadans aşağıdaki seçeneklerin hangisinde **doğru** verilmiştir?



17. Armonik Fa diyez minör dizisi aşağıdaki seçeneklerin hangisinde **doğru** verilmiştir?



18. Segâh makamını oluşturan beşli ve dörtlü isimleri aşağıdaki seçeneklerin hangisinde **doğru** verilmiştir?

- A) Segâh beşlisi + Kürdi dörtlüsü
B) Segâh beşlisi + Rast dörtlüsü
C) Segâh beşlisi + Hüseyini dörtlüsü
D) Segâh beşlisi + Hicaz dörtlüsü

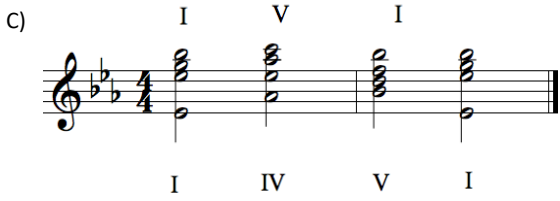
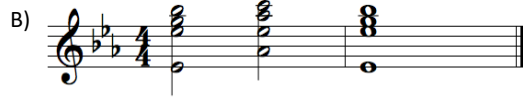
19. Segâh makamı dizisi aşağıdaki seçeneklerin hangisinde **doğru** verilmiştir?



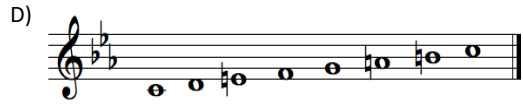
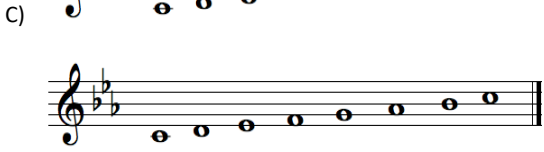
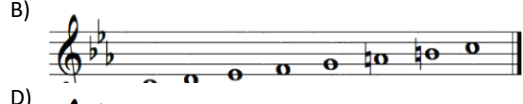
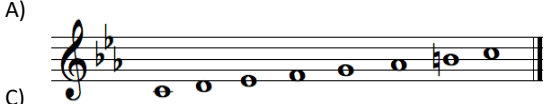
20. Fa diyez minör tonu aşağıdaki seçeneklerin hangisinde **doğru** verilmiştir?



21. Mi bemol majör tonunda tam kadans aşağıdaki seçeneklerin hangisinde **doğru** verilmiştir?



22. Çıkıcı melodik Do minör dizisi hangi seçenekte **doğru** verilmiştir?



23. Aşağıdaki donanıma ait majör ton hangi seçenekte **doğru** verilmiştir?



B) Si bemol majör

B) La bemol majör

C) Fa majör

D) Mi bemol majör

24. Do minör tonunda otantik kadans aşağıdaki seçeneklerin hangisinde **doğru** verilmiştir?



25. Aşağıdaki seçeneklerden hangisi Klasik Dönemin özelliklerinden **değildir**?

A) Çalgı müziği, vokal müziğin önüne geçmiştir.

B) Senfoni, bu dönemde dört bölümlü önemli bir biçim hâline gelmiştir.

C) İlk kez gürlük terim ve işaretleri kullanılmıştır.

D) Barok Dönem sanatındaki abartı, Klasik Dönemde yerini sadeliğe ve içtenliğe bırakmıştır.

APPENDIX -4

12. Sınıf Gitar Dersi Nihai Başarı Testi

1. "İleri" vuruş tekniğini gösteren işaret aşağıdaki seçeneklerin hangisinde **doğru** verilmiştir?

A) \wedge

B) \vee

C) \rightarrow

D) \downarrow

2. Aşağıda verilen resimlerde anlatılan teknik hangi seçenekte **doğru** verilmiştir?



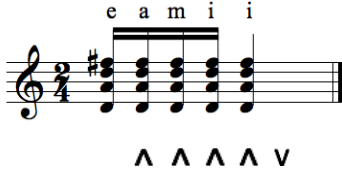
- A) Tremolo
- B) Rasgueado
- C) Tambora
- D) Flageolet

3. Aşağıda verilen resimlerde anlatılan teknik hangi seçenekte **doğru** verilmiştir?



- A) Tremolo
- B) Rasgueado
- C) Tambora
- D) Flageolet

4. Aşağıda verilen notalar hangi seçenekte belirtilen teknikle çalınabilir?



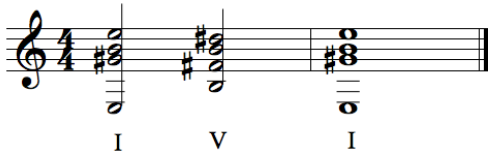
- A) Tremolo
- B) Rasgueado
- C) Tambora
- D) Flageolet

Aşağıda verilen cümledeki boş bırakılan yere uygun olan seçeneği işaretleyiniz.

5. Gece müziği anlamında, hülyalı, romantik ya da duygulu karakterde, özgür biçimdeki piyano parçalarını tanımlamakta kullanılan şiirsel forma.....denir.

- A) Sonat
- B) Fantezi
- C) Noktürn
- D) Senfoni

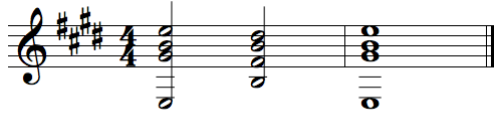
6. Aşağıda verilen kadans'ın tonu ve çeşidi hangi seçenekte **doğru** verilmiştir?



- A) Mi majör-Tam Kadans
- B) Mi majör-Otantik Kadans
- C) Mi minör-Plagal Kadans
- D) Mi minör-Tam Kadans

7. Mi majör tonunda plagal kadans aşağıdaki seçeneklerin hangisinde **doğru** verilmiştir?

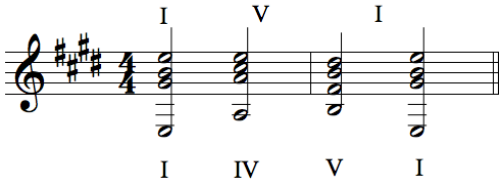
A)



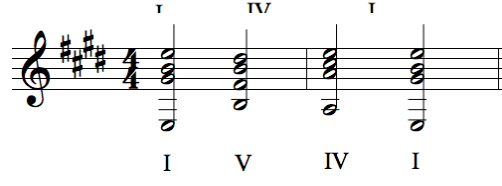
B)



C)



D)



8. Karıcıgar makamı dizisi aşağıdaki seçeneklerin hangisinde **doğru** verilmiştir?

A)



B)



C)

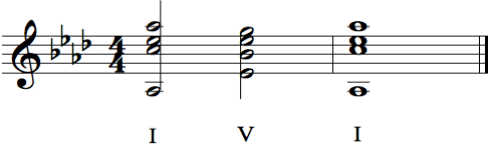


D)

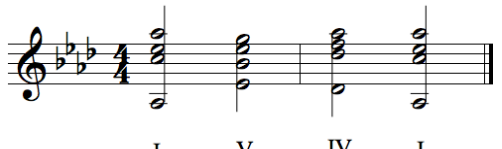


9. La bemol majör tonunda plagal kadans aşağıdaki seçeneklerin hangisinde **doğru** verilmiştir?

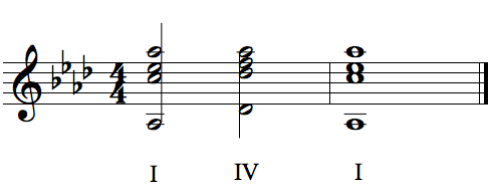
A)



B)



C)



D)

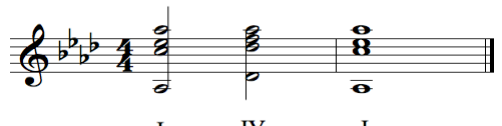


10. La bemol majör tonunda tam kadans aşağıdaki seçeneklerin hangisinde **doğru** verilmiştir?

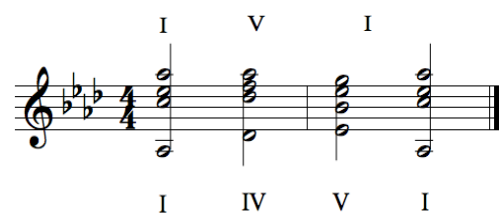
A)



B)



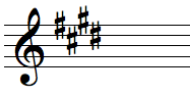
C)



D)



11. Aşağıdaki donanım a ait minör ton hangi seçenekte **doğru** verilmiştir?



A) Sol diyez majör

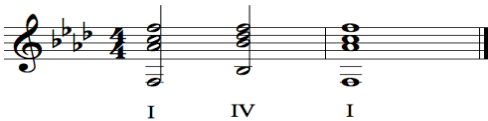
B) Re diyez minör

C) Do diyez minör

D) Fa diyez majör

12. Fa minör tonunda otantik kadans aşağıdaki seçeneklerin hangisinde **doğru** verilmiştir?

A)



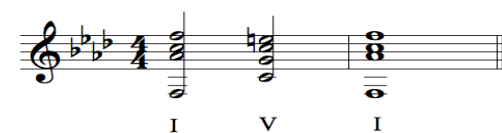
B)



C)

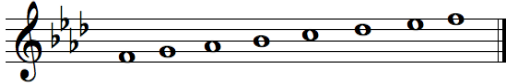


D)

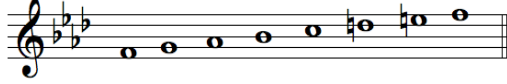


13. Çıkıcı melodik Fa minör dizisi aşağıdaki seçeneklerin hangisinde **doğru** verilmiştir?

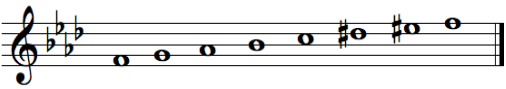
A)



B)



C)



D)



14. Saba makamını oluşturan dörtlü ve beşli isimleri aşağıdaki seçeneklerin hangisinde **doğru** verilmiştir?

- A) Eksik saba dörtlüsü + Hicaz beşlisi + Kürdi dörtlüsü
 B) Eksik saba dörtlüsü + Hicaz beşlisi + Hüseyini dörtlüsü
 C) Eksik saba dörtlüsü + Hicaz beşlisi + Hicaz dörtlüsü
 D) Eksik saba dörtlüsü + Hicaz beşlisi + Rast dörtlüsü

15. Aşağıdaki seçeneklerin hangisi Romantik Dönemin özelliklerindedir?

- A) Aydınlanma çağı, Romantik Dönemde duraklamaya başlamıştır.
 B) Armoninin sınırları zorlanmış, nüans terimleri abartılı şekilde kullanılmıştır.
 C) "12 ton müziği" adı verilen bir sistem oluşturulmuştur.
 D) Hümanizm düşüncesi müziğe bu dönemde yansımıştır

16. Aşağıdaki seçeneklerin hangisi Romantik Dönemde kullanılan müzik formlarından **değildir**?

- A) Noktürn B) Senfonik şiir C) Fantezi D) Courante

17. Antonio LAURO hangi dönem bestecilerindedir?

- A) Barok Dönem B) Klasik Dönem C) Romantik Dönem D) Çağdaş Dönem

18. Aşağıdaki seçeneklerin hangisi Çağdaş Dönemde kullanılan müzik formlarından **değildir**?

- A) Bale B) Senfoni C) Galliarde D) Konçerto



| Research Article / Araştırma Makalesi |

Impact of Aberrant Responses on Item Response Theory-Based Model Estimations

Normal Olmayan Yanıtların Madde Tepki Kuramına Dayalı Model Kestirimleri Üzerindeki Etkisi

Akif Avcu¹

Keywords

1. Person-fit
2. Item response theory
3. University students
4. Generalized anxiety
5. R program

Anahtar Kelimeler

1. Kişi uyumu
2. Madde tepki kuramı
3. Üniversite öğrencileri
4. Yaygın kaygı
5. R programı

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Abstract

Purpose: Misfit individuals can bias model results at both the tests and item levels. Given the importance of detecting aberrant responses, the purpose of this study was to examine the effect of aberrant responses on item response theory-based model estimates.

Design/Methodology/Approach: This study is descriptive research, and simulated data was used. For this purpose, data were collected from 1104 university students enrolled in 8 different universities in Turkey using the Generalized Anxiety Disorder-7 scale. After parameter estimation based on the item response theory model, 100 different datasets were simulated using the item and person parameters obtained from these estimations. In this way, it was aimed at increasing the findings' generalizability. The R program analyzed the data using "PerFit" and "mirt" packages. Misfit persons were identified with Lz, U3, G and norm-based G person fit statistics.

Findings: The findings showed that misfit persons affected the model fit statistics, item fit statistics, item discrimination values, the amount of information provided by the items, the total amount of information provided by the scale, and empirical reliability levels across different levels of ability trait. In addition, in order to improve the results based on the item response theory, it was observed that removing the misfit persons detected based on the Lz statistic from the dataset was the least effective among the existing techniques. On the other hand, the G-fit statistic has been identified as the most effective technique.

Highlights: The obtained results should be interpreted with caution because the simulated data used in this study is based on parameters representing the dataset collected with a measurement tool aimed at measuring anxiety, and these results may not be generalizable to the measurement of different traits.

Öz

Çalışmanın amacı: Uyumsuz bireyler, model sonuçlarını hem test hem de madde düzeyinde bozabilir. Anormal yanıtların tespit edilmesinin önemi göz önünde alındığında, gerçekleştirilen bu çalışmanın amacı anormal yanıtın madde madde tepki kuramına dayalı kestirimler üzerindeki etkisinin incelenmesi olarak belirlenmiştir.

Materyal ve Yöntem: Gerçekleştirilen bu çalışma betimsel araştırmadır ve türetilmiş veriler kullanılmıştır. Bu amaçla Türkiye genelinde 8 farklı üniversiteye kayıtlı 1104 üniversite öğrencisinden Yaygın Kaygı Bozukluğu-7 Ölçeği kullanılarak veriler toplanmış ve madde tepki kuramı modeline dayalı parametre kestirimleri gerçekleştirildikten sonra elde edilen madde ve kişi parametreleri kullanılarak 100 adet veri seti türetilmiştir. Bu sayede elde edilen bulguların genellenebilirliğinin artırılması amaçlanmıştır. Veriler R ortamında "lavaan", "perfit" ve "mirt" paketleri kullanılarak analiz edilmiştir. Uyumsuz kişiler Lz, U3, G ve norma dayalı G kişi uyumu istatistikleri ile tespit edilmiştir.

Bulgular: Elde edilen bulgular, uyumsuz kişilerin model uyumu istatistikleri, madde uyumu istatistikleri, madde ayırt edicilik değerleri, maddeler tarafından sağlanan bilgi miktarı, ölçeğin verdiği toplam bilgi miktarı ve kaygı özelliğinin farklı düzeyleri boyunca görgül güvenilirlik düzeyi üzerinde etkisi olduğunu göstermiştir. Ayrıca, madde tepki kuramına dayalı sonuçları iyileştirmek için Izipoly istatistiğine dayalı belirlenen uyum göstermeyen bireyleri veri setinden uzaklaştırmanın mevcut teknikler içerisinde en az etkili olduğu görülmüştür. Diğer taraftan, G istatistiği ise en etkili olarak belirlenmiştir.

Önemli Vurgular: Elde edilen sonuçlar dikkatle yorumlanmalıdır çünkü gerçekleştirilen bu çalışmada kullanılan türetilmiş veriler kaygının ölçümünü amaçlayan bir ölçüm aracı ile elde edilen veri setini temsil eden parametrelere dayalıdır ve elde edilen sonuçlar farklı özelliklerin ölçümüne genellenemeyebilir.

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INTRODUCTION

For any measurement instrument, validity is an essential concern for sound interpretation of test results and proper use of those results (American Educational Research Association, 1985). As Messick (1995) puts it, the validity of test scores can be examined at both the score level and the individual level because test scores are a function of the items or stimuli given and a function of respondents. When factors other than the latent trait being measured affect the response process, the subject's response behavior becomes abnormal (also referred to as aberrant or unexpected), and the resulting test score does not adequately reflect the level of the latent trait. This can lead to biased research results and erroneous decisions about individuals. Reasons such as the respondents' level of motivation, poor understanding of the instructions, inattentive reading of the items, inability to respond sincerely, and ignoring some response categories cause respondents to produce response patterns that are inconsistent with the underlying model of the trait (Meijer, 1996).

It is essential to identify individuals who do not fit the underlying model or give strange responses compared to the rest of the sample group, as the proper level of the latent trait may not be accurately estimated. Inaccurate trait estimation negatively affects individuals and organizations and leads to erroneous conclusions about test validity (Schmitt et al., 1999). Examining test score validity at the individual level could be done through a person-fit analysis. Person-fit assessment is concerned with identifying atypical test performance based on the item or test score patterns (Meijer & Sijtsma, 2001), and it is conducted by using one or more person-fit statistics. Currently, about forty person-fit statistics have already been developed in the relevant literature, although only four of them are designed explicitly for Likert-type polytomous items. For a detailed overview of these person-fit statistics, the reader is advised to look at Karabatsos (2003).

Various person-fit statistics can be divided into two broad families: group-based and IRT-based. Most group-based person-fit statistics are based on the Guttman model (Guttman, 1944), in which items are classified from easiest to the most complex and any inconsistency in the response vector is counted as a Guttman error. More specifically, on a dichotomously scored achievement test, a Guttman error occurs when a person gives a correct response to a difficult item while giving an incorrect response to a relatively easy item. In a test, if a person answers the easiest x items correctly while answering the remaining items incorrectly, this pattern is considered a perfect Guttman scaling with no error. On the other hand, answering a more difficult item correctly and answering an easier item incorrectly is considered a Guttman error. For example, on a five-item achievement test where items are ordered by difficulty, a response pattern of [1, 1, 1, 0, 0] contains zero errors, while a response pattern of [1, 0, 0, 1, 1] contains four Guttman errors because it contains four (0, 1) item pairs.

On the other hand, polytomous item formats are usually used in psychological assessment instruments. For polytomous items, the concept of item steps is used instead of difficulty (Sijtsma & Molenaar, 2002). Item level is the psychological threshold between ordered response options. For example, in a Likert-type item, the threshold between the "I disagree completely" option and the "I disagree" option is the first step for a respondent. If the person feels that they do not fully agree with this statement, they will cross the first threshold and choose between "I disagree" and "I have no idea." This process will continue until the respondent does not choose the next option. Using this approach, the proportion of people passing each step for any item can be determined by the proportion of respondents answering correctly in the previous example. Later, the steps can be ordered from lowest to highest popularity, and the polytomous item responses for each respondent can be compared to the order of the item steps. Taking a less popular item step will result in a Guttman error (Molenaar, 1997).

One of the fit statistics used based on Guttman error is G statistics. Polytomous extension of G statistics is named G-poly. G statistics reflect the number of Guttman errors. The minimum possible value for the G statistic is 0. This indicates that the Guttman error has not been observed, and the score vector follows perfect Guttman scaling. On the other hand, the maximum value that G can take varies depending on the number of items and the number of item categories.

For this reason, it is not possible to compare the G-poly values of different tests if they contain a different number of items or items' response categories are not the same. The normed G statistics, on the other hand, enable this comparison. Derived from G-poly statistics, the standardized version can take values between 0 and 1. The polytomous version of the normed G statistic is denoted as $G_{\text{normed-poly}}$ (Emons, 2008). U3 statistic (Van Der Flier, 1982) is also based on Guttman errors. It takes into account both item difficulty order and values of item difficulties. Accordingly, if the response vector is perfectly Guttman vector, the U3 statistic takes the value of zero, whereas if the Guttman vector is perfectly inverse, this value becomes one. In other words, increasing U3 values provide stronger indicators of a person's misfit. Later, Emons (2008) generalized the U3 statistics (Van Der Flier, 1982) to polytomous items (denoted as U3-poly). U3-poly values can also vary between 0 and 1.

In contrast to the U3 statistic, the increase in value indicates that the level of fit is also increasing. Therefore, increasing U3-poly values provide stronger indications of person fit. Among the IRT-based person-fit statistics, the Lz value comes to the fore regarding its applicability to polytomous items. The Lz statistics is a standardized likelihood-based statistic used to determine the likelihood of an item response pattern in the context of the selected IRT model. The low Lz values indicate a stronger misfit (Drasgow et al., 1985).

Although many studies on the person fit have been conducted to date, including those using simulative data (Karabatsos, 2003; Tendeiro & Meijer, 2014), recent studies are also increasingly using real data (Engelhard, 2009; Conrad, 2010). Considering that studies on understanding the effects of person fit on practical test results provide valuable information for researchers and test developers in education and psychology, this study aimed to investigate the effect of aberrant responses on item response theory (IRT) based model estimates. More specifically, this study aims to show how IRT-based model fit statistics, item fit statistics, item

discrimination values, the amount of information provided by items, the total amount of information provided by the scale, and empirical reliability levels changed across different levels of the anxiety trait when misfit persons were removed from the dataset. This study is essential because item response theory-based estimates have been becoming common among researchers, and the results of this study should help researchers better identify the effect of aberrant responses and shed light on which person fit index should be preferred while researchers estimate model parameters.

METHOD/MATERIALS

The purpose of this study is to show how misfit persons alter IRT-based model estimates. Since the study aims to reveal the existing situation without manipulating the conditions or showing the relationships between different variables, it carries the specifications of a descriptive research design (Karasar, 2005).

Participants and procedure

A large representative data was collected in this study. The sample group consists of 1104 university students. The participants were selected from 8 different universities. Seven of these universities are public, and one is private, and all universities are located in two different major cities. Of the participants, 808 (74%) are females, and the remaining 284 (26%) are males. The distribution of participants based on the faculty in which they were enrolled as follows: Faculty of Education 557 (51%), Faculty of Business and Administrative Sciences 149 (13.7%), Faculty of Dentistry 118 (10.8%), Faculty of Science and Literature 108 (9.8%), Faculty of Fine Arts 106 (9.7%) and Faculty of Health Sciences 54 (4.9%). Data was collected through an online platform due to the 2020 pandemic outbreak. Convenience sampling was used due to the difficulty of using systematic sampling techniques in online data collection. Participants were informed of the purpose of the study before they began participating and were informed that participation in the study was voluntary. Written consent was obtained before they began answering the questions.

Measures

Generalized Anxiety Disorder-7 Scale (GAD-7) is a seven-item self-report measurement instrument developed by Spitzer et al. (Spitzer et al., 2006). It was developed to evaluate the General Anxiety Disorder based on DSM-IV (American Psychiatric Association, 2000) criteria. It is scored on four-point Likert scale (0 = none, 1 = many days, 2 = more than half the days, 3 = almost every day).

GAD-7 questions ask respondents to assess their experiences in the last 2 weeks. The cut-off points of 5, 10, and 15 correspond to mild, moderate and severe anxiety, respectively. Patients with a total score of 10 or above are recommended to be closely screened further for possible diagnosis of GAD. The adaptation study of the scale to Turkish was conducted in 2013 by Konkan et al. (Konkan et al., 2013). In the adaptation study, the Cronbach's alpha value for GAD-7 total score was 0.852. In addition, validity-related evidences were provided and it was concluded that GAD-7 is a reliable and valid assessment tool ($\chi^2=14.48$, $p>0.05$, $\chi^2/df=1.03$, CFI=0.99, TLI=0.99, GFI=0.96, RMSEA=0.02 and AGFI=0.93).

Statistical analysis

Firstly, analyses were carried out using a mirt package (Chalmers, 2012) to examine which polytomous IRT model fits the data better. Graded Response Model (GRM) (Samejima, 1970) and Generalized Partial Credit Model (GPCM: Muraki, 1992) were compared with likelihood-based ratio test. The results suggested that GAD-7 data showed a significantly better fit with the GRM model ($p<0.01$), and further analysis were decided to be continued with the GRM. This preference is also in line with previous IRT-based analyses of GAD-7 (Jordan et al., 2017). In the next stage, simulative datasets were generated 100 times based on the estimated person (traditionally denoted as θ) and item parameters obtained after fitting the GRM model, and further analyses were carried out by using those datasets to increase the generalizability of the results. The expected a-posteriori (EAP) (Bock & Aitkin, 1981) estimation method was used to estimate θ parameters. This method is based on the Bayesian statistical approach. Among other alternatives, the EAP was selected because it has no inherent problems like non-convergence and dependence on starting value. In addition, estimation is not affected by the existence of the highest and the lowest possible scores in the dataset.

Firstly, it was examined whether GAD -7 data met the assumptions of IRT analysis. There are two basic assumptions for parametric IRT models: unidimensionality and local independence (Hambleton, 1991). Unidimensionality implies that only one latent feature underlies a group of items. The existence of an underlying dominant factor is sufficient to meet this assumption. The ratio of the first two eigenvalues obtained from the exploratory factor analysis (EFA) is the first criteria for evaluating the unidimensionality of GAD -7 data. Morizot et al. (2009) stated that having a ratio of 3 and above is sufficient evidence for unidimensionality. The acceptable level of fit by confirmatory factor analysis (CFA) model testing unidimensional structure is another criterion used. Model fit was assessed with χ^2/df , Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), Goodness-of-fit index (GFI), Normed Fit Index (NFI), Root Mean Square Error of Approximation (RMSEA), Standardized Root Mean Square Residual (SRMR). These fit indices are interpreted as suggested by Kline (2015). Explanatory factor analysis was performed with IBM SPSS Statistics for Windows (Version 21), while the lavaan package (Rosseel, 2012), which is available in the R software environment (R Core Team, 2020), was used for the CFA.

On the other hand, local independence implies that the probability of the response of a person taking the test is not to be affected by the responses given to other items in the test. Q3 statistics proposed by Yen (1984) were used to evaluate the local independence assumption. Q3 values are calculated between each item pair, and values lower than 0.2 imply no local dependence

among the corresponding item pairs, while the values in the range of 0.2-0.3 are acceptable even if they need closer attention (Christensen, 2017).

At the last stage, the person fit statistics were calculated. PerFit package (Tendeiro et al., 2016) was used for this procedure. As cited in the previous section, four different statistics can be used with polytomous items: Lz-poly, G-poly, Gnormed-poly, and U3-poly. Among them, the Lz-poly statistic is parametric (IRT model-based), and the rest of the statistics are nonparametric (based on Guttman errors). When specifying misfit people, the decision was made based on the empirical cut-off value specified by bootstrapping procedures at a specified p-value (the p-value for the current study was set at a conventional 0.05 significance level). After removing misfit persons from simulated datasets, misfit person-free datasets were obtained. For the rest of this article, simulated datasets will be referred to as complete datasets, while the dataset that responses of misfit persons were removed will be called misfit-free datasets to facilitate the readers' understanding. For both datasets, the GRM model was fit, and the model fit statistics, item fit statistics, item and test information levels, and predicted discrimination (as denoted by a) parameter values were compared. Model fit of IRT models was evaluated by log-likelihood statistics, G2, AIC, and BIC values. Higher log-likelihood values and lower G2, AIC and BIC values imply better model fit. In addition, item fit was evaluated with $S\text{-}\chi^2$ statistics similar to χ^2 statistics, and lower values indicate a better fit of items to the given IRT model tool.

FINDINGS

Please The results section consists of three parts. In the first part, it was examined whether IRT assumptions are met in order to see the applicability of the IRT model. Later, GAD-7 data was fit to the GRM model and main findings were shortly interpreted. For the rest of the analysis, the statistics of Lz-poly, U3-poly, G-poly, and Gnormed-poly were calculated and after removing response vectors belong to misfit persons, misfit-free datasets were obtained. Those misfit-free datasets were fit to the GRM model again and the results were compared.

Checking the assumptions of IRT

The statistical results presented in the findings section represent the arithmetic mean of corresponding statistics obtained from 100 different simulated datasets. To begin, principal components analysis was used to investigate the unidimensionality of simulated datasets. The analyses' findings provided sufficient evidence for the factorability of GAD-7 data: the average KMO value was obtained as 0.92 and in none of the values obtained from simulated datasets fell below .90; the average χ^2 value for Bartlett's Test of Sphericity is 3391, and with 21 degrees of freedom, all the tests were statistically significant. Furthermore, the average anti-image correlations range from 0.89 to 0.95, and the average communality values never fall below 0.50. After the analyses of factorability were conducted, the unidimensionality of the simulated datasets was investigated. As outlined in the previous section, both the EFA and the CFA were conducted to investigate the unidimensionality assumption. Based on the EFA, one factor with an Eigenvalue greater than one was extracted. The average variance value explained by this first factor was found as %55.6 of the overall variance, and the average first-to-second eigenvalue ratio was found to be 6.42, and the ratios of each simulated dataset never fell below 4. According to Gorsuch (2003), if the first to second-factor ratio is greater than 3, the scale may be considered unidimensional. These findings demonstrated the simulated datasets' unidimensionality. A looser way to look at the unidimensionality is the inspect the amount of the first variance explained by the first factor. Even this value does not provide evidence for strict unidimensionality; it enables us to see whether or not there is an underlying dominant factor for the responses provided. Drasgow and Hulin (1990) pointed out that in the context of the IRT analysis, the existence of a dominant factor is sufficient to fulfill the assumption of one-dimensionality. The variance explained by the first factor is generally viewed as an index to assess the existence of the dominant factor, even in multidimensional datasets (i.e., Miguel, 2013). Reckase (1989) found that stable estimates can be obtained when the first factor explains at least %20 of the total variance. The average value of %55.6 is well above the %20 threshold and supports the existence of an underlying dominant factor. Unidimensionality was further explored with the CFA. As the average values of the fit indices were investigated, it was seen that, the average values of them also supported the unidimensionality [$\chi^2/df = 1.29$, TLI = 0.997, GFI = 0.968, NFI = 0.977, RMSEA = 0.071, SRMR = 0.026]. All in all, the results of both the EFA and the CFA show that the assumption of unidimensionality was met.

Local independence assumption of dataset items was scrutinized via investigating Yen's Q3 statistics. As stated in the previous section, the Q3 values less than 0.2 are regarded as local independence for a given item pair, while a value of 0.3 or less needs closer inspection according to Christensen's (2017) guidelines. The results are shown in Table 1 below. In the Table, upper diagonal values represent the average Q3 statistics obtained from 100 simulated datasets, while the lower diagonal values represent the average standard errors of corresponding Q3 statistics. As the Table was investigated, it can be seen that none of the Q3 statistics for item pairs exceeded the 0.3 thresholds. It would be more desired to observe values lower than 0.2 to be sure for local independence, taking 0.3 value as a criterion; none of the Q3 values seemed to violate the local independence assumption. Because inspecting the possible violations and their underlying reasons is beyond the aim of the current study, an eventual conclusion was drawn as no violation of the local independence assumption.

To summarize, both the unidimensionality and the local independence assumptions of the IRT models were satisfied by different analyses. As a next step, the GRM model fits each simulated dataset.

Table 1. The average Q3 statistics among GAD-7 item pairs

	Item 1	Item 2	Item 3	Item 4	Item 5	Item 6	Item 7
Item 1		-0.21	-0.16	-0.13	-0.10	-0.10	-0.14
Item 2	0.03		-0.25	-0.21	-0.15	-0.16	-0.23
Item 3	0.03	0.03		-0.16	-0.12	-0.12	-0.17
Item 4	0.03	0.03	0.03		-0.10	-0.10	-0.13
Item 5	0.03	0.03	0.03	0.03		-0.07	-0.10
Item 6	0.03	0.03	0.03	0.03	0.03		-0.10
Item 7	0.03	0.03	0.03	0.03	0.03	0.03	

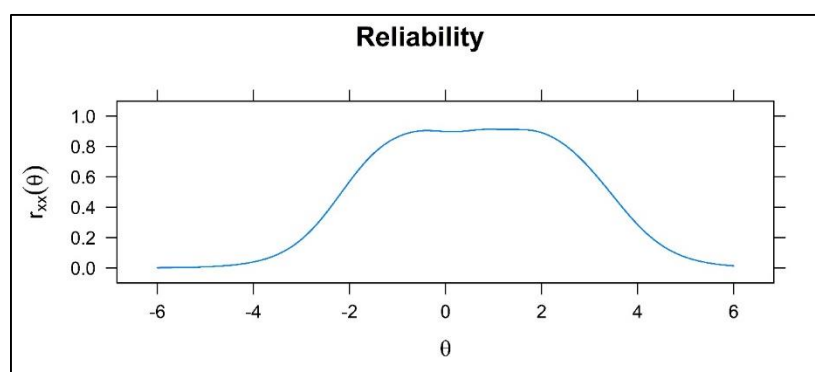
After checking the IRT assumptions, the GRM model was fit to the datasets separately. The average estimated item parameters and the information values of the analyses were shown in Table 2 below. The results indicated that, the second item had higher discrimination parameter value while the fifth and the sixth items have the lowest. Also, as it can be inferred from the discrimination values, the second item provided the highest information and contributed to the accuracy of the measurement while the fifth and the sixth items have lowest information values and provide the lowest accuracy to the measurement of simulated datasets.

Table 2. The average item parameters and item information values of items.

	a1	d1	d2	d3	Information
Item 1	2.17	-0.39	1.02	1.82	5.05
Item 2	3.45	-0.45	0.85	1.68	9.34
Item 3	2.50	-0.86	0.53	1.47	6.28
Item 4	2.06	-0.57	0.80	1.78	4.80
Item 5	1.59	-0.24	1.40	2.61	3.68
Item 6	1.55	-1.25	0.39	1.53	3.49
Item 7	2.30	-0.09	1.04	1.75	5.04

Note: $a1$ denoted to discrimination parameter while $d1-d3$ denotes to successive item difficulty parameters for each category thresholds.

Based on the GRM analyses, obtained reliability plot of datasets was provided in Figure 1. As deduced from the figure, it could be stated that the average reliability of datasets never falls below 0.80 across the ability levels of -2 to 2. The curve has no clear peak, and keep going almost horizontally in this range. The figure suggest that average reliability value of datasets can provide accurate results at that range of the ability spectrum. On the other hand, as expected, the average reliability level of datasets fell dramatically at both extreme θ levels. In addition, even the test information plot of the datasets was not provided in the present study, considering that the amount of information a test yields is related to the reliability, the similar conclusions can be drawn for the information level of the datasets across the ability levels.

**Figure 1. Empirical reliability plot of GAD-7 scale**

Comparison of the GRM results for complete datasets and misfit person-free datasets.

Effect of misfit persons on the GRM model results were investigated by comparing the results for complete datasets and misfit-free datasets. The misfit-free datasets were obtained by simply removing misfit persons based on either *Lz-poly*, *U3-poly*, *G-poly* and *Gnormed-poly* person-fit statistics. This process was repeated for each simulated dataset. In the first stage, the simulated complete datasets used to estimate *Lz-poly*, *U3-poly*, *G-poly* and *Gnormed-poly* person fit statistics. After estimating person fit statistics, those cases that were flagged as misfit person were removed based each person fit statistics separately and four different misfit-free datasets were obtained. The model fit values of estimated the GRM model were presented in Table 3.

Table 3. The average model fit values of complete datasets and mean Δ after case removal.

	Lz-poly		U3-poly		G-poly		Gnormed poly	
	Mean	Mean Δ	Mean	Mean Δ	Mean	Mean Δ	Mean	Mean Δ
Loglikelihood	-7180	-649	-7033	-796	-6744	-1086	-6964	-866
G ²	2014	394	2188	220	1818	590	2123	285
AIC	14417	1299	14123	1593	13543	2172	13984	1732
BIC	14555	1300	14260	1595	13681	2175	14121	1734

The values in the table represents the arithmetic average model fit values of 100 simulated datasets. The change of model fit values when misfit persons were removed were represented with difference (Δ) scores. These difference scores were obtained by simply subtracting model fit value of misfit-free dataset from the corresponding fit value of the complete dataset. Positive Δ scores for G², AIC and BIC values and negative scores for the log-likelihood implies model improvement after removal of misfit person. The results showed that highest decline for log-likelihood scores were observed after removing the misfit persons *G-poly* method. Similarly, the highest increase of scores for G², AIC and BIC were also observed for *G-poly* method. This results suggest that, misfit person removal based on *G-poly* values contribute better to the model fit results compared to other person fit statistics.

As similar to investigation on model fit results, average item fit $S-\chi^2$ values and mean Δ item fit $S-\chi^2$ values for each person fit statistics were calculated and shown in Table 4.

Table 4. The average item fit values of complete datasets and mean Δ after case removal.

	Lz-poly		U3poly		Gpoly		Gnormed	
	$S-\chi^2$	$S-\chi^2\Delta$	$S-\chi^2$	$S-\chi^2\Delta$	$S-\chi^2$	$S-\chi^2\Delta$	$S-\chi^2$	$S-\chi^2\Delta$
Item 1	32.31	-2.26	33.13	-1.44	31.04	-3.53	32.88	-1.69
Item 2	22.32	-1.92	23.74	-0.51	22.37	-1.88	23.28	-0.97
Item 3	27.51	-1.15	28.40	-0.25	27.17	-1.48	28.06	-0.59
Item 4	32.82	-2.09	33.27	-1.65	31.59	-3.33	32.86	-2.06
Item 5	33.27	-1.52	37.26	2.47	31.01	-3.78	36.14	1.35
Item 6	33.55	-1.07	37.81	3.19	33.62	-1.00	37.36	2.74
Item 7	31.36	-0.83	31.91	-0.28	31.07	-1.12	31.85	-0.34

As previously stated, $S-\chi^2$ values could be interpreted as higher values imply worse fit of the item to the given model (Orlando & Thissen, 2000). Hence, the negative values of Δ scores in the table imply model fit improvement after removal of misfit persons while the positive values imply model deterioration.

The results revealed that misfit person removal based on *G-poly* statistics contribute the most to the item fit while the worst performance was observed for *U3-poly* statistic. The only exception of this result was observed for the second item where the use of *Lz-poly* statistics contributed the most. Interestingly, this item was also found as the one with highest information value. This result can lead us to the conclusion that if an item has relatively modest level of fit to the given IRT model, *G-poly* may not be superior over the other alternative person-fit statistics. Another interesting finding showed that misfit person removal based on *U3-poly* and *Gnormed-poly* statistics worsen the fit of item 5 and item 6 because, $S-\chi^2$ show rise as misfit persons were removed. These two items were also being found to be the worst fitting items based on the GRM analysis with complete datasets. This result implies that when item fit poorly to the given IRT model, person removal based on *U3-poly* and *Gnormed-poly* statistics further deteriorate the fit of item and should not be preferred by the researchers.

The average item discrimination parameter values obtained with complete datasets and the average scores obtained after item removal based on each person fit statistics were presented in Table 5 below. The values in the table were calculated by taking arithmetic average of the corresponding values from each simulated dataset. The values for each person-fit statistics were interpreted based on their comparison with the values obtained for the complete datasets. Contrary to previous tables, Δ scores were not used in Table 5.

Table 5. The average discrimination parameter values of complete datasets and for misfit-free datasets.

	Item 1	Item 2	Item 3	Item 4	Item 5	Item 6	Item 7
<i>A parameter</i>							
Complete	2.17	3.45	2.50	2.06	1.59	1.55	2.30
Lz-poly	2.37	3.86	2.72	2.21	1.70	1.64	2.50
U3-poly	2.24	3.36	2.40	2.14	1.67	1.60	2.36
G-poly	2.41	3.63	2.70	2.29	1.85	1.81	2.55
Gnormed-poly	2.26	3.34	2.43	2.11	1.72	1.63	2.40

The results revealed that person removal based on *G-poly* statistics provided the highest increase in item discrimination values for the last four items while the highest increases were observed for the first three items by *Lz-poly* statistics. The contribution of *G-poly* and *Gnormed-poly* on item discrimination values never became the highest or the second highest for any items. Beyond that, for some conditions, the use of them even decrease discrimination values. This result imply that person removal based on *G-poly* and *Lz-poly* statistics contribute relatively more to the accuracy of measurement for each items and the researcher need to be cautious when using *G-poly* and *Gnormed-poly*.

The average item and test information values and Δ values were presented in Table 6 below.

Table 6. The average item information values of complete datasets and mean Δ after case removal.

	Lz-poly		U3-poly		Gpoly		Gnormed-poly	
	Mean	Mean Δ	Mean	Mean Δ	Mean	Mean Δ	Mean	Mean Δ
Item 1	5.61	0.59	5.29	0.27	5.84	0.82	5.38	0.36
Item 2	10.60	1.35	9.06	-0.19	9.95	0.70	9.06	-0.20
Item 3	6.97	0.72	6.06	-0.19	6.95	0.70	6.16	-0.09
Item 4	5.28	0.49	5.12	0.32	5.58	0.78	5.04	0.24
Item 5	4.00	0.37	4.01	0.38	4.52	0.89	4.17	0.54
Item 6	3.75	0.27	3.71	0.23	4.25	0.76	3.78	0.30
Item 7	5.66	0.58	5.34	0.26	5.92	0.84	5.48	0.40
Total Info	41.87	4.36	38.59	1.07	43.02	5.50	39.06	1.55

The results showed that The highest increases in total test information were observed for *Lz-poly* and *G-poly* statistics. Hence, it can be concluded that case removal based on *Lz-poly* and *G-poly* statistics improve the test information better relative to the other two person fit statistics. On the other hand, the use of *U3-poly* and *Gnormed-poly* statistics even deteriorate total information values for some items.

The table 7 below show the amount of average change on test information across ability spectrum (ability spectrum was taken between -6 and +6 θ levels) based on case removal by different person fit statistics.

Table 7. The average change of test information change across ability spectrum for different person-fir statistics

θ interval	Lz		U3		G		G normed	
	Mean	Mean Δ	Mean	Mean Δ	Mean	Mean Δ	Mean	Mean Δ
-6. -5	0.00	0.001	0.01	-0.001	0.00	0.003	0.00	0.000
-5. -4	0.02	0.005	0.03	-0.004	0.01	0.012	0.03	-0.001
-4. -3	0.11	0.019	0.15	-0.026	0.08	0.043	0.14	-0.014
-3. -2	0.61	0.050	0.80	-0.136	0.56	0.105	0.76	-0.099
-2. -1	3.48	-0.154	3.69	-0.373	3.41	-0.093	3.64	-0.314
-1.0	9.70	-1.254	8.46	-0.012	9.74	-1.296	8.52	-0.076
0.1	10.59	-1.284	9.23	0.072	10.70	-1.391	9.32	-0.012
1.2	11.55	-1.622	10.00	-0.067	11.67	-1.745	10.11	-0.179
2.3	4.65	-0.206	4.81	-0.364	5.50	-1.050	5.07	-0.627
3.4	0.94	0.050	1.11	-0.124	1.11	-0.118	1.18	-0.185
4.5	0.18	0.025	0.24	-0.034	0.20	0.013	0.25	-0.037
5.6	0.03	0.008	0.05	-0.005	0.03	0.011	0.05	-0.003

The results showed that case removal based on *Lz-poly* and *G-poly* statistics improved the amount of information at central θ levels while decreased the amount of information at extreme θ levels. In practical conditions, increase of information at specific ability range is generally a desired feature because most of the measurement tools aims precision for specific target group. In this sense, *Lz-poly* and *G-poly* may be more practical to obtained more desired information curve depending on the aim of measurement. On the other hand, case removal based on *U3-poly* and *Gnormed-poly* statistics improve the amount of information throughout the whole spectrum but this improvement is relatively less compared to *Lz-poly* and *G-poly* statistics.

DISCUSSION

This study contributed to the existing literature in various ways. First of all, as a result of the fitting GAD-7 derived data with the GRM, the second item of GAD-7 provided the most information while the fifth and sixth items provided the least amount of information. These findings also coincide with the previous findings (Jordan et al., 2017). Another finding is that this study showed that GAD-7 could provide highly reliable results for a relatively wide range of θ spectrum.

Removing the data belonging to misfit persons from the complete datasets improved model fit indices for all four-person fit statistics. The most effective one was G-poly, while data removal based on Lz-poly statistics was less effective and improved the model fit relatively more minor. In parallel with this finding, it was observed that item fit statistics improved with the removal of misfit individuals from the dataset for G-poly and Lz-poly item removal.

As emphasized in the introduction section, simulative data are generally used in the studies conducted for person fit analysis literature (Karabatsos, 2003; Tendeiro & Meijer, 2014), and none of these studies suggested G-poly person fit statistics as a practical approach. One reason for this contrast may be the usage of simulated datasets based on parameters obtained from real data in the current study. Tendeiro and Meijer (2014) stated that data simulation creates an unfair advantage in the effectiveness of parametric methods and that parametric statistics may yield worse results than non-parametric ones in studies performed with real data. The current study partly supported this view because Lz-poly statistic, as the only parametric technique used in this study, was not found to be the most effective method. On the other hand, in the context of this study, G-poly statistics provided the best results.

In a study examining the effect on model fit for the CFA (Conijn et al., 2014), removing misfit individuals from the dataset improved the model fit. Hence, aberrant responses affect validity negatively. Similarly, in another study (Meijer & Nering, 1997), removing misfit persons from the dataset has positively affected the model fit. Even though the current study was conducted in an IRT context, the observed improvement in model fit indices is compatible with the results of these studies conducted in the context of classical test theory. If evaluated from this point of view, it could be suggested that removing misfit persons improve model fit results regardless of the measurement paradigm adopted by the researcher.

In addition, another remarkable point is that observed model fit improvements are observed for log-likelihood, G2, AIC and BIC indices. On the other hand, in a recent study (Liu et al., 2019), when the effect of the misfit individuals on CFA models' fit indices was examined, it was observed that RMSEA and SRMR fit indices were insensitive to the elimination of misfit individuals and no consistent results were obtained for all of the fit indices. Contrary to this previous finding, improvement in all indices were observed in the current study.

In addition, in the same study, Liu and his colleagues stated that the model fit of CFA can remain acceptable when the proportion of misfit individuals is not less than %30. For none of the simulative data in this current study, the percentage of misfit individuals did not reach %20, which is far less than the %30 rates. For this reason, it has been observed that the IRT model can provide satisfactory results in the analyses performed even with complete datasets containing misfit response vectors.

According to another finding, item discrimination levels and the amount of item information (and test information) values also increased due to removing misfit persons from the dataset. In this context, the most influential person fit statistics were found as Lz-poly and G-poly. Finally, when data was removed based on Lz-poly and G-poly fit statistics, the improvement in the amount of information was observed at central θ levels, while the amount of information for extreme θ levels was decreased. On the other hand, when the U3-poly and Gnormed-poly person fits statistics were considered for data removal, a more consistent but relatively more minor amount of improvement was observed for the entire spectrum of θ .

CONCLUSION AND RECOMMENDATIONS

All in all, this study is essential in terms of showing the effects of misfit persons on IRT-based model estimation results. It provides valuable information for practitioners to choose which person fits statistics to prefer when using GAD-7 with university students. Likewise, the results showed that removing misfit persons improve validity-related findings and, accordingly, proper test interpretations become more possible. On the other hand, despite the valuable contribution, this study also has some limitations. In addition, it differs from many studies by using real data. Primarily, online data was used in this study. The test conditions were not checked accordingly since the data was not collected under controlled conditions. In addition, the data used in this study were collected from university students whose clinical history is unknown and, possibly, the majority of them do not have a psychiatric disorder. It is suggested to examine the generalizability of these findings to the clinical sample groups. Finally, the simulated datasets were derived from an instrument measuring anxiety. Hence, the findings need to be interpreted in this context. Future studies may replicate this study with the instruments measuring different constructs.

Declaration of Conflicting Interests

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Statements of publication ethics

I/We hereby declare that the study has not unethical issues and that research and publication ethics have been observed carefully.

Researchers' contribution rate

The study was conducted and reported by the researcher.

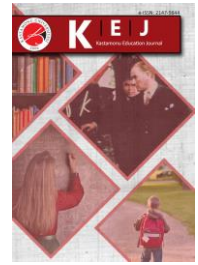
Ethics Committee Approval Information

As All procedures performed in this study involving human participants were in accordance with the ethical standards of the institutional research committee at Marmara University. It has the Ethics Committee Certificate with the Decision of Marmara University Institute of Education Sciences Publication Ethics Committee Dated 04.11.2020 and Numbered 2000310207.

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| Research Article / Araştırma Makalesi |

The Effect of Poetry Focused Supportive Educational Program to Preschool Children's Phonological Awareness

Şiir Odaklı Destekleyici Eğitim Programının Okul Öncesi Dönemi Çocuklarının Fonolojik (Sesbilgisel) Farkındalıklarına Etkisi¹

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Keywords

1. Phonological awareness
2. Early childhood period
3. Supportive educational program
4. Poetry

Anahtar Kelimeler

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Abstract

The study aims to examine the effect of the Poetry Focused Supportive Educational Program (PFSEP), which was prepared for preschool children, on children's phonological awareness skills. In order to support the phonological awareness of preschool children, poetry focused educational program was developed using phoneme awareness, rhythmic utterance and sound games. PFSEP's activity plans cover the phases of word awareness, syllable awareness, rhyme awareness and phoneme awareness, including phonological awareness skills. In addition, while organizing the activities of the PFSEP, care was taken to ensure that it is suitable for practice in the form of play-based activities and small groups in which children can participate more actively. In the research, the pretest-posttest control group was studied in a quasi-experimental design. The research study group was determined by using the easily accessible sampling method among the preschool within the primary schools affiliated to the Ministry of National Education in the city center of Denizli in the spring term of the 2017-2018 academic year. A total of 32 children, 16 in the experimental group and 16 in the control group, participated in the study. "General Information Form" and "Yangın Erdoğan Erdoğan Phonological Awareness Scale" (YEPPAS) were used as data collection tools. After the pretest was applied to the experimental and control groups, the PFSEP was implemented in the experimental group for eight weeks. After applying the PFSEP, the posttest was administered to the children in the experimental and control groups. As a result of the research, there was a significant difference in favor of the experimental group in the total phonological awareness score and all sub-dimension scores of the scale. The retention test applied to the experimental group four weeks after the post-test supports the significant difference. This result shows that the PFSEP is effective in improving phonological awareness skills.

Öz

Araştırmanın amacı okul öncesi dönemdeki çocuklara yönelik hazırlanan Şiir Odaklı Destekleyici Eğitim Programının (ŞODEP) çocukların fonolojik farkındalık becerileri üzerindeki etkisini incelemektir. Okul öncesi çağındaki çocukların fonolojik farkındalıklarını desteklemek için sesbirim farkındalığı, ritmik söyleyiş ve ses oyunları kullanılarak şiir destekli bir eğitim programı geliştirilmiştir. ŞODEP'in etkinlik planları, fonolojik farkındalık becerilerini içeren sözcük farkındalığı, hece farkındalığı, uyak farkındalığı ve sesbirim farkındalığı aşamalarını kapsamaktadır. Ayrıca ŞODEP'in etkinlikleri düzenlenirken, çocukların daha aktif katılabileceği oyun temelli etkinlikler ve küçük gruplar şeklinde uygulamaya uygun olmasına özen gösterilmiştir. Araştırmada, öntest - sontest kontrol gruplu yarı deneysel desende çalışılmıştır. Araştırmanın çalışma grubu, 2017-2018 öğretim yılının bahar döneminde Denizli il merkezinde bulunan Milli Eğitim Bakanlığına bağlı ilkokullar bünyesindeki ana sınıfları arasından kolay ulaşılabilir örnekleme yöntemi kullanılarak belirlenmiştir. Deney grubunda 16, kontrol grubunda 16 olmak üzere toplam 32 çocuk araştırmaya katılmıştır. Veri toplama aracı olarak "Genel Bilgi Formu" ve "Yangın Erdoğan Erdoğan Fonolojik Farkındalık Ölçeği" (YEFFÖ) kullanılmıştır. Deney ve kontrol gruplarına öntest uygulandıktan sonra deney grubuna sekiz hafta boyunca ŞODEP uygulanmıştır. ŞODEP'in uygulanmasının ardından deney ve kontrol grubundaki çocuklara sontest uygulanmıştır. Araştırma sonucunda deney grubu lehine hem fonolojik farkındalık toplam puanında hem de ölçeğin tüm alt boyut puanlarında anlamlı düzeyde bir farklılık görülmüştür. Sontest uygulamasından dört hafta sonra deney grubuna uygulanan kalıcılık testi anlamlı düzeydeki farklılığı destekler niteliktedir. Bu sonuç ŞODEP'in fonolojik farkındalık becerilerini geliştirmede etkili olduğunu göstermektedir.

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INTRODUCTION

It is essential that children's early literacy skills, including their knowledge, skills and attitudes before they learn to read and write, develop in the process, both at home and school. It is known that young children's phonological awareness, writing awareness, letter and phonetic knowledge, vocabulary, comprehension, and writing skills acquired within the scope of early literacy skills affect their later academic and social skills. Therefore, it is vital to support phonological awareness, accepted as one of the most important predictors of early literacy skills in the preschool period. (Erdoğan, 2009; Erdoğan, 2011; Erdoğan, 2012; Flett & Conderman, 2002; Goswami & Bryant, 2016; Hempenstall, 2015a; Lim & Chew, 2017; Lundberg, Larsman & Strid, 2012; Parpucu, 2017, Stahl, Murray, 1994; Yopp & Yopp, 2009).

Phonological awareness skill makes it possible to establish accurate and fast relationships between phonemes and graphemes, decode words while reading, and encode words while writing. Phonological awareness is the awareness of sound units. Individuals who can recognize, distinguish, and understand phonemes, the smallest building blocks of language, show high skill and awareness in early literacy (Erdoğan, 2011). On the other hand, the vocabulary knowledge of the individual plays an essential role in terms of the descriptive richness and quality of the text and the accuracy of the written text (Brynildssen, 2000). Phonological awareness skills with the prerequisite qualifications to understand the relationship between letters and phonemes (Erdoğan, 2009) are concerned with the structure of words rather than their meaning (Hempenstall, 2003). In the preschool period, children are expected to go through the steps of word awareness, syllable awareness, first sound/final sound awareness and phoneme awareness and, throughout these steps, they are also expected to perform tasks such as noticing - dividing - collation - adding - subtracting. It is thought that a child who has completed the tasks expected to be accomplished by passing through these steps and has developed phonological awareness is ready to acquire reading skills (Chard & Dickson, 1999; Karakelle, 1998; Pfof, Blatter, Artelt, Stanat & Schneider, 2019).

Having the skill of phonological awareness means becoming competent in the areas of realizing that sentences consist of words, realizing that words can have rhymes, realizing that words can start with the same sound, realizing that words are made up of syllables, and realizing that words can end with the same sound. If a child realizes that words can be broken down into sounds, they can use the letter-sound relationship for reading. (Chard & Dickson, 1999; Çelenk, 2007). The development in the level of phonological awareness significantly predicts the level of the vocabulary of children and their success in constructing qualified sentences (Bdeir, Bahous & Nabhani, 2020; Bayraktar, 2013; Carroll, 2001; Erdoğan, 2009; Erdoğan, 2011; Parpucu, 2017; Sönmez, Haznedar & Babür, 2017; Turan & Akoğlu, 2011; Yopp, 2009).

In the preschool period, the foundation of early literacy skills is strengthened by phonological awareness. Educators and researchers working with preschool children should support them cognitively and socio-culturally in this process. Children's phonological awareness skills should be supported simultaneously with the current program (Karaman, 2015). Children have a natural inclination to play games involving language and speech. The preschool period is the best time to support children and encourage them to expand their phonological exploration. In this period, rhythmic structures such as poetry give clues that children can play with the structure of words. These may be the first signs of phonological awareness for children (Hempenstall, 2015a; Morais, 1991; Opitz, 2000; Yopp & Yopp, 2009).

Poems are significant in the life of preschool children. Poetry is a way of learning about life for children by being with them since infancy. Sometimes children can express themselves through body percussion or natural life by using their own body, voice, gestures and mimics without any play element. In this respect, nursery rhymes, lullabies, and counting are the most important parts of children's development (Erdoğan, Altınkaynak & Erdoğan, 2013). It is a fact that children need poetry at every stage of development (Kaya, 2013; Oğuzkan, 2013; Önal, 2002). In addition, poetry is an essential tool for children to develop their language skills and understand the magic of words and language mathematics; as Gülerüz (2002) stated, children, can benefit from the power of language through poetry and develop their creative thinking skills.

It can be said that the greatest supporter of phonological awareness is poetry. This is because poetry is a form of literary expression that emerges with rich symbols, rhythmic words, and harmonious sounds, which are equivalent in terms of syllables, stops and is a whole on its own (TDK, 2011). The raw material of all literary products known as songs, folk songs, marches, riddles, and puzzles learned at school is poetry. Accordingly, children are already involved in poetry (Aksan, 1993; Akyol, 2016). Children react positively to poetry at every stage of their development; they enjoy listening, reading, and memorizing poetry. Therefore, at every developmental stage, children need poetry (Oğuzkan, 2013). An individual who uses his/her language ultimately and ideally will be successful in his academic life and experience the spiritual pleasure of conveying their feelings and thoughts comfortably. Poetry activities will also have an essential role in developing these skills (Kıbrıs, 2008).

Similarly, children's ability to recognize and produce poems are clear examples of their phonological skills. Therefore, acquaintance with poetry is considered an essential experience for young children (Maclean, Byrant & Bradley, 1987). Flett and Conderman (2002) emphasized the importance of reading poems to children in developing phonological awareness; they also stated that phonological awareness could be supported by reading poetry from the book and creating environments where children can listen to poems from the music player. The musical aspect of the poem is an undeniable fact (Beyatlı, 1949; Arat, 1986). Today, brain research has revealed that playing music to a baby in the womb is vital for brain development (Başer, 2004; Fernandez, 2018; Fox, 2000; Önkaş, 2009; Uçan, 1996; Steinbrink, Knigge, Mannhaupt, Sallat & Werkle, 2019).

According to the study conducted by Lordier, Meskaldji et al. in 2019, it was found that rhythmic and harmonious sounds support the brain development of babies born prematurely. In the experiment conducted by Canadian researcher musician E. Glenn Schellenberg (2006) by forming two different groups in a school in Canada on the relationship between music and intelligence, it was determined that the IQ test scores of the children who took music lessons were considerably higher than those who did not. In the same study, it was observed that music positively affects children's thinking skills, mathematics, language, and ability to perceive the world. Music is a way of expression. Expression is realized with language. In this direction, it is inevitable that poetry, which has a musical aspect, cannot be neglected in children's literature (Erol, 2002). It was stated that drawing attention to rhymed and rhyming words during daily interactions with children is also effective in developing phonological awareness and simple poems with rhymed words, puppets and finger games (Eliaison & Jenkins, 2003; Sevinc, 2003; Uyanik & Kandır, 2010).

Children develop their skills within preschool education by using the opportunities that educational processes create for them. As children's emotional, mental and language skills develop and their experiences enrich, the content of the connection they establish with poetry also changes. In this context, preschool education is expected to offer rich experiences to children. These planned and programmed experiences create a natural learning process for children (Vardell, 2006; Yopp & Yopp, 2000). Similarly, it is essential to support children's phonological awareness by providing rich, stimulating preschool environments.

In the literature, there are many studies on supporting phonological awareness in the preschool period (Groth, 2020; Kruse, Spencer, Olszewski & Goldstein, 2015; Lim & Chew, 2017; Maclean, Byrant & Bradley, 1987; Piasta, 2016; Strom & Neuman, 2016; Skibbe, Gerde, Wright & Samples-Steele, 2016; Soto, Olszewski & Goldstein, 2019). However, only studies by Maclean, Byrant, and Bradley (1987) and Lim and Chew (2017) supported phonological awareness with a poetry-focused program. In the study of Byrant and Bradley (1987), in which they investigated 66 children aged three to four months and for 15 months, it was found that children were able to demonstrate skills in poetry and alliteration exploration and were also successful in producing poetry and sound. However, a solid and specific relationship was found between the interest in poetry and the development of phonological skills. In the research by Lim and Chew (2017), a quasi-experimental study was conducted with 30 children from different ethnicities receiving preschool education in public schools in Malaysia on the similarities of poetry, rhyme and sound. While no intervention was made to the control group, which consisted of 32 children in total, a program containing poetry and rhymed words was applied to the experimental group, which included phonological awareness sub-dimensions such as syllable awareness, rhyme awareness, sound awareness, first sound-final sound awareness, unlike traditional teaching methods. According to the study's findings, a significant difference was found in the children's phonological awareness in the experimental group, who received a poetry-focused program, compared to the control group. The recommendations of the same research stated that preschool teachers should include activities focused on poetry and rhyme in their educational programs to affect the development of children's phonological awareness positively.

When Turkish literature is examined, it is seen that there are not enough studies to support the development of phonological awareness in preschool children (Akyüz & Doğan, 2019; Bayraktar, 2013; Erdoğan, 2009; Karaman, 2006; Parpucu, 2017; Süel, 2011; Yücel, 2009). In the literature, although not poetry-oriented, research was conducted in a quasi-experimental design with a pretest-posttest control group by applying the "Colorful World of Sounds Program" by Parpucu (2017) on phonological awareness. The research study group was determined using a random sampling method among the official preschools where 60-72 months old children attend Eskişehir city center. Twenty-four children in the experimental group and 19 children in the control group participated in the study. "General Information Form" and "Early Childhood Phonological Sensitivity Scale" were used as data collection tools in the research. After the pretest was applied to the experimental and control groups, the Colorful World of Sounds Program activities were applied by the researcher in the experimental group during one-hour sessions, three days a week, for eight weeks. As a result of the research, it was found that the experimental group showed a significant difference compared to the control group both in the total score of phonological awareness and in all sub-dimensions of the scale.

Erdoğan's (2012) study examined the relationship between first-grade primary school students' phonological awareness and reading skills. This study was carried out with 126 first-grade students from two primary schools in Ankara. The research determined children's basic reading skills and phonological awareness skills when they start the first grade of primary education. Afterward, children's reading and reading comprehension skills were examined in the middle, at the end of the first term and in the middle of the second term. The research showed a relationship between the phonological awareness skills of primary school first-grade students and their reading skills.

Kartal and Güner (2016) examined the Ministry of National Education (MoNE) Preschool Education Activity Book activities in terms of phonological awareness. The researchers concluded that out of the 40 activities in the book, only seven activities could support the acquisition of "Phonology shows awareness." Based on this result, it was stated that teachers needed more activity examples to support the development of phonological awareness of preschool children preschools. In this context, it can be said that there is not enough research study in Turkey to improve the literacy experiences of preschool children and that preschool teachers do not have the necessary skills and equipment in this regard (Demir, 2011; Akbaba-Altun, Çetin & Bay, 2014). Likewise, although preschool teachers apply early literacy activities in their programs, applications for gradual phonological awareness appropriate to the child's level are not carried out in sufficient numbers. Therefore, it is expected that no significant progress can be seen in children in the current learning process (Erdoğan, Altınkaynak & Erdoğan, 2013; Şimşek & Alisinanoğlu, 2013). However, children are always ready to learn; even the lullabies they listened to when they were babies are in a process that will

improve their phonological awareness (Güneş, 2010; Hempenstall, 2015b). Looking at the literature on phonological awareness, there are many experimental studies (Bryant, Bradley & Maclean, 1989; Erdoğan, 2009; Erdoğan, 2011; Erdoğan, 2012; Erol, 2002; Flett & Conderman, 2002; Kaya, 2013; Kıbrıs, 2008; Kjeldsen, Saarento-Zaprudin & Niemi, 2019; Kruse, Spencer, Olszewski & Goldstein, 2015; Lim & Chew, 2017; Lundberg, Larsman & Strid, 2012; Oğuzkan, 2013; Önkaş, 2009; Parpucu, 2017; Piasta, 2016; Richgels, Poremba & McGee, 1996; Skibbe, Gerde, Wright & Samples-Steele, 2016; Soto, Olszewski & Goldstein, 2019; Stahl, Murray, 1994; Strom & Neuman, 2016; Ukrainetz, Nuspl, Wilkerson & Beddes, 2011; Yopp & Yopp, 2009). However, since no poetry-oriented Turkish educational program is to be created and implemented, the "Poetry Focused Supportive Educational Program" (PFSEP) was developed. The aim of this study, which examines the effect of the PFSEP, is to provide a basis for applications and subsequent research to support preschool children's phonological awareness. The problem statement of the research is "What is the impact of the 'Poetry Focused Supportive Educational Program' on the phonological awareness skills of 60–72-month-old preschool children? The sub-problems are, "What is the level of effect of PFSEP on the following skills: 'realizing that sentences are made up of words,' 'realizing that words can have rhymes,' 'realizing that words can start with the same sound,' 'realizing that words are made of syllables' and 'realizing that words can end in the same sound.'"

METHOD/MATERIALS

This section gives information about the research design, study group, data collection tools, data collection, the internal and external validity of the research, the creation and implementation of the PFSEP and the data analysis.

Research Pattern

This research was planned in a quasi-experimental design with the pretest-posttest control group. In experimental studies conducted in the school environment, the quasi-experimental design is generally preferred because the continuing education system of the school is not disrupted, and more objective data are obtained (Erden, 1998). The PFSEP was applied with the children in the experimental group, and the children in the control group continued their education with the current MoNE Preschool Education Program. Control group children were not included in any supportive educational program.

Phonological awareness skills (Realizing that sentences consist of words, realizing that words can have rhymes, realizing that words can start with the same sound, realizing that words are made of syllables, realizing that words can end with the same sound) of 60-72 months old preschool children is the dependent variable of the research. The PFSEP is the independent variable of the research.

Study Group

Sönmez (2005) suggested that no population and sample selection should be made in experimental research. For this reason, the study group was determined without aiming to generalize the research to the universe. Based on the fact that children from families from disadvantaged socioeconomic levels have inadequate conditions, they are in the risk group in their early literacy skills and future academic success and that they should be the main focus of supportive intervention studies (Golova, Cala Cala & High, 2016). While determining the study group, information was obtained from Denizli Province about the preschool classes attended by the children of families with low socioeconomic level. In this direction, a total of two preschool classes from two different primary schools were included in the study, considering easy accessibility.

After obtaining the necessary legal permissions, the preschool teachers were interviewed at the beginning of the fall semester of the 2017-2018 academic year, and they were informed about the study. Four preschool classes; two in the morning and two in the afternoon, in a primary school; the other primary school has six preschool classes, three in the morning and three in the afternoon. A preschool class that volunteered to implement the educational program was determined as the experimental group, and a preschool class in the other school that agreed to participate in the study was determined as the control group.

A flyer was sent to the parents of the children through the teacher, and the purpose of the research was mentioned; brief information about the scale was shared, and they were provided to fill out the consent form for their children's participation in the research.

Table 1. Socio-Demographical Characteristics of the Study Group

Socio-Demographical Characteristics		n	%
Gender	Girl	18	56.250
	Boy	14	43.750
Year of Birth	2011	3	9.375
	2012	26	81.250
	2013	3	9.375
Duration of Preschool Education	1 Year	30	93.750
	2 Years	1	3.125
	3 Years	1	3.125
Birth Order	First Child	15	46.875
	Second Child	12	37.500
	Third Child	5	15.625
Number of Siblings	Only Child	6	18.750
	Two Siblings	14	43.750
	Three Siblings	11	34.375
	Four Siblings	1	3.125
Age of Mother	Below Average (32,12)	17	53.125
	Above Average	15	46.875
Age of Father	Below Average (36,34)	16	50.000
	Above Average	16	50.000
Mother Occupation	Officer	1	3.125
	Self-employed	4	12.500
	Worker	6	18.750
	Housewife	8	25.000
	Not working	13	40.625
Father Occupation	Not working	1	3.125
	Officer	4	12.500
	Self-employed	12	37.500
	Worker	15	46.875
Mother Educational Status	Primary	18	56.250
	High school	10	31.250
	University	4	12.500
Father Educational Status	Primary	14	43.750
	High school	13	40.625
	University	5	15.625
Marriage Status	Together	30	93.750
	Separate	2	6.250

Table 1 shows that 18 children were girls (56.250%), and 14 children were boys (43.750%). Looking at the years of birth; It was determined that three children were born in 2011 (9.375%), three children were born in 2013 (9.375%), and 26 children the majority (81.250%) were born in 2012. Considering the duration of preschool education; It is seen that the majority (93.750%) with 30 children started preschool education for the first time, 1 child was in the 3rd year (3.125%), and 1 child was in the 2nd year (3.125%). Looking at the birth order of the children; It was determined that 5 children were born as the third child (15.625%), 12 children as the second child (37.500%), and 15 children as the first child (46.875%). Considering the number of siblings of the children, it was determined that 1 child had four siblings (3,125%), 6 children were one child (18.750%), 11 children had three siblings (34.375%), and 14 children had two siblings (43.750%).

Relating to the socio-demographic characteristics of their families, the average age of the mothers was 32 (min.23, max.47); the mean age of the fathers was 36 (min.29, max.49). It was determined that the majority of the mothers (n=21; 65.620%) were not working, 6 mothers (18.750%) were workers, 4 mothers (12.500%) were self-employed, and 1 mother (3.120%) was civil servants. In terms of fathers' occupations, it was determined that 15 fathers were workers (46.870%), 12 fathers were self-employed (37.500%), 4 fathers were civil servants (12.500%) and one father was unemployed (3.120%). Considering their educational status, 43.750% of the fathers were primary school graduates, 40.625% were high school graduates, and 5 fathers (15.625%) were university graduates; It was determined that 56,250% of the mothers were primary school graduates, 31.250% were high school graduates, and 4 mothers (12.500%) were university graduates. Considering the marital status; It was determined that 93.750% of them were divorced together and 2 people (6.250%) were divorced.

Data Collection Tools

"General Information Form" and "Yangın Erdoğan Erdoğan Phonological Awareness Scale" (YEEPAS) were used as data collection tools in the research.

In the General Information Form developed by the researchers. The form includes questions about obtaining demographic information such as the child's date of birth, gender, number of siblings, year of preschool education as well as parents' age and occupation, educational status. The preschool teachers for each child answered the form.

YEEPAS was applied to 293 first-year primary school students in Ankara. The scale includes five sub-dimensions of phonological sensitivity. Sub-dimensions of the scale; (1) Realizing that sentences are made up of words, (2) Realizing that words can have rhymes, (3) Realizing that words can start with the same sound, (4) Realizing that words are made up of syllables, (5) Realizing that words can end with the same sound. YEEPAS measures phonological awareness with a total of 35 items, seven of which are in five tasks. The correct answer to each question at the scoring stage is worth 1 point, and the highest score to be obtained from the scale is 35. The reliability of scale is KR-20 = 0.74 (Yangın, Erdoğan & Erdoğan, 2010).

Data Collection Process

In the research, first, the General Information Form was given to the teachers. Before the pretest application, children were met by going to the experimental and control group classes in turn, and time was spent with the children in the classroom environment for a week. Then, between February 12 and February 16, 2018, YEEPAS was administered by the first author as a pretest to measure the phonological awareness skills of the children in the experimental and control groups. Necessary environment arrangements such as a comfortable sitting arrangement and a quiet room outside the classroom were made to implement YEEPAS. While applying the scale, the door of the classroom was left open all the time, and care was taken to ensure that the child was not a compulsory participant during the application. In other words, the child felt free to leave whenever s/he wanted. The application of the scale took approximately 40 minutes for each child individually. After the pretest was applied, it was started to implement the PFSEP with the experimental group. The program was implemented by the first author for a total of 8 weeks, three days a week. A volunteer undergraduate student assisted the researcher with camera/video, photographing, and sound recording during the program. During the program's implementation, the class teacher was present with the group, and it was aimed that the children would feel more comfortable in the process. In the week following the end of the program implementation (April 16 - April 27 2018), the environment and conditions during the pretest were re-established, and the posttest was applied to both the experimental and control groups. Finally, the permanence test was applied only to the experimental group on 14 - 17 May 2018, 4 weeks after the posttest.

Development of Poetry Focused Supportive Educational Program (PFSEP)

In order to create the PFSEP, first of all, theoretical and applied studies on phonological awareness and poetry in the literature were examined. These examinations reviewed the contents, creation and implementation forms, activity contents, types, and materials of the programs other than those implemented in Turkey. After all these examinations, among all the learning objectives that presented in the MoNE 2013 Preschool Education Program, the skills expected to be acquired for children focused on language development were determined. In the light of the determined skills and the literature review carried out, the educational status of the supportive educational program has begun to be planned, taking into account the basic principles and characteristics of the MoNE 2013 Preschool Education Program. At this planning stage, the main focus of the PFSEP was peer interaction, giving children the opportunity to learn together and from their peers, and being supported by themselves, their environment and adults.

The PFSEP covers 24 educational situations: Early literacy, Language, Music, Movement, Game, Field Trip, Science, Art, Drama, and Mathematics activity types. The content of the educational situations includes the stages of word awareness, syllable awareness, rhyme awareness and phoneme awareness, including the definition of phonological awareness. The activities have been prepared by paying attention to the difficulty of each stage and task. For this reason, tasks from the simple to complex, from easy to challenging, were followed as suggested in the literature (Albrecht & Miller, 2000). While preparing the activities in the program, large group activities mainly were included, and small group activities were also used. In most of the activities, it is also aimed that children learn actively through direct experiences with object photographs, natural materials, and field trips. While implementing the program activities, question and answer, group discussion, brainstorming, and drama techniques were also used. In the program, cultural processes such as body awareness and breathing exercises, object-art, world lullabies, creative dance activities, body percussion were used as routine activities. During the program's implementation, care was taken to provide various materials such as hula hoops, poetry books, storybooks, matching cards, boxes, envelopes, Orff instruments, music CDs, art materials, puppets.

The draft program was presented to five experts, two of whom are experts on preschool education and three experts on early literacy and phonological awareness. The experts evaluated the program in terms of its suitability and applicability for the research, the development of preschool children and the basic principles and features of the MoNE 2013 Preschool Education Program. At the end of the feedback received from the experts, necessary arrangements were made, and the program was finalized.

Implementation of Poetry Focused Supportive Educational Program (PFSEP)

One of the activities prepared in the PFSEP was piloted on December 18, 2017 in a preschool classroom with 27 children aged 6 years old. For this application, the purpose of the study was mentioned, and permission was obtained by interviewing the school principal and the class teacher. In this trial period, the researcher can apply for the program fluently, establish a relationship between the objectives-indicators determined in the plan and the activities and evaluate the suitability of the activities for children. Considering children's short attention span after the pilot application, short and entertaining transitions were added to the flow of all activities in the PFSEP, and their fluency was increased.

Before the pre-tests were applied to the experimental and control groups, a newsletter was sent to the parents of the children in the experimental group, and the purpose, duration, education levels to be implemented within the program, and expected achievements were explained. Then, on two different days, the purpose and duration of PFSEP were briefly explained to the children and information was given, and time was spent in the classroom with the children for a week. The activities, as determined by the level of difficulty alternately, is applied. Before the application, the researcher prepared the necessary tools and materials for the children in the experimental group in the classroom where the application will be made. A connection was established between the activities by reminding them about what was done in the previous stage when starting the activities. Between February 19 and April 13 2018, the PFSEP was applied to the experimental group. In consultation with the teacher of the classroom, the program was applied for a total of about 24 hours, on Monday, Wednesday, and Friday in every week including a session.

While applying the PFSEP, care was taken to ensure that children communicate with each other in a healthy and accessible manner. After the researcher gave the instructions during the implementation phase, the children allowed them to explore the existing work and develop or terminate it if they wanted to. In addition, the researcher was in the position of not only the teacher but also the learner. According to the study of Akgün, Yazar, and Dinçer (2011), in particular, considering that the negative expressions in preschool teachers' classroom communication and management strategies are more than the positive ones, all of the instructions for the PFSEP activities were formed in the form of positive sentences.

The educational program was continued with all the children in the class. The applications were made in the classrooms of the children in the experimental group. After the application, an evaluation was made every day, and the children's opinions about the application were taken. In addition, throughout the application, the families were given mini guides that they could apply at home to support the development of gamified phonological awareness. In addition, various domestic and foreign poetry books were read to children in the PFSEP. After the implementation, family participation with a poetry festival event was organized, and feedback was received from the parents about the change and development of their children during the educational program. Posttests and retention tests were applied in the following process, and the data analysis phase was started.

Analysis of Data

SPSS 23.00 (Statistical Package for Social Sciences) program was used to analyze the data. The Mann Whitney U Test and Wilcoxon Signed Rank Test were used to test whether there was a difference between the scores of the children who participated in the PFSEP from the YEOPAS (2011) compared to the children who did not participate in such an education after the experiment, depending on the effect of the education applied. In addition, whether there was a significant difference between the phonological awareness levels of the children participating in the PFSEP after the experiment and the phonological awareness levels measured four weeks later was tested using the Wilcoxon Signed Rank Test.

Role of the Researchers

In the study, the researchers created and implemented the applied program and analyzed the pretest-posttest analysis results with the help of SPSS program.

FINDINGS

This section includes the analysis of the data obtained by the methods described in the previous section with statistical techniques related to the sub-problems and the findings obtained.

In order to determine whether there are statistically significant differences between the phonological awareness levels of the children in the experimental and control groups at the beginning of the education, the pretest results of the children in the two groups were analyzed with the Mann Whitney U test. The results obtained are shown in Table 2.

Table 2. Mann Whitney U Test Results Regarding Experimental and Control Group YEOPAS Pretest Scores

	Group	n	Rank Average	Rank Total	z	P
Realizing that sentences are made of words	Experiment	16	15.88	254.00	118.00	.70

	Control	16	17.13	274.00		
Realizing that words can have rhymes	Experiment	16	15.84	253.50	117.50	.68
	Control	16	17.16	274.50		
Realizing that words can start with the same sound	Experiment	16	18.69	299.00	93.00	.17
	Control	16	14.31	229.00		
Realizing that words are made of syllables	Experiment	16	15.22	243.50	107.50	.43
	Control	16	17.78	284.50		
Realizing that words can end in the same sound	Experiment	16	18.69	299.00	93.00	.17
	Control	16	14.31	229.00		
Total	Experiment	16	15.97	255.50	119.50	.74
	Control	16	17.03	272.50		

When Table 2 is examined, there is no significant difference between the scores ($z=119.50$, $p>0.05$) of the experimental and control groups in the pretests. Accordingly, it is seen that the pretest mean scores of the experimental and control groups are very close to each other. Thus, when starting the education, it can be said that the experimental and control groups have similar characteristics in terms of realizing that sentences consist of words, Realizing that words can have rhymes, realizing that words can start with the same sound, realizing that words are made up of syllables, and realizing that words can end with the same sound.

Table 3. Mean and Standard Deviation Values of Experimental and Control Group YEEPAS Scores

Scale	Group	n	Pretest		Posttest	
			Average	Standard Deviation	Average	Standard Deviation
Realizing that sentences are made of words	Experiment	16	1.87	1.85	4.87	1.74
	Control	16	2.12	1.99	1.50	1.89
Realizing that words can have rhymes	Experiment	16	2.75	1.00	3.93	1.34
	Control	16	3.00	1.41	2.68	1.49
Realizing that words can start with the same sound	Experiment	16	2.62	1.20	4.18	1.55
	Control	16	2.06	1.23	1.81	1.75
Realizing that words are made of syllables	Experiment	16	2.31	1.99	5.43	1.26
	Control	16	3.00	2.52	3.37	1.96
Realizing that words can end in the same sound	Experiment	16	1.81	.83	2.62	1.20
	Control	16	1.37	1.45	.56	.96
Total	Experiment	16	11.37	3.99	21.06	4.50
	Control	16	11.56	3.81	9.93	4.15

When Table 3 is examined, the YEEPAS pre-test mean scores of 16 children in the experimental group, according to the sub-dimensions: Recognizing that Sentences Are Composed of Words sub-dimension 1.87; The sub-dimension of 'Realizing that words can have rhymes' 2.75; The sub-dimension of 'Realizing that words can start with the same sound' is 2.62; The sub-dimension of 'Realizing that words are made of syllables' was 2.31 and the sub-dimension of 'Realizing that words can end in the same sound' was 1.81. The mean total score of the scale was determined as 11.37. The mean scores of the children in the control group from the pre-test were, in the same order, 2.12; 3.00; 2.06; 3.00; 1.81; and 11.56 was determined.

According to this table, the pretest total scores (experimental: 11.37, control: 11.56, difference: 0.19) and standard deviation scores (experiment pretest standard deviation: 3.99, control pretest standard deviation: 3.81, pretest standard deviation difference: 0.18, experimental posttest standard deviation: 4.50, control posttest standard deviation: 4.15, posttest standard deviation difference: 0.35) of the experimental and control groups, there is no significant difference in terms of sub-dimensions of phonological awareness. Considering the relevant scores, it is seen that the experimental and control groups are homogeneous groups. Considering the total scores of the phonological awareness sub-dimensions of the experimental group after the PFSEP application (experimental group pretest: 11.37, experimental group posttest: 21.06) confirms the hypothesis that the PFSEP may be effective in supporting the development of children's phonological awareness.

Table 4. Mann Whitney U Test Results of Experimental and Control Group YEEPAS Posttest Scores

	Group	n	Rank Average	Rank Total	U	P
Realizing that sentences are made of words	Experiment	16	22.81	365.00	27.00	.000*
	Control	16	10.19	163.00		
Realizing that words can have rhymes	Experiment	16	19.97	319.50	72.50	.032*
	Control	16	13.03	208.50		
Realizing that words can start with the same sound	Experiment	16	22.09	353.50	38.50	.001*
	Control	16	10.91	174.50		
Realizing that words are made of syllables	Experiment	16	21.38	342.00	50.00	.003*
	Control	16	11.63	186.00		
Realizing that words can end in the same sound	Experiment	16	22.78	364.50	27.50	.000*
	Control	16	10.22	163.50		
Total	Experiment	16	24.06	385.00	7.00	.000*
	Control	16	8.94	143.00		

* $p < 0.05$

When Table 4 is examined, it was determined that the difference between the posttest scores of the experimental group and the control group, in terms of all sub-dimensions of YEEPAS and the total scores of the scale ($U=7.00$, $p < 0.05$) was in favor of the experimental group. The mean scores of the children in the experimental and control groups from the posttest were, in the same order, the sub-dimension of 'Realizing that sentences are made of words' 4.87 and 1.50; 'Realizing that words can have rhymes' 3.93 and 2.68; 'Realizing that words can start with the same sound' 4.18 and 1.81; 'Realizing that words are made of syllables' 5.43 and 3.37; 'Realizing that words can end with the same sound' was found as 2.62 and 0.56. The total mean score of the scale was determined as 21.06 and 9.93.

This result confirms the hypothesis that the PFSEP may effectively support the development of children's phonological awareness.

Table 5. Experimental Group YEEPAS Pretest-Posttest Scores Wilcoxon Signed Ranks Test Results

	Pretest-Posttest	n	Rank Average	Rank Total	z	p
Realizing that sentences are made of words	Negative Rank	0	.00	.00	-3.422*	.001**
	Positive Row	15	8.00	120.00		
	Equal	1				
Realizing that words can have rhymes	Negative Rank	1	9.00	9.00	-2.595*	.009**
	Positive Row	12	6.83	82.00		
	Equal	3				
Realizing that words can start with the same sound	Negative Rank	2	5.00	10.00	-2.505*	.012**
	Positive Row	11	7.36	81.00		
	Equal	3				
Realizing that words are made of syllables	Negative Rank	1	1.50	1.50	-3.455*	.001**
	Positive Row	15	8.97	134.50		
	Equal	0				
Realizing that words can end in the same sound	Negative Rank	4	5.50	22.00	-1.998*	.046**
	Positive Row	10	8.30	83.00		
	Equal	2				
Total	Negative Rank	0	.00	.00	-3.520*	.000**
	Positive Row	16	8.50	136.00		
	Equal	0				

* Based on negative ranks ** $p < 0,05$ ** Significant difference

According to Table 5, it is seen that the difference ($p < 0.05$) between the scores of the children in the experimental group before and after the experiment obtained from YEEPAS is significant. When the rank totals of the difference scores are examined, it is seen that the difference is in favor of the positive rank, in other words, the posttest. Effect size values were also examined to determine whether the significant differences found were of practical significance.

Eta squared (η^2), and Cohen's d indicators used in the research express the effect size. The effect size is expressed as "the standardized measurement of the difference or relations between the means" with the most general and standard definition. Eta squared value; .01 is interpreted as small, .06 as a medium, .14 as large; The value of d, small for .20, and medium to .50, are

interpreted as .80 to large. In addition, Cohen's d value is an indicator of sample size. If Cohen's d value is small, it indicates a larger sample size (Özsoy & Özsoy, 2013).

When the YEEPAS pretest-posttest scores of the experimental group are examined in terms of effect size; 'Realizing that sentences are made of words' sub-dimension is highly effective (d:0.855), 'Realizing that words can have rhymes' is highly effective (d:0.648), 'Realizing that words can start with the same sound' is highly effective (d:0.626); 'Realizing that words are made of syllables' were found as high-impact (d:0.863), and low-impact (d:0.499) for 'Realizing that words can end with the same sound' sub-dimension. Considering the effect size of all sub-dimensions of the study, it was seen that it provided a large effect size (z:-3,520, n:16, d:0,880). This situation can be interpreted as that the PFSEP effectively increased the phonological awareness levels of the children in the experimental group.

Table 6. Control Group YEEPAS Pretest-Posttest Scores Wilcoxon Signed Ranks Test Results

	Posttest-Pretest	n	Rank Average	Rank Total	z	p
Realizing that sentences are made of words	Negative Rank	7	6.79	47.50	-.672*	.501
	Positive Row	5	6.10	30.50		
	Equal	4				
Realizing that words can have rhymes	Negative Rank	7	9.71	68.00	-.466*	.641
	Positive Row	8	6.50	52.00		
	Equal	1				
Realizing that words can start with the same sound	Negative Rank	7	7.21	50.50	-.355*	.722
	Positive Row	6	6.75	40.50		
	Equal	3				
Realizing that words are made of syllables	Negative Rank	7	6.64	46.50	-.777**	.437
	Positive Row	8	9.19	73.50		
	Equal	1				
Realizing that words can end in the same sound	Negative Rank	8	6.63	53.00	-1.801*	.072
	Positive Row	3	4.33	13.00		
	Equal	5				
Total	Negative Rank	11	7.68	84.50	-1.400*	.162
	Positive Row	4	8.88	35.50		
	Equal	1				

* Based on negative ranks

** Based on positive ranks

When Table 6 is examined, the difference between the YEEPAS pretest and posttest scores of the children in the control group was positive in the sub-dimension 'Realizing that words are made of syllables', that is, in favor of the posttest; Although it is observed that the difference is in favor of the negative order, in other words, in favor of the pretest, there is no significant difference in the other sub-dimensions and the sum of the scale. Considering the effect size; medium effect size detected (z: -1.400, n:16, d: 0.36).

Table 7. Experimental Group YEEPAS Posttest-Persistence Test Scores Wilcoxon Signed Ranks Test Results

	Persistence- Posttest	n	Rank Average	Rank Total	z	p
Realizing that sentences are made of words	Negative Rank	4	3.75	15.00	-.173**	.862
	Positive Row	3	4.33	13.00		
	Equal	9				
Realizing that words can have rhymes	Negative Rank	4	5.63	22.50	.000***	1.000
	Positive Row	5	4.50	22.50		
	Equal	7				
Realizing that words can start with the same sound	Negative Rank	7	5.71	40.00	-1.387**	.166
	Positive Row	3	5.00	15.00		
	Equal	6				
Realizing that words are made of syllables	Negative Rank	3	4.50	13.50	-.707*	.480
	Positive Row	5	4.50	22.50		
	Equal	8				
Realizing that words can end in the same sound	Negative Rank	7	5.14	36.00	-1.732**	.083
	Positive Row	2	4.50	9.00		
	Equal	7				
Total	Negative Rank	11	8.14	89.50	-1.122**	.262
	Positive Row	5	9.30	46.50		
	Equal	0				

* Based on negative ranks

** Based on positive ranks

*** The sum of the negative ranks is equal to the sum of the positive ranks

According to Table 7, there was no significant difference between the scores of the children in the experimental group in the posttest to determine the phonological awareness level and the scores they got from the permanence test performed four weeks later in the scale sub-dimensions and in the total. According to this result, it can be said that the educational program has a permanent effect on the development of phonological awareness of children participating in the PFSEP.

DISCUSSION

The results of this study examining the effects of the PFSEP on the skills of phonological awareness of preschool children showed that the PFSEP activities applied for eight weeks significantly affected the development of children's phonological awareness ($d: 0.88$). At the end of the research, it was observed that the children in the experimental group reached a higher level of phonological awareness compared to the control group. In other words, the phonological awareness skills of the children in the experimental group increased significantly more than the other children after an 8-week and 24-session intervention. This finding, which shows that a poetry-based educational process significantly increases the development of children's phonological awareness, shows similar results with the studies in the literature (Erdoğan, 2009; Erdoğan, 2011; Goswami & Bryant, 2016; Lim & Chew, 2017; Lundberg, Larsman & Strid, 2012; Parpucu, 2017, Richgels, Poremba & McGee, 1996; Stahl & Murray, 1994; Ukrainetz, Nuspl, Wilkerson & Beddes, 2011). In addition, it was observed that it overlaps with studies in which poetry was used as a tool in the development of phonological awareness (Erdoğan, 2009; Erdoğan, 2012; Erol, 2002; Flett & Conderman, 2002; Kaya, 2013; Kibris, 2008; Lim & Chew, 2017; Oğuzkan, 2013; Önkaş, 2009; Yopp & Yopp, 2009).

The scale related to phonological awareness used in the research has a total of five sub-dimensions. These; 'Realizing that sentences are made of words', 'Realizing that words can have rhymes', 'Realizing that words can start with the same sound', 'Realizing that words are made of syllables', and 'Realizing that words can end in the same sound'. When the findings of the study were examined, it was seen that the most significant difference between the sub-dimensions of phonological awareness in the experimental group after the application of the PFSEP was in the sub-dimension of 'Realizing that words are made of syllables', followed by the sub-dimension of 'Realizing that sentences are made of words'. The fact that these two sub-dimensions had such a significant difference in the experimental group that the PFSEP's activities are in the form of sequential games from simple to complex, syllable awareness exercises that will activate children such as body percussion, spelling with Orff instruments, spelling their names, the child who forgot his/her name game; Similarly, it is thought that it is due to the fact that children were active and decisive in the learning process with games such as Word-Sentence game (Başer, 2004; Güdek & Öziskender, 2013; Tuğrul, 2002; Yazıcı, Sarıca, Aksu & Yurdakul, 2012).

For example, Güdek and Öziskender (2013) stated that the use of Orff tools in the educational process and the provision of Orff education positively affect preschool children in interpersonal communication, control of anger behaviors and adaptation to changes, verbal communication, having a purpose and fulfilling the given task. Başer (2004) stated that the use of music and rhythm in the educational process positively affects language development, social development, personality development, mental development, and emotional development. Yazıcı, Sarıca, Aksu, and Yurdakul (2012) stated that the language

development of children receiving preschool education is positively affected as a result of activities such as creating art products, playing games, visual reading, listening, understanding, and self-expression. Tuğrul (2002) stated that the educational processes carried out in teaching environments that consider children's differences, interests, needs, and individual characteristics positively affect children's mental structures in the form of dynamic interaction in understanding information application, analysis, synthesis, and evaluation.

In the other three sub-dimensions of the scale, a significant difference was found in the experimental group after the PFSEP. Realizing that words can have rhymes sub-dimension is considered as one of the basic skills for preschool children in the literature (Erdoğan, 2009; Erdoğan, 2012; Pullen & Justice, 2003). Especially poetry activities are instrumental for the child to gain these skills and understand the rhymes (Maclean, Bryant & Bradley, 1990; Oğuzkan, 2013; Önkaş, 2009). About this sub-dimension in the PFSEP, there were creative language development games such as word manipulation, sound changing activities, sound combining/separation activities, painting, and sound, creating songs with puppets, creating poetry, "absurd poetry", "object-art", art, and poetry games. In the literature, it is stated that activities that emphasize creativity support language development (Uçan, 1996; Ulutaş & Ersoy, 2004; Yazıcı, 2002a).

Finally, a significant difference was observed in the experimental group after the PFSEP in the sub-dimensions of Realizing that words Can Start with the Same Sound and Realizing that words Can End with the Same Sound. From these sub-dimensions, it is easier to realize that it can start with the same sound than to realize that it can end with the same sound. According to the literature, although the first and last sound acquisition is not found at a complex level in preschool children (Goswami & Bryant, 2016; Goswami, 1993; Hulme & Nation, 1997), it was observed in various studies that phonological awareness skills improve significantly when supported by a training program (Erdogan; 2011; Turan & Akoglu, 2011). A significant difference was found in these sub-dimensions in the experimental group in which the PFSEP was applied, and it was determined that the first sound-last sound awareness was gained (Table-4.). In addition, when children acquire this skill, they can analyze parts of a word and break it down into syllables, initial sounds, and all sounds. In this process, it was seen that using picture animal cards, picture fruit cards, and picture profession cards is very useful in the education process. According to Torgesen, Morgan, and Davis (1992), "Recognizing that it starts with the same sound" and "Recognizing that it can end with the same sound" skills are the skills that seem to be closely related to success in starting early literacy and are an important upper step for learning the sounds of letters.

The scale sub-dimension of the PFSEP with the least progress in terms of significant difference is 'Realizing that words can end in the same sound'. A few possibilities can be considered as to why this sub-dimension showed lower progress in the sub-dimensions of 'Realizing that words are made of syllables', 'Realizing that sentences are made of words', 'Realizing that words can be rhythmic', and 'Realizing that words can start with the same sound' in the experimental group. For this reason, it is thought that the effectiveness of the program will increase if it is implemented with all the elements of the program. As stated in the literature, thanks to field trips, the knowledge and manners of the children participating in the trip are improved, and it is much easier for the information learned through the trips to be permanent and turn into behavior. (Cevher-Kalburan, 2014; Erten, 2004; Eschenhagen, Kattmann & Rodi as cited in Erten, 2005; Güler, 2009; Ozaner, 2004). From another point of view, when the effect size is taken into account, the sub-dimension of 'Realizing that words can end with the same sound' is the smallest ($d: 0.499$), compared to other sub-dimensions ('Recognizing that sentences are made of words' $d: 0.855$, 'Realizing that words can have rhymes' $d: 0.648$, 'Realizing that words can start with the same sound' $d: 0.626$, 'Realizing that words are made of syllables' $d: 0.863$) may indicate the possibility that the developmental characteristics of preschool children have not reached the required readiness or that the maturity in terms of language and speech has not yet been achieved in terms of final sound awareness.

Due to the variability of parental attitudes towards family participation, there was not a very comprehensive sharing except for a few family meetings and letters about small activities and game suggestions. However, family participation is very important as stated in the literature; especially in preschool period, parents should prepare environments with rich stimuli for their children at home and offer opportunities to make their experiences permanent with positive reinforcements (Çağdaş & Seçer, 2006; Çakmak, 2010; Göktaş, 2015; Ömeroğlu, 1994; Ratcliff, 2008; Yazıcı & Kandır, 2018; Yazıcı, 2002b). Therefore, developing the family involvement dimension of the PFSEP; It is believed that involving families in the process by using various methods and supporting children's phonological awareness skills outside of school will increase the program's effectiveness.

In the permanence test administered four weeks after the posttests, it was observed that the permanence of the scores obtained from the 'Recognition that words are composed of syllables' dimension was the highest, followed by the scores of the 'Recognition that sentences are made of words', with a slight difference. These were followed by the scores of 'Realizing that words can have rhymes', 'Realizing that words can start with the same sound', and lastly, the least persistent sub-dimension of 'Realizing that words can end with the same sound'.

After the sub-dimensions of the research 'Realizing that sentences are made of words', 'Realizing that words can have rhymes', 'Realizing that words can start with the same sound', 'Realizing that words are made up of syllables', and 'Realizing that words can end with the same sound', after the PFSEP When the pretest-posttest scores analyzed with SPSS were compared, it was found that the language development levels of all sub-dimensions of phonological awareness differed significantly in favor of the experimental group. This finding showed that the PFSEP activities were effective in increasing the repetition scores of the

experimental group for all sub-dimensions of phonological awareness. As a result of this research, when the total score of phonological awareness skill is compared with the control group, it is seen that PFSEP is effective in supporting the experimental group to achieve more meaningful results. This result is consistent with the results of other studies examining the effectiveness of phonological awareness training and studies on intervention programs (Bryant & Goswami, 2016; Erdoğan, 2009; Erdoğan, 2011; Lundberg, Larsman & Strid, 2012; Parpucu, 2017; Richgels, Poremba & McGee, 1996; Ukrainetz, Nuspl, Wilkerson & Beddes, 2011).

While creating the PFSEP, child-centred (Senemoğlu, 1994), creativity (Aral & Yaşar, 2010) and respect for different ideas, no right or wrong answers, more question-focused than answers process-oriented educational program were created. Especially Orff instruments (Bilen & Canakay, 2006), rhythm studies, picture poetry, poetry from the dough (Ulutaş & Ersoy, 2004), first sound with object-art, poetize the picture, make one day a poem, paint a dream, complete a missing poem, a tale Creativity and art-oriented works such as make poetry, sing your own poetry create permanent differences in the level of phonological awareness by providing an accessible and effective process in the education process. On this subject, Kıbrıs (2008) states that giving children an incomplete poem and filling in the missing parts with their creativity will change their attitude towards poetry.

The preschool period is very critical for phonological awareness education, which is the focus of the research. During the education process, children develop language skills such as listening, comprehension, speaking and visual reading while playing group games, creating art products, conveying their feelings and thoughts about events or situations in their daily life. For this reason, preschools are considered as the ideal environments to support the correct use of Turkish. However, preschool education in Turkish in training a particular time is not enough. For this reason, every situation or activity that children can communicate with is used as a tool in Turkish education and in supporting phonological awareness without being limited to a specific period while implementing preschool educational programs (Ergül et al., 2014). The obtained results demonstrate that the children were in the experimental group phonological awareness development ii showed a significant increase; phonological awareness development of children in the control group statistically significantly increased or decreased. However, when the pretest-posttest scores of the control group are taken into account, it is seen that there is a relative decrease in the mean rank. In this analysis process, put in groups rather than as observed values among the elements are performed calculations (Kalaycı, 2010; as cited in Şimşek, 2017). For this reason, intra-group pretest-posttest comparisons were examined. As Kol (2011) stated, a child's situation during the language development period may contribute to his/her positive influence as well as may have negative effects. Different data collection tools and methods such as observing the teacher-child and child-child interaction in the preschool education process, examining the physical characteristics of the educational environment offered to children, analyzing the documents regarding the education plans of the teachers, as well as collecting data from the families on issues such as communication with the child and language skills displayed by the child. It is thought that it is necessary to examine the factors affecting this regression in detail and in a multi-dimensional way. Among the main reasons why the PFSEP makes a positive difference in the development of phonological awareness of preschool children are; Based on Vygotsky's socio-cultural learning theory, the program includes providing opportunities for peer interaction, children's learning with and from each other, and considering the area of proximal development, and in this context, it is supported by themselves, their environment and adults.

In addition, as the implementer of the program, the researcher tried to deal with each of the children individually. The fact that child-child and child-teacher interaction were applied more than other techniques should also be considered in evaluating success. Gillon (2004) stated that starting phonological awareness education as soon as children reach the age of three will positively affect their subsequent early literacy skills. In contrast, reading and writing in preparation for the subject of scientific studies carried out in Turkey, according to various variables such as the teacher's years of work in the classroom where the academic studies demonstrating that variations in the strategies (Bay, 2008; Çelenk, 2008). In addition, preschool teachers, day in preparation for reading and writing up to half an hour, concept, tone and line work implements is max. This can be interpreted as teachers' literacy skills are not sufficient (Altun, Çetin & Bay, 2014; Gönen et al., 2010). In the light of these researches, it is thought that the educator support of the PFSEP and the implementation of the current MoNE Preschool Education Program (2013) as a support to the education flow will be severe support for the daily early literacy studies. In addition, it will enable teachers who have just started their preschool teaching profession to enrich their daily education flows in the future by showing different and modern activity methods in order to improve themselves. For this reason, although no data to reveal the practices of the teacher in the control group within the scope of early literacy activities and his/her proficiency in this subject were not obtained in this study, it is believed that it is necessary to carry out in-depth and comprehensive research on how current preschool education program practices affect children's phonological awareness skills.

CONCLUSION AND RECOMMENDATIONS

As a result, no significant difference was found between the pretest YEEPAS total scores of the experimental and control groups. In addition, it was found that there was no significant difference between the scores of the experimental and control groups regarding the sub-dimensions of the pretest phonological awareness scale.

There is no significant difference between the pretest and posttest phonological awareness total scores of the control group. At the same time, no significant difference was found between the pretest and posttest phonological awareness sub-dimensions of the control group. When the effect size was calculated, a small effect size was found ($d: 0,36$).

When the pretest and posttest phonological awareness total scores of the experimental group are examined, it is seen that there is a significant difference between the results obtained. This difference can be explained by the significant change in the total scores of the experimental group in terms of phonological awareness, in other words, the experimental group being positively affected in terms of the development of phonological awareness. In this case, the result obtained from the research shows that the PFSEP is effective in increasing the phonological awareness scores of the experimental group ($d: 0.88$). Based on the results of this research, some suggestions can be made for other future studies. First, a limited number of children were included in this study due to a lack of time and opportunities. This situation limits the generalizability and effectiveness of the research results. In addition, it is recommended to work with a large group, as it will allow analysis using parametric tests with a larger sample power. For this reason, it is recommended that the PFSEP be applied as much as possible in different socio-cultural structures, different age groups and on more samples.

The PFSEP is a poetry-focused supportive education program, but experimental studies in different disciplines support phonological awareness in the literature. In the light of these studies, researchers are recommended to create drama, art, story-oriented supportive education programs besides poetry and to conduct experimental studies focusing on different disciplines.

The PFSEP is an educational program for six-year-old children with typical development. Researchers can examine the effect of this and similar educational programs on developing children's phonological awareness in different age groups by adapting them to younger age groups or primary school and higher educational levels. In the study, it was determined that the effect of PFSEP continued one month after the posttest. It would be more accurate to make repeated measurements at longer intervals to strongly evaluate the program's effectiveness. In addition, it is recommended to investigate the longitudinal effectiveness of PFSEP by measuring the primary literacy skills, success in Turkish language and general academic success of the children participating in the study in the first grade and later stages of primary school. Family involvement in the study was limited; for this reason, it is recommended that researchers examine the effect of the supportive educational program they will implement by providing effective family participation in all its dimensions on the phonological awareness levels of children. In addition, this study was carried out using quantitative research methods. It is thought that a qualitative study in which children's experiences during the education program are examined in depth in terms of the effects of all dimensions on the development of phonological awareness will contribute to the literature.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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Statements of publication ethics

We here by declare that the study has not unethical issues and that research and publication ethics have been observed carefully.

Researchers' contribution rate

The study was conducted and reported with equal collaboration of the researchers.

Ethics Committee Approval Information

Since the study was carried out in 2017, there is a board approval permit from Denizli Governorate and Denizli Provincial Directorate of National Education. The Scientific Research Permit was approved by Pamukkale University as a permit numbered 16605029/44-E.15137893, with the letter dated 15/09/2017 and numbered 19128. It is signed with an electronic signature and can be confirmed with the code 60b1-0510-32b7-a32a-1bc7.

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| Research Article / Araştırma Makalesi |

Mathematical Skills in Traditional Children's Games in Early Childhood

Erken Çocukluk Döneminde Geleneksel Çocuk Oyunlarıyla Matematik

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Keywords

1. Traditional play
2. Math
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Abstract

Purpose: To protect the intangible cultural heritage by transferring it from generation to generation, it is imperative to effectively use games specific to our culture in children's education. The present study presents examples of the traditional games related to early childhood mathematical skills, including matching, comparing, grouping, sorting, creating patterns, numeracy, operation, geometric figures, spatial thinking, measurement, estimation and creating patterns. In addition, it is explained how the games can be adapted and played in different ways for a better achievement of these skills.

Design/Methodology/Approach: This descriptive study uses a qualitative research method to examine mathematical skills in traditional children's games and provide examples of adaptations that support mathematical skills. In the study, traditional children's games were examined with document analysis and the data obtained were analyzed with descriptive analysis method.

Findings: 11 examples of traditional games that can be associated with math skills in the pre-school education program are presented in the study. The way these games are played, their math skills and adapted versions are explained in detail. It was concluded that these games, which were discussed in the research, can be used by teachers and parents in teaching and reinforcing math skills in early childhood.

Highlights: Teachers can adapt different math skills to children by adapting them according to the gains and indicators included in the program.

Öz

Çalışmanın amacı: Kültürümüze özgü oyunların çocuk eğitiminde etkin bir şekilde kullanılması da somut olmayan kültürel mirasın nesilden nesile aktararak korunmasında oldukça önemlidir. Bu çalışmada; erken çocukluk dönemi matematik becerilerinden, eşleştirme, karşılaştırma, sınıflandırma/gruplama, sıralama, örüntü oluşturma, sayı, işlem, geometrik şekiller, uzamsal düşünme, ölçme, olasılık ve örüntü oluşturma ile ilgili geleneksel oyun örnekleri sunulmuş ve oyunların uyarlanarak bu becerilerin kazanımında nasıl farklı şekillerde oynanabileceği açıklanmıştır.

Materyal ve Yöntem: Geleneksel çocuk oyunlarındaki matematik becerilerinin incelendiği ve matematik becerilerini destekleyici uyarlama örneklerinin sunulduğu bu araştırma nitel araştırma yöntemi kullanılarak yapılandırılan betimsel bir çalışmadır. Doküman analizi ile geleneksel çocuk oyunları incelenmiş ve elde edilen veriler betimsel analiz yöntemiyle analiz edilmiştir.

Bulgular: Araştırmada okul öncesi eğitim programında yer alan matematik becerileri ile ilişkilendirilebilecek 11 geleneksel oyun örneği sunulmuştur. Bu oyunların oynanış şekli, kazandırdığı matematik becerisi ve uyarlanmış hali detaylı bir şekilde açıklanmıştır. Araştırmada ele alınan bu oyunların erken çocukluk döneminde matematik becerilerinin öğretiminde ve pekiştirilmesinde öğretmenler ve ebeveynler tarafından kullanılabilirliği sonucuna ulaşılmıştır.

Önemli Vurgular: Öğretmenler programda yer alan kazanım ve göstergeler doğrultusunda oyunlarda uyarlama yaparak farklı matematik becerilerinin çocuklara kazandırılmasını sağlayabilirler.

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INTRODUCTION

In addition to acquiring many mathematical concepts, the foundations of more complex concepts to be acquired in later school life are laid in early childhood (Aktaş-Arnas, 2012). Mathematics education given in this period aims to contribute to the cognitive development of the children, to enable them to form a positive attitude towards mathematics, to help them establish a connection between their previous conceptual knowledge and new knowledge and to understand why and how mathematical concepts are used (OÖEP, 2013). Mathematical thinking ways are basic scientific processes, and through these, children organize, internalize and construct the knowledge they receive from the outside world by making sense of it. They interpret the situations they encounter by establishing cognitive connections between the four essential components of mathematics: concrete materials, symbols, language and pictures (Haylock & Cockburn, 2014). Children learn the concept of "more" in early childhood and therefore begin to distinguish the more group in a certain aspect. For example, they count the orange juice poured from the jug into glasses as "1, 2, 3". Children who are allowed to think about a problem and produce ideas can have a broader mathematical knowledge as they grow up and become self-confident mathematics students in the future (Sperry-Smith, 2009). For this reason, it is vital to provide the mathematics education given in early childhood concerning situations that children may encounter in daily life and to support children in acquiring the said mathematical skills (OÖEP, 2013).

Game is one of the best ways to teach mathematical skills early childhood. Games form the basis of children's first mathematical experiences, such as reflecting their experiences, establishing relations between different experiences, researching, making estimations and making sense of all these (Carruthers & Worthington, 2011). Although the game is an activity in every phase of life, it has a critical role for children to recognize the world they live in and express their thoughts, especially in the first years of life (Başal, 2017). Games can be played anywhere in the world at any time, with anything and under any circumstances. Games form the basis for human beings to get to know themselves as well as the world around them in childhood, and they have a positive effect on all development areas of children, leading to the acquisition of various skills (OÖEP, 2013; Sümbüllü & Altınışık, 2016). Playing games enables children to enrich their experiences by stimulating their senses and emotions, establishing relationships and making comparisons between people, events, and objects. Due to the features based on movement, interaction, active participation and thinking, pleasurable games results in the stimulation of the human brain in a holistic manner (Tuğrul, 2015). Through playing games, children begin to comprehend the similarities and differences between objects and develop abstract abilities that require mental skills such as thinking, perception, comprehension and imagination (Poyraz, 2003).

The main goal of mathematics programs is to enable children to understand mathematics through research, exploration and problem-solving. The use of game-play in mathematics education enables children to develop a positive attitude and understanding towards mathematics in addition to helping them make connections between the parts of a whole (Ginsburg, 2006; Holton, Ahmed, Williams, & Hill, 2001; NAEYC & NCTM, 2002). Children encounter many mathematical skills such as angle, direction, distance, perspective while playing games and transfer their daily mathematical skills to games (Clements, 2004). For instance, the child who realizes which of the two plates has "more" cookies and decides to choose the plate with the most significant number, and the child who uses conversational skills and ideas about number, shape and pattern while playing with the blocks can be given as examples of this transference. Having a good game experience in the early childhood period provides children with a cognitive foundation for mathematics and other aspects of life (Ginsburg, 2006). Children develop their conceptual knowledge through their experiences during the games they play. While playing, children encounter many different situations and try to make a new decision to solve each new problem faced. The highest level of establishing knowledge structure is realized in the game-playing process. Thus, playing games allows mental operations in children (Tuğrul, 2015). Mathematics through playing games is part of the process of problem-solving, and it involves using mathematics to generate ideas through experimentation and creativity and concluding an idea. Mathematics through playing games offers children the opportunity to push their limits and follow their ideas in any way they can think of (Holton Et al., 2001). The game plays an important role in acquiring many skills, such as having fun while learning, problem-solving, critical thinking, concept learning, strategy development, goal-oriented thinking and adapting to individual and group work. In addition to these, it is also stated that playing games should be used to provide effective mathematics education starting from an early age (Ginsburg, 2006; NAEYC & NCTM, 2002; Öz-Pektaş, 2017). In early childhood mathematics education, teachers should provide children with opportunities to reveal their mathematical skills in daily activities and games. Teachers should help children establish a relationship between the game and mathematics by directing children's attention to mathematical parts with the use of mathematical language, providing children with enough game time and materials, supporting children accordingly and helping them expand their knowledge and skills (Clements, 2004; NAEYC & NCTM, 2002; Parks & Wager, 2015). Previous studies on games and cognitive skills (Dansky, 1999; Gredlein & Bjorklund, 2005; Keeley & Fox, 2009; Moore & Russ, 2008; Nielsen & Dissanayake, 2000; Ranger, 2014;) have shown that playing games positively affect cognitive skills, and previous research on the effects of game-based mathematics education programs (Gözalın, 2013; Karaman, 2012; Kaya, 2010; Sönmez, 2013; Türkoğlu, 2016) has also supported that these programs support children's acquisition of mathematical skills. It was also concluded by the research on game and mathematics (Ginsburg, 2000; Giren, 2013; Levine, Ratliff, Huttenlocher, & Cannon, 2012; Ness & Farenga, 2016; Nikfarjam, 2012; Oostermeijer, Boonen, & Jolles, 2014; Ramani, Zippert, Schweitzer & Pan, 2014; Parks & Wager, 2015) that the game has a significant effect in the development of mathematical skills.

All games play an essential role in the physical, emotional and mental development of children (Güneş, 2015; Fırat, 2013; Tuğrul, 2015); however, traditional children's games have particular importance. Traditional children's games have been transferred from past generations to the present generation and continue to be transferred as they are kept being played. Traditional games are played with a sharing spirit, sometimes outdoors, sometimes inside the home or school. Although traditional games with a long history differ in some regions geographically and culturally, they still contain the national and spiritual values of the society in terms of the natural materials/toys they include (Sümbüllü & Altınışık, 2016). Traditional games, which have been one of the important sources in the transfer of culture for centuries, have survived to the present day with some changes that are resulted from modern life, urbanization, technology and many new developments. Today, outdoor games played in the streets, gardens and parks have been replaced by games played indoors with computers due to technology (Öz-Pektaş, 2017). Clements (2004) has shown that today's children spend much less time playing outdoor games than their mothers played outdoors in their childhood. The reasons for that have been determined to be various, ranging from addiction to television and digital media to security concerns. Despite games changing over time and new ones being added to old ones, some traditional games exist. It is known that many of the games known and played today were also played in ancient times. One of the oldest game tools was stones, and similar games have been played in different cultures with different materials, such as knucklebones instead of stones. In order to protect the intangible cultural heritage by transferring it from generation to generation, it is very important to use games specific to our culture effectively in children's education (Başal, 2017).

In the literature, there are various studies that compile traditional children's games (Cengiz, 1996; Çolak, 2015; Demir, 2015; Doğan, 2010; Esen, 2008; Oğuz and Ersoy, 2005; Özbakır, 2009; Tokuz, 2011; Şarman, 2015), examine the contribution of traditional games to the development of children (Aliyeva-Esen, 2008; Akay, 2017; Gürbüz-Özden, 2016), and investigate the use these games for teaching purposes (Aksoy, 2014; Araz, 2013; Başal, 2007; Bay, 2018; Gümüştaş, 2010; Karadeniz, 2017; Öz-Pektaş, 2017; Sümbüllü & Altınışık, 2016;). However, no study has been conducted on the effect of traditional children's games on mathematical skills in early childhood. Therefore, the present study aims to examine mathematical skills in traditional children's games, which constitute our cultural heritage, and present examples of adapted versions of these games that support the said mathematical skills. In the Ministry of National Education (MoNE) Preschool Education Program (2013), it is stated that mathematical activities consist of the following studies: establishing relations, matching, grouping, creating patterns, sorting, counting, addition-subtraction, recognizing geometric figures (symbols) and preparing graphics. Accordingly, the present study presents examples of the traditional games related to early childhood mathematical skills, including matching, comparing, grouping, sorting, creating patterns, numeracy, operation, geometric figures, spatial thinking, measurement, estimation and creating patterns. In addition, it is explained how the games can be adapted and played in different ways for a better achievement of these skills. The present study is unique in that it examines contemporary mathematical skills in traditional games, presents examples, and gives suggestions for adaptations for these mathematical skills. In addition, this study will guide pre-school teachers working in the field and those who research this field and form the basis for future research.

METHOD/MATERIALS

Research Model

This descriptive study uses a qualitative research method to examine mathematical skills in traditional children's games and provide examples of adaptations that support mathematical skills. Qualitative research is an interpretative process of perceiving and addressing previously known or unrecognized problems in a realistic manner (Seale, 1999). Qualitative research examines what kind of meaning people attribute to events, that is, how they describe events (Dey, 1993). Thus, the present study aims to examine traditional children's plays with regards to the mathematical skills in the preschool education program and to support the said mathematical skills with examples of game adaptations.

Data Collection

In qualitative studies, data are generally obtained through observation, interviews and documents. In the present study, document analysis was used for data collection. Document analysis is defined as the process of analyzing documents such as diaries, letters, and books that are considered to be related to the research topic by the researcher (Yıldırım & Şimşek, 2013). Accordingly, mathematical skills in the "Preschool Education Program" (MoNE, 2013) were primarily examined. In addition, achievements and indicators that can be associated with these skills have been identified. Later, a literature search was conducted to find examples of traditional children's games (Aliyeva-Esen, 2008; Aksoy, 2014; Başal, 2007; Başal, 2017; Bay, 2018; Cengiz, 1996; Çolak, 2015; Demir, 2015; Doğan, 2010; Gümüştaş, 2010; Gürbüz-Özden, 2016; Oğuz & Ersoy, 2005; Özbakır, 2009; Öz-Pektaş, 2017; Sümbüllü & Altınışık, 2016; Şarman, 2015; Tokuz, 2011) and 1000 game examples obtained from different sources were examined by the researchers.

Data Analysis

In this study, traditional games to be discussed in terms of mathematical skills have been determined by the descriptive analysis method. Descriptive analysis is performed with an aim to organize the findings and present them to the reader in an interpreted form (Yıldırım & Şimşek, 2013). For this reason, achievement and indicators were also determined, in addition to mathematical skills in the MoNE preschool education program (matching, comparing, grouping, sorting, creating patterns,

sorting, numeracy, operation, geometric figures, spatial thinking, measurement, estimation and creating patterns). In the second stage, 58 games reflecting mathematical skills were determined from among the 1000 games that have been examined. Six of these games were found to be suitable for using to measure two different skills. Afterwards, selected games are defined, analyzed and interpreted. The following criteria were taken as a basis for the selection of the games included in the research: the game should be suitable for the development level of preschool children, the game should be easily played by children in this period, and the game should support at least one of the achievements and indicators of the relevant skill in the preschool education program. In order to increase the reliability, the games used in the study were examined separately by both researchers and only the games on which a consensus was reached were included in the research. An example of a game for each mathematical skill in 58 traditional games, that are found suitable for the purpose of the study, is explained in detail. The games included in the study and the way they are played are provided below.

Noah's Ark Game (Nuh'un Gemisi): Noah's Ark is a game played with two groups. The players are divided into two groups of equal numbers of boys and girls. At the beginning of the game, animal names are determined to be half the number of players. For example, if there are 10 players, five animals (eg. cat, dog, bird, cow, monkey) are determined. The two groups gather in different areas and share the names of these animals among themselves. Thus, each child chooses an animal name. The players of both groups come together after a short while and try to find their partner in the opposite group by imitating the sound of the animal they have chosen (such as meowing, barking) or by making the movements of the animal. Players who cannot find their match when time runs out get penalized. Punishment is usually rhyme chanting.

Well Game (Kuyu Oyunu): The well game is played with two people in an open area. Before starting the game, the players dig two small pits opposite each other about four meters apart, which are called "wells". Children take ten stones, provided that they are not too big. Then, players pass behind the wells in such a way that they stand opposite each other. They throw stones into the wells with their fingertips or hands. After finishing throwing, the stones in the well are counted. Whichever well has more stones, the player that threw stones into that well wins the game. The game continues in this way.

Slouch Game (Himbil Oyunu): Slouch is a game played in groups. First, as many fruit groups as the number of players are created. The names of the fruits are written on small pieces of paper of equal number as the number of players (for example, four apples, four pears, four strawberries, four cherries). Pictures of fruits can be drawn instead of names for young children who cannot read. Then, the cards are folded, shuffled and randomly distributed to the players in equal numbers. Players try to collect cards belonging to the same fruit group in their hands. The player to start the game is decided by counting. The player who starts the game gives any of the cards s/he wants to the player next to him/her. In the same way, this player gives any of the cards in his/her hand to the player on his/her other side. The game continues like this. The first player to complete the same fruit group in his/her hand reveals his/her hand by saying "slouch" (himbil). The other players must also quickly place their hands on the hand of the player who placed his/her hand on the ground. Scoring is done according to the order of the hand placement. The player with the hand on the bottom gets more points, while the player who puts his/her hand on the top gets no points. The way of scoring is determined at the beginning of the game. The player with the most points wins the game.

Shake Hands, Greet and Run Game (El Sık Selam Ver Koş Oyunu): Children line up around a large circle drawn on the playground. One of them is chosen "it". While the "it" kid is walking around outside the ring, s/he touches the back of a friend s/he wants, and the two start running in opposite directions. The child whose back is touched and the "it" shake hands and greet at the point where they come face to face. "It" tries to take the place of his/her friend whose back s/he touched. The child whose back is touched tries to take his/her place back, in order not to become "it". If the "it" child occupies the place, s/he stops thing "it", the other child becomes "it". If the opposite happens, the child who is "it" continues to be "it". In case players do not shake hands and greet their friends during the run, the game is stopped and other children join the game.

Boom Game (Bom Oyunu): Players sit on the floor in a circle. They choose the person to start the game by counting. The first player shouts "one", the second player continues to count "two". But they need to shout "boom" at numbers five and multiples of five. The game is played fast and those who hesitate, say boom in the wrong place or forget to say boom are eliminated.

Dodgeball (Yakan Top Oyunu): Players are divided into two equal groups by counting. One person from each group is selected and it is decided which group will be "piggy (rat/mouse in Turkish)" using the foot counting method ("I took & I gave" rhyme). The group with "piggy" is the group that will be in the middle. Other group members will try to hit them by going to the opposite determined places. Players who try to hit the middle group with the ball throw the ball from the air and if one of the players in the middle catches the ball, that player gains an extra life. But if that player fails to catch the ball and the ball touches a player in the middle group, that player is out of the game. The player who gains a life can call a friend who was hit back to the game by using this extra life. The game continues until there is only one person left. If the last player remaining is not hit in any of the ten ball throws in total, that player's team wins and the game starts over. If the last player is hit, the groups change places.

Puss in the Corner Game (Köşe Kapmaca Oyunu): Puss in the corner is played in a garden, room or any area with at least four corners. The game requires at least five people. All players move to the middle of the playing area. Players simultaneously try to take the corners in the area they are in, and the person left outside becomes "it". After the "it" is determined, the other players try to change corners among themselves by running, while "it" tries to move to one of the vacant corners. Whichever player's corner is captured by "it", that player becomes "it".

Ali Baba What Time is it?/Fox Fox, What Time is it? Game (Ali Baba/Tilki Tilki Saat Kaç Oyunu): This game is played in a wide area. A minimum of three players is required. "It" is chosen among the players and becomes "Ali Baba". "It" faces the wall, and the players stand in a line 6-8 meters behind the "it" child. The aim of the players is to touch "it" and return to the starting line again. The aim of the "it" kid is to catch the players who touch him/her, run away and make them "it". The players ask "it" in unison, "Ali Baba, what time is it?" Ali Baba can answer in two ways: s/he either says a time or says "cauldron base" (kazandibi) When the time is told, the players try to get closer to "it" by taking steps as the said clock (as many times as the number said). When "it" says "cauldron base (kazandibi)", s/he suddenly turns around and sends the closest player to the starting line.

Loop Game (Loop Oyunu): Loop game is played with at least two people. Players draw a circle on the ground and throw their loops (buttons) there in turn. The player throws closest to the circle starts the game first. After the player ranks are found, the measures to be used in the game are determined. As a rule, the player who throws the loop one inch away from the loop thrown by the first player wins the game. Whichever player's loop has fallen to the agreed distance wins the game. This player will take the loops of the others.

Watermelon Seller / Zucchini Seller Game (Karpuzculuk/ Kabakçı Oyunu): The game is played with at least 10 players. A scarf or a suitable eye patch is used to bind the player's eye in the game. Two groups are formed and group leaders are determined. Group members crouch while the group leaders stand. Group leaders name group members (fruit, vegetables, etc.). The following conversation takes place between the group leaders:

- Zucchini seller, did your zucchinis get cooked?
- They did.
- How should I come?
- By bouncing on the countryside.
- There is a well in the middle.
- Pass on the side.
- There is a dog.
- Shoo shoo.

In turn, the leader of the other group touches the heads of the players in the opposite group, saying "not cooked, not cooked". The leader chooses one of the players and says "cooked" and covers eyes of this player with a piece of cloth or scarf. The leader summons a fruit from his/her group (for example, a cherry). The cherry comes, the player who is blinded hits the head of the cherry and the cherry returns to see where it came from. All the players turn their backs. The players clap their hands and say in unison: "I hit". The blindfolded player's blindfold is opened, s/he taken to the group and told to find out who hit him/her on the head. If the blindfolded player knows which player hit his/her head, s/he takes the hitter to his/her own group. If s/he doesn't know, s/he is transferred on to the other group. The game continues like this. At the end of the game, whichever group has the most numbers wins the game.

Surprise Game (Şaşırtmaca Oyunu): Surprise is played in groups of two. In groups of two, children say the rhyme written below by doing the movements described within parentheses. Surprise (two players facing each other grab each other's hands as if shaking hands and rotate their hands) / 3 times a a a (clap once and high-five their right hands 3 times) / 3 times b b b (clap once and high-five their left hands 3 times) / 1 time a (clap once and high-five their right hand once) / 1 time b (clap once and high-five each other with their left hands once) / al (clap once) / pha (high-five each other's right hands) / bet (they high-five each other with their left hands and at the same time the right thumb touches the right shoulder and the left thumb touches the left shoulder simultaneously).

FINDINGS

In this section, data analysis findings of the present study are presented. Table 1 below shows achievements and indicators related to mathematical skills in the MoNE preschool program, including matching, comparing, grouping, sorting, numeracy, operation, geometric figures, spatial thinking, measurement, estimation and creating patterns.

Table 1. Mathematical skills, achievements and indicators

Mathematical Skill	Achievement	Indicator
Matching	C. D. Achievement 6. Matches objects or things according to their properties.	Matches objects/things one-to-one. Distinguishes and matches objects/things according to their color, shape, size, length, texture, sound, material, taste, smell, quantity and usage purposes. Shows the matching object/things. Matches objects/things with their shadows or images.
Comparing	C. D. Achievement 8. Compares properties of objects or things.	Distinguishes and compares the color, shape, size, length, texture, sound, smell, material, taste, amount and purpose of use of objects/things.
Grouping	C. D. Achievement 7. Groups objects or things according to their properties.	Groups objects/things according to their color, shape, size, length, texture, sound, material, taste, smell, quantity and intended use.
Sorting	C. D. Achievement 9. Sorts objects or entities according to their properties.	Sorts objects/things by their length, size, quantity, weight, and hue.
Numeracy	C. D. Achievement 4. Counts objects.	Counts forward/backward one by one rhythmically. Points to the specified number of objects. Tells how many objects s/he counted. Says the sequential number. Says the number that comes before a number among the numbers up to 10 and the number that comes after it.
Operation	C. D. Achievement 16. Performs simple addition and subtraction operations using objects.	Adds the specified number of objects to the object group. Separates the specified number of objects from the object group.
Geometric figures	C. D. Achievement 12. Recognizes geometric figures.	Says the name of the geometric shape shown. Tells the properties of geometric figures. Shows objects that look like geometric figures.
Spatial thinking	C. D. Achievement 10. Follows directions about location in an area.	Tells the position of the object in the area. Positions the object in the right place in accordance with the instruction. Takes position in the area.
Measurement	C. D. Achievement 11. Measures objects.	Predicts the measurement result. Child measures in non-standard units and tells the measurement result. Compares measurement results with predicted results.
Estimation	C. D. Achievement 2. Makes an estimation of the object/situation/event.	The child tells his/her guess about the object/situation/event. Explains estimation clues. Examines the real situation. Compares the estimation with the real situation.
Creating patterns	C. D. Achievement 14. Creates patterns with objects.	Creates patterns with objects by looking at the model. Says the rule in the pattern consisting of at most three elements. Specifies and completes the missing element in a pattern. Creates a unique pattern with objects.

Table 1 shows the mathematical skills that are associated with achievement and indicators in the field of cognitive development (C.D.). It has been determined that matching skill is related with achievement 6 and its indicators, comparing skill with achievement 8 and its indicators, grouping skill with achievement 7 and its indicators, sorting skill with achievement 9 and its indicators, numeracy skill with achievement 4 and its indicators, operation skill with achievement 16 and its indicators. It has been found that the geometric figures skill is associated with achievement 12 and indicators, spatial thinking skill with achievement 10 and indicators, measurement skill with achievement 11 and indicators, estimation skill with achievement 2 and indicators, and creating patterns skill with achievement 14 and indicators. In Table 2 below, traditional children's games and frequency values that support the mathematical skills of matching, comparing, grouping, sorting, numeracy, operation, geometric figures, spatial thinking, measurement, estimation and creating patterns skills, which are among the mathematical skills in the MoNE preschool education program, are given.

Table 2-Mathematical skills, achievements and indicators

Mathematical Skill	Traditional Children's Plays	f
Spatial thinking	Ali Father (Ali baba), Stop (İstop), House (Hane) , Box box pliers (Kutu kutu pense), Hot-Cold (Sıcak soğuk), Puss in the Corner (Köşe kapmaca), I'm on the stone I'm on the ground (Taştayım topraktayım), Nightingale in the cage (Bülbül kafeste) , Shake (Sallama), Bottle (Şişe)	10
Matching	Noah's Ark (Nuh'un gemisi), Hopscotch (Seksek), Fire-earth-air-water (Ateş-toprak-hava-su), Pine Cone (Kozalak), What do you need (Ne lazım), Ball goal (Top kalesi), Girl girl out (Kız kız dışarı)	7
Measurement	Loop (İlik), Ali Father (Ali baba), I took it I gave it (Aldım verdim), Tipcat (Çelik çomak), Lever (Naldırnaç), Stone (Tot), Step Jump (Adım atlama), Rock (Kaya)	7
Geometric figures	Puss in the Corner (Köşe kapmaca), I sell oil, I sell honey (Yağ satarım bal satarım), House (Hane), Hopscotch (Seksek), Matches (Kibrti), Needle (Tığ)	6
Numeracy	Boom (Bom), Hide and Seek (Saklambaç), Ring (Halka), Train (Tren), Surpass (Ütmenli), Odd or Even? (Tek mi çift mi?)	6
Operation	Dodgeball (Yakantop), Seven Tiles (Yedi kiremit), My hand is epelek (Elim elim epelek), Marbles (Bilye), Nine stone (Dokuztaş), Castle grab (Kale kapmaca)	6
Creating Patterns	Surprise (Şaşırtmaca), Tic-tac-toe (Üçtaş), Boom (Bom), Row stone (Sıra taş)	5
Sorting	Shake hands, greet and run (El sık selam ver koş), Seven Tiles (Yedi kiremit), Tar (Katran), Tulip (Laleli)	4
Comparing	Well (Kuyu), Open the door Bezirgan Başı (Aç kapıyı bezirgân başı), Broody hen (Gurk tavuk)	3
Estimation	Watermelon seller (Karpuzculuk), Aspirin	2
Grouping	Slouch (Hımbıl), Jackstones (Beştaş)	2

As seen in Table 2, there are 10 traditional games for spatial thinking, 7 for matching, 7 for measurement, 6 for geometric figures, 6 for numeracy, 6 for operation, 5 for creating patterns, 4 for sorting, 3 for comparing, 2 for estimation, and 2 games for grouping. Below given the games of Noah's Ark, Well, Slouch, Shake Hands, Greet and Run, Boom, Dodgeball, Puss in the Corner, Ali Father What Time is it?, Loop, Watermelon Seller and Surprise with regards to the mathematical skills in preschool education program. Traditional games are presented in two parts: In the first part, the findings about the mathematical skills acquired by the game are given, and in the second part, the adapted versions of the games are presented.

Matching

Noah's Ark: Matching is establishing the correspondence of objects in one group to the objects in another group (Charlesworth & Lind, 2009). Noah's Ark game is one of the traditional games that can be used to improve matching skills in children. There are two groups in the game. Number of players in the group is equal. Children have to find the same animal they have chosen from among their friends in the opposite group. For example, a child who chooses a cat tries to find the other player who also chose the cat in the opposite group. This makes children practice matching. This game is also appropriate for achievement 6 in the field of cognitive development, which is as follows: 'matches objects or things according to their properties'. In this game, children fulfill the indicators of the matching achievement by bringing the things together according to their sounds and movements and matching them one-to-one.

Adaptation: The Noah's Ark game can also be played by adapting it in different ways for the matching skill achievements and indicators. For example, different objects/things can be used instead of animals. It is possible to match the color, shape, size, length, texture, sound, material, taste, smell, quantity and usage purposes of the object/things. For example, half the number of vehicles is determined at the beginning of the game. That is, if there are 10 players, five vehicles (train, plane, ship, automobile, bicycle) are determined. The two groups gather in different areas and share these vehicles among themselves. Each child chooses a vehicle. The players of both groups come together after a short while and try to find their partner in the opposite group by imitating the sound or the movements of the vehicle they choose.

Comparing

Well: Comparing is the name given to the process of determining whether two objects or groups of objects are the same or different according to a certain feature (Aktaş-Arnas, 2012). One of the traditional games that can be used to improve children's comparing skills is the well game. In this game, the player who throws the most stones at the end of the game wins the game. To determine which player has thrown the most stones, the stones in the well must be counted, and then the two numbers must be compared to decide which one has the most. Here, the children decide who is the winner of the game by comparing the amounts. The well game is suitable for achievement 8 in the field of cognitive development. This achievement is as follows: 'Compares properties of objects or things'. Children achieve this achievement by comparing objects according to their quantity in this game.

Adaptation: It is possible to play the well game by adapting it in different ways in terms of achievements and indicators of comparing skill. For example, the stones used in the game may have different properties. Thus, children can compare objects/things by color, shape, size, length, texture, sound, material from which they are made, and their intended use. In order to compare according to their size, players take five big and five small stones in their hands and pass behind the wells in opposite directions. They throw stones into the wells with their fingertips or hands. After the throwing, the stones in the well are counted. Whichever well has a greater count of large stones, that player wins the game. The game continues as this.

Grouping

Slouch: The ability to bring objects together according to their general qualities or characteristics such as color, shape, size is called classification (Charlesworth & Lind, 2009). The slouchy game is one of the traditional games that can be used to improve children's classification, in other words grouping skills. The aim of the game is to collect the most points on an individual basis. The most points are obtained by making slouch. To make slouch, players must hold all the cards of a fruit group. Players make slouch by bringing together the same fruit cards that they have chosen, that is, by grouping. The Slouch game is suitable for achievement 7 in the cognitive development area, which is: 'groups objects or things according to their properties'. In this game, children acquire the achievement by grouping the same fruits.

Adaptation: It is possible to play this game in different ways by adapting the grouping skill in terms of achievements and indicators. For example, different objects/things can be used instead of fruit pictures. These objects/things can be grouped by color, shape, size, length, texture, sound, material, quantity, and intended use. For example, for grouping by shape, as many geometric shape groups as the number of players are created. These shapes are drawn on as many pieces of paper as there are players (for example, four triangles, four squares, four circles, four rectangles). These small cards are then folded, shuffled and randomly distributed to the players in equal numbers. Players try to collect the same group of geometric shapes in their hands. The first player to complete the same group of geometric shapes in his/her hand reveals his/her hand by saying "slouch". The player with the most points wins the game.

Sorting

Shake Hands, Greet and Run Game: Sorting is the arrangement of more than two objects or groups of objects according to certain characteristics such as length, height, weight, and tone of voice (Charlesworth & Lind, 2009). This game is a traditional game that can be used to develop sorting skills in children. There are behaviors that need to be done and expressions that need to be said in order to achieve the game goal. These behaviors are shaking hands, greeting and running when children meet. Children have to perform these behaviors in a given order, otherwise they will be out of the game. In order to continue the game, shaking hands, greeting and running must be done in sequence. In other words, children are expected to have a certain "sorting" of these behaviors. This game is suitable for achievement 9 in the cognitive development area, which is: 'orders objects or things according to their properties'. Here the children can obtain this achievement by sorting the behaviors.

Adaptation: Shake hands, greet and run game can be played in different manners by being adapted in terms of achievements and indicators of sorting skill. The sequential behavior in the game can be changed. Also, sorting of length, size, amount, weight, color tone can be asked. For example, children line up around a large circle drawn on the playground and one of them is chosen as "it". While the "it" kid walks around outside the ring, s/he touches the back of a friend s/he wants and both start running in the opposite direction. At the point they meet, the "it" child and the child whose back is touched, jump, hug, wave and continue running. The "it" child tries to take the place of the friend whose back is touched, and the child whose back is touched tries to take his/her place again in order not to become the "it".

Numeracy

Boom: Number refers to the amount of units that are found at the end of operations such as counting, measurement, weighing, and it means pieces (TDK, 2020). The boom game is one of the traditional games that can be useful for developing children's counting skills. This game helps children develop counting skills and consolidate numbers. Children count rhythmically from 1 to 4, 6 to 9, 11 to 14, and 16 to 19. In addition, they know that in rhythmic counting 5 will come after 4 and 10 will come after 9 etc., and they show this by saying "boom". The boom game is in accordance with the cognitive development area achievement 4 and its indicators, which is stated as: 'counts objects'. The child acquires this achievement by counting forward one by one rhythmically in the game.

Adaptation: The boom game can be played in different ways by adapting the number skill in terms of achievements and indicators. For example, instead of 5 and multiples of 5, different numbers and multiples can be used. For instance, players sit in a circle on the ground and count and choose the person to start the game. The first player starts to count by shouting one, the second player continues to count by two, but it is necessary to shout boom on three and multiples of three. Thus, children acquire the achievement of counting forward one by one rhythmically, saying the sequential number, and saying the number that comes before and after a particular number among numbers up to 10.

Operation

Dodgeball: Operation is defined as obtaining another element from two elements of a set or obtaining another item from more items according to a certain rule (Baykul, 1999; cited in Baydemir, 2016). The dodgeball game is one of the traditional games that can be used to develop children's simple addition and subtraction skills. In the game, children gain a life when they catch the ball. The child who catches the ball does the addition operation by adding one to the previous life count. At the same

time, a child who is hit by a ball loses a life. In this case, the child calculates the new number of lives by subtracting one from the previous number of lives. If children who have only one life in the game are hit, they are out of the game. When the child with the only life in the group is hit and leaves the game, the number of players in the group decreases by one. The dodgeball game is suitable for cognitive development area achievement 16. Achievement 16 is as follows: 'Performs simple addition and subtraction operations using objects'. In this game, kids get this achievement by catching the ball and adding a life, or by being hit by the ball and losing a life.

Adaptation: The dodgeball game can be played in different ways by adapting it in terms of operation skill achievements and indicators. Children can gain or lose a different number of "lives". For example, when players trying to hit the middle group with the ball throw the ball from the air, if one of the players in the middle catches the ball, they can gain two lives. The player who gains a life can re-include a friend who was hit by giving two of their own lives.

Geometric Figures

Puss in the Corner: Geometric figures are standards used to determine the shape of an object (Aktaş-Arnas, Aslan & Günay-Bilaloğlu, 2017). Puss in the corner is one of the traditional games that can be used to develop children's geometric figures skills. In this game, children hear different examples of geometric shapes such as corners and edges, and they reinforce geometric figures by trying to catch one of the four corners (edges) in the playground. This game is suitable for cognitive development area achievement 12, which is as follows: 'Recognizes geometric figures'. In the game, children gain awareness about different geometric figures.

Adaptation: Puss in the corner game can also be played by adapting the geometric figures skill differently in terms of achievements and indicators. Children's recognition of the names and properties of geometric figures can be ensured by using different geometric figures in the game. For example, the game puss in the corner can be played in two different stages. The first stage is played by catching the corners in the square-shaped playing field. The second stage is played on a rectangular area using the same rules. The game focuses on the differences between square and rectangular shapes. The square-shaped play area ensures that children are equidistant from both adjacent corners and can navigate from the adjacent corners to whatever they want. When played in a rectangular area, children will be able to go to one of the corners next to them more quickly, while it will be more difficult to go to the corner on the other side (the longer side). Thanks to this adapted version, children can see the similarities and differences between geometric figures.

Spatial Thinking

Ali Father What Time is it?/Fox Fox, What Time is it?: The concept of space, which is explained by the area and the use of this area, is related to the distance between objects, the relationship between objects and the direction of one's body (Charlesworth, 2011). Ali father game is among the traditional games that can be played to improve the spatial thinking skills of children. Children move by calculating the distance between themselves and "it", being close or far from "it" throughout the game. When the "it" child says "cauldron base", the player closest to "it" must return to the starting line. In order not to return to the starting line, children have to calculate the position between them and the "it" and make an effort not to be closest to the "it". Ali father is a game suitable for cognitive development area achievement 10. Cognitive development area achievement 10 is: 'Executes location-related directions in the area'. In this game, children acquire this achievement by taking position in the area according to the instruction.

Adaptation: It is also possible to play the Ali father game by adapting it in different ways in terms of spatial perception skill achievements and indicators. Children may be asked to position themselves differently in the area and to say their position. For example, at the beginning of the game, all children are positioned in different places behind the "it" child. The players all in unison ask "it", "Ali father, what time is it?" Ali father can respond in two ways: by saying a time or by giving directions such as one step to the right, one step to the left, one step forward, back and forth. Children move in accordance with these instructions and say their position (like I'm on the right, I'm behind). When the time is told, the players try to get closer to "it" by taking steps (as many times as the number said) for the clock. Whoever approaches and touches "it" the fastest wins the game.

Measurement

Loop: Measurement is the expression of physical properties such as volume, weight, length and height of situations or objects or non-physical properties such as temperature, time, money with a number and comparing them with situations or objects of the same nature (Charlesworth, 2011). Loop game is one of the traditional games that can be used to practice measurement with children. In order to start the game in the first place, the loop must be thrown the farthest. In addition, a measurement operation is performed to determine the farthest loop. In the game, the winner is decided as a result of the measurement operation performed with the non-standard unit "handsbreadth". Loop is a game suitable for cognitive development area achievement 11, which is as follows: 'Measures objects'. Children acquire this achievement by measuring with non-standard units in the game.

Adaptation: It is possible to play the Loop game in different ways in terms of measurement skill achievement and indicators. Different measurement tools, standard or non-standard, can be used in the game. Children may be asked to predict a measurement result, tell the actual measurement result, and compare the measurement results with the predicted results. For example, players draw a circle on the ground and place their loops (buttons) there in turn. The player who throws the closest distance to the circle starts the game first. After the player ranks are determined, the measures to be used in the game are

determined. As a rule, the player who drops the loop one step away from the loop thrown by the first player wins the game. Whichever player's loop falls within the agreed distance wins and gets others' loops as well.

Estimation

Watermelon Seller / Zucchini Seller: Estimation is the likelihood of something to happen, it is the probability, the possibility of something (TDK, 2020). Watermelon seller game is a traditional game that can be used for developing estimation skills in children. In this game, the blindfolded player has to guess and choose one of the five players from the opposite group who may have touched him/her. In other words, the child knows that the player who touched him/her is one of the five players, that is, s/he realizes that there is a one in five probability that his/her estimation will be correct. This game complies with the cognitive development field achievement 2, which is: 'Makes an estimation of the object/situation/event'. Children acquire this achievement by telling their estimation about a situation/event in the game.

Adaptation: The watermelon game can also be played by adapting the estimation skill in different ways in terms of achievements and indicators. Children can be asked to guess not one but two people. The child may be given clues about the prediction or the child may be asked to compare the prediction with the actual situation. For example, two groups are created. The leader of the group chooses one of the opposing group and summons two fruits from his/her own group (for example, cherry and apple). Cherries and apples come and hit the blindfolded player's head, then the cherry and apple return to their places. All the players turn their backs. The players clap their hands and say in unison: "I hit". The blindfolded player's eyes are opened, taken to the group, and told to find out who hit him/her on the head. If the blindfolded player knows which players hit on the his/her head, s/he takes those players to his/her own group. If s/he does not know, s/he will be transferred to the other group. The game continues like this. The group with the most numbers wins the game.

Creating Patterns

Surprise: A pattern is a systematic combination of geometric figures, sounds, symbols or events (Souviney, 1994). A pattern is defined as a "core" group of at least two objects lining up according to a certain rule and the said rule repeating sequentially. Surprise is one of the traditional games that can be used to help children gain pattern skills, because this game consists of both a sound pattern and a movement pattern. In this game, children create patterns by repeating sounds and movements consecutively according to a certain rule. This game is in compliance with the cognitive development area achievement 14, which is: 'Creates patterns with objects'. Children acquire this achievement by creating patterns with sounds and movements in this game.

Adaptation: Surprise can also be played by adapting the pattern skill in different ways in terms of achievements and indicators. Movements and sounds in the pattern can be changed or new ones can be added to the existing ones. For example, in pairs, children say the following nursery rhyme by performing the movements described in parentheses: Surprise (the two players standing opposite each other hold each other's hands as if shaking hands and rotate their hands) / 5 times a a a a a (clapping their hands once, high-fiving their right hands 5 times) / 5 once b b b b b (clapping once and high-fiving their left hands together 5 times) / 2 times a (clapping their hands twice, high-fiving their right hands twice) / 2 times b b (clapping their hands twice and high-fiving each other with their left hands twice) / al (clapping once) / pha (high-fiving each other's right hands together) / bet (they clap their left hands together and at the same time the right thumb touches the right shoulder and the left thumb touches the left shoulder).

CONCLUSION AND RECOMMENDATIONS

The present study aimed to examine mathematical skills in traditional children's games and provide examples of adaptations that support these mathematical skills. In this context, the study presents classic game examples related to matching, comparing, grouping, sorting, numeracy, operation, geometric figures, spatial thinking, measurement, estimation, and creating patterns skills included in early childhood mathematical skills. In addition, a detailed explanation of these games has been made in terms of mathematical skills. In addition, it is emphasized that these games can be used by adapting them in line with the achievements and indicators in the preschool education program. The present study also presented adapted examples of these games. This study is limited to traditional game examples obtained due to document analysis and associated with mathematical skills.

The results of the study show that, among the traditional children's games obtained as a result of document analysis, there are 58 traditional games for mathematical skills, including matching, comparing, grouping, sorting, numeracy, operation, geometric figures, spatial thinking, measurement, estimation and creating patterns, which are also included in the MoNE preschool education program. It has been found that six of these games can support two different mathematical skills. Through games, it is possible for children to develop positive attitudes towards mathematics and to learn mathematics concretely by having fun. The mathematical skills of children who are actively involved in the game can be supported in this manner (Uygun & Hakkoymaz, 2019).

Within the scope of the study, Noah's Ark for was examined for matching skill, Well for comparing skill, Slouch for grouping skill, Shake Hands, Greet and Run for sorting skill, Boom for numeracy skill; Dodgeball for operation skill, Puss in the Corner for geometric figures skill, Ali Father, What time is it? For spatial thinking skill, Loop for measurement skill, Watermelon Seller for estimation skill and Surprise for creating patterns skill was examined in detail.

The gameplay of the games and their associated mathematical skills were presented. Playing games is an indispensable occupation of childhood and creates one of the most effective learning opportunities. By playing, children develop in all areas of experience. In other words, playing games contribute to the child's development (OÖEP, 2013). Games are one of the best ways to teach mathematical skills in early childhood (Carruthers & Worthington, 2011). Therefore, it is of great importance that traditional games that support the learning of mathematical skills are presented to children from an early age. In this way, children can learn mathematical skills enjoyably and entertainingly through games. The traditional games examined within the scope of the present study are games that teachers and parents can easily use to teach and consolidate mathematical skills in early childhood. It can be said that these games are known by teachers and parents and even played by them in the past.

This study presented adaptation suggestions for each of the games Noah's Ark, Well, Slouch, Shake Hands, Greet and Run, Boom, Dodgeball, Puss in the Corner, Ali Father What Time is it? Loop, Watermelon Seller and Surprise are in line with the achievements and indicators in the preschool program. In addition, the way these games are played is explained with the examples given. Mathematics through playing games offers children the opportunity to push their limits and follow their ideas in any way they can think of (Holton et al., 2001). For this reason, it is important to offer different play opportunities according to children's ages, developmental needs and interests. Traditional children's games can also be considered an opportunity to gain mathematical skills because they can be played in different environments, with different materials and in different ways with various adaptations. Accordingly, preschool teachers can create opportunities to reveal mathematics in traditional games while teaching mathematics to children. In addition, teachers can benefit from traditional games in their activity plans and daily education flow. Adapting and playing traditional children's games will offer children various opportunities for playing games. This will also help teachers in their classroom practices. At the same time, teachers need to pay special attention to using mathematical language while playing these games with children to help children establish a relationship between games and mathematics and raise awareness about mathematical concepts in children from an early age. In order to achieve this, various practical educational activities related to traditional children's games can be organized for preschool teachers.

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Statements of publication ethics

We hereby declare that the study has not unethical issues and that research and publication ethics have been observed carefully.

Researchers' contribution rate

The study was conducted and reported with equal collaboration of the researchers.

Ethics Committee Approval Information

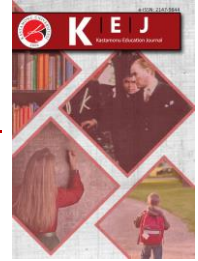
Ethics committee evaluation was not presented because the study was not conducted with human contributors.

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| Research Article / Araştırma Makalesi |

An Investigation of Critical Thinking Skills in Illustrated Children's Books

Resimli Çocuk Kitaplarında Eleştirel Düşünme Becerisine Yer Verilme Durumunun İncelenmesi

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Keywords

1. Critical thinking
2. Illustrated children's books
3. Children's literature

Anahtar Kelimeler

1. Eleştirel düşünme
2. Resimli çocuk kitapları
3. Çocuk edebiyatı

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Abstract

Purpose: The purpose of this research is to investigate the critical thinking skills in illustrated children's books in pre-school education classes.

Design/Methodology/Approach: Within the scope of the research, 200 picture children's books were analyzed by document analysis method.

Findings: According to the findings, it was observed that in the analyzed children's books, there were more phrases that support critical thinking skills such as inference, evaluation and self-regulation while high-level skills such as analysis and interpretation were rather limited. In addition, while phrases supporting the explanation skills were included directly in the examined children's books, it was observed that there was no indirect mention.

As a result, research findings showed that critical thinking skills are limited in the illustrated children's books, and they are usually given directly. These results also clearly revealed the existence of a didactic approach, an attitude that restricts critical thinking in children's books. Illustrated children's books prepared for early childhood should avoid this approach and they should be enriched with content that supports children's thinking skills.

Highlights: The abstract of the article should be written by adding the "Calibri (Body)" text font, 8 font size, single line spacing and 6 nk space at the end of the paragraph. The abstract should be between 150 and 350 words. In the abstract, the purpose of the article, the method used, the main findings, conclusions and suggestions should be clearly stated.

Öz

Çalışmanın amacı: Bu araştırmanın amacı okul öncesi eğitim sınıflarında yer alan resimli çocuk kitaplarında eleştirel düşünme becerilerine doğrudan veya dolaylı olarak yer verilme durumunu incelemektir.

Materyal ve Yöntem: Araştırma kapsamında doküman analizi yöntemi ile okul öncesi sınıflarının kitap merkezinde bulunan 200 yerli resimli çocuk kitabı incelenmiştir.

Bulgular: Elde edilen bulgulara göre incelenen çocuk kitaplarında eleştirel düşünme becerilerinden çıkarım yapma, değerlendirme ve öz düzenleme gibi becerileri destekleyici ifadelerle daha çok yer verilirken üst düzey beceriler olan analiz etme ve yorumlama becerisine oldukça az yer verildiği gözlenmiştir. Ayrıca incelenen çocuk kitaplarında açıklama becerisini destekleyici ifadelerle kısmen doğrudan yer verilirken, dolaylı olarak hiç yer verilmediği görülmüştür. Sonuç olarak araştırma bulguları incelenen resimli çocuk kitaplarında eleştirel düşünme becerilerine sınırlı olarak yer verildiğini ve bunun da genellikle doğrudan yapıldığını göstermiştir. Bu sonuçlar çocuk kitaplarında eleştirel düşünmeyi kısıtlayıcı bir tutum olan didaktik yaklaşımın varlığını da açıkça ortaya koymuştur. Erken çocukluk dönemine yönelik hazırlanacak resimli kitapların bu yaklaşımdan uzaklaşarak çocukların düşünme becerilerini destekleyici içeriklerle zenginleştirilmesi gerekmektedir.

Önemli Vurgular: Çocuklar için kitap seçimi yapan yetişkinlerin özellikle okul öncesi öğretmenlerinin kitapların popülaritesi yerine kitapların içerik açısından düşünme becerilerini destekleyici özelliğine önem vermeleri ve seçici olmaları bu konuda daha nitelikli yayınların yapılmasına katkı sunacaktır.

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INTRODUCTION

Throughout his life, human beings are the only beings who seek their reason for existence, strive to protect their freedom and struggle for originality in the field of freedom. These searches have made the interaction of a social being with other people and the need to question his life's essential practice. Early childhood years are critical when these life practices take shape, and the first steps are taken (Oktay, 2004). Children begin to explore life through their innate feelings of overbearing curiosity. Therefore, they are prone to ask questions (İnan, 2012). The attitudes that adults develop towards children's questions affect the development of thinking action, which is effective in mental processes. Thinking is a mental process that results in systematic or coincidental idea generation. The act of thinking can occur spontaneously in children or develop systematically through interaction with adults. These experience practices form the foundations of a different way of thinking in which children can think purposefully under their control, reject the usual and repetitive patterns, test, evaluate and discuss all kinds of information, and as a result, reach new ideas or actions. The development of thinking flexibly and creatively depends on the support given to the child and the practices made. (Wallace, Cave, & Berry, 2009; Kestel & Şahin, 2018; Söylemez, 2016). Critical thinking is necessary for the individual's freedom and originality (Seferoğlu & Akbıyık, 2006). This way of thinking is a unique way of thinking purposefully. In other words, critical thinking is an individual who thinks systematically and makes it a habit, has empathy, open-mindedness, and courage to examine facts in intellectual integrity (Rood, 2012).

Critical thinking is a way of thinking that blends skill and strategy. It is also geared towards a specific goal and purpose. Critical thinking depends on the acquisition of pioneering skills and strategies such as language skills and social-emotional skills and the use of these skills in real life (Murphy, Rowe, Ramani, & Silverman, 2014). Individuals with critical thinking skills express their thoughts in a short, concise, clear and consistent manner, discern whether the information they obtain as a result of their observations are reliable or not, avoid making judgments without sufficient evidence, observe objectively and in detail, take care to collect evidence and documents, reveal the relationship between the data they reach. They make new connections; their desire to learn is continuous, they are open to new ideas, they can apply problem-solving skills in situations other than what they have learned (Gürkaynak, Üstel, & Gülgöz, 2008; Seferoğlu & Akbıyık, 2006, Yoldaş, 2009). Askar et al. (2005) define critical thinking as a cognitive and affective feature that is aimed to be developed together with problem-solving in the process of reaching, processing and generating new information in the interaction with information. In addition, they express it as a power that enables the individual to control the self-development and learning process and a tool that provides freedom and originality in learning. Studies show that children with high critical thinking dispositions are academically more successful than those with low (Akbıyık & Seferoğlu, 2006).

According to Facione (1990), the essential skills that define critical thinking are as follows;

- **Interpretation:** Understanding and expressing the meaning or significance of various experiences, situations, events, judgments, traditions, beliefs, rules, procedures or criteria.
- **Analysis:** Identifying genuine relationships between situations, problems, concepts, definitions or other types of representations designed to express beliefs, judgments, knowledge, and opinions.
- **Evaluation:** Evaluating the reliability of statements or other statements that express a person's perception, experience, situation, judgment, belief or opinion; Evaluating the logical power of actual or deliberate inferential relationships between statements, questions or other forms of expression.
- **Making inferences:** identifying and securing the elements necessary to produce good results; to create assumptions and hypotheses, to take into account relevant information and to draw conclusions by using data, statements, principles, evidence, judgments, beliefs, opinions, connections, explanations, questions or other forms of expression.
- **Explanation:** Stating the results of the individual's reasoning; justification of reasoning in terms of evidential, conceptual, methodological, critical and contextual thoughts on which its results are based, and to present the individual's reasoning in the form of persuasive arguments.
- **Self-regulation:** Self-regulation is defined as the capacity of the individual to delay or prevent his / her behaviors and desires, to adapt to social norms, to regulate and control their emotions, to focus and to sustain this.

Critical thinking, which has been frequently mentioned by educators in recent years and includes the cognitive skills that an individual need in the process of adapting to the rapidly changing world, enables thinking differently and flexibly instead of directly receiving stereotyped information (Fisher, 2007). Studies reveal that critical thinking can be taught early childhood (Rodd, 2012; Soydan & Dereli, 2014). For this reason, critical thinking should be one of the essential skills that families and schools should teach children as this skill is a thinking skill that starts with the self-confidence of the family and progresses in every stage of life (Kasımoğlu, 2013). Truths and theories may vary, but flexible and analytical thinking, problem-solving are competencies that prevail in every moment of life (Williams Howe, 2016). Considering the speed and intensity of the flow of information today, it is an inevitable necessity for the individual to have critical thinking skills to make sense of information and reach the correct information. The development of this thinking skill is directly related to the child's experiences in the social environment and the opportunities offered to him since early childhood (Murphy et al., 2014). Developing critical thinking skills can be achieved in early childhood in different ways.

Children who are directed to establish cause-effect relationships with open-ended questions such as "why" and "how" that will prompt children to think can be supported to acquire higher-level thinking skills (Salmon, 2010). Games, artworks, drama exercises, or sincere conversations can contribute to the child's thinking skills. In addition, while supporting the development of children's critical thinking skills, stories that also entertain them, introduce the aesthetic aspect of language, and enable them to dream have an essential place. Illustrated children's books prepared for early childhood are friends who will provide vital and intellectual support. Illustrated books prepared by taking care of children's developmental needs support children's sense perception, concept learning, imagination and creativity, and sense of the aesthetic aspect of their mother tongue (Ceran, 2019).

For this reason, quality children's books are a practical resource that helps children in all development areas. Children's books are essential materials in acquiring and developing critical thinking. However, not all illustrated children's books support critical thinking skills in children. Guided publications that want to make the child dependent on the truths formed by an adult or publications using a didactic language to provide continuous information can lead to misconceptions in children about books and literature, discourage the child's desire to read over time, and consequently form barriers between the child and the book (Sever, 2008). Particular attention should be paid to the story and illustrations of the books prepared to teach critical thinking skills. First, books should develop reasoning and connection skills in children. In addition, questioning should include weeding out irrational thinking, establishing cause-effect relationships, basing on evidence, making comparisons, distinguishing relevant and unrelated information, and using motifs that give creative thinking power. It will be a didactic approach to try to give information, values, and skills desired to be acquired directly in children's books, and it will be intellectually ineffective in the face of an inquisitive, imaginative and questioning reader like a child (Cihaner, 2007).

One of the most important goals of the child's learning environment is to raise individuals who can think and use what they experience in real life (Narin & Aybek, 2010). For this reason, today's modern schools should be institutions that raise individuals who produce knowledge and discover ways to reach information, not transferring knowledge to children (Kurnaz, 2019; Seferoğlu & Akbıyık, 2006). The responsibility of both educators and parents is to make children feel that the truth is not the only one; the important thing is to develop their own opinion by examining a problem from various angles without losing the ability to think independently, and that the opinions of others are also worth respecting and tolerating (Williams Howe, 2016). For this reason, critical thinking skill is one of the essential skills that we should teach children. Critical thinking is thinking free from all kinds of obsession, addiction, dogmatism. In this respect, he is skeptical of any authoritarian view claiming that the only truth is mine (Sever, 2008). Therefore, critical thinking shapes the child's future life and guides the choices about his life.

The critical thinking process has begun for children who have been introduced to picture books chosen for them by educators and their parents from an early age and follow the characters in this book with great curiosity and interest. These books are the first tools to introduce children to the aesthetic language of colors, lines, and words, make them feel the beauty of their mother tongue, and contribute to their thinking skills starting from early childhood. Children can discover their own potentials and reach new concepts and meanings utilizing books with superior qualities prepared by master writers (Pekdoğan, 2017; Samur, 2018; Sever, 2008). Considering that young children especially learn through modeling, it should be taken into consideration that the way of thinking and skills presented in the illustrated books written for them will also be adopted by children due to identifying with the characters in the book. For this reason, it is imperative to include critical thinking skills, one of the 21st-century skills, in books prepared for children in terms of supporting the children's thinking skills. In addition, this study aims to contribute to the literature by drawing attention to the need to support the acquisition of critical thinking skills with different means, starting from early childhood years.

This study aims to examine critical thinking skills in illustrated books for preschool education classes. As a result of the research, it was revealed which critical thinking skills were included more and which skills were less or not included in the illustrated storybooks read/told to children in preschool classrooms. Thus, it is aimed to raise awareness and provide information to educators working in the field, children's book publishers, authors and illustrators with the areas of critical thinking skills that need to be developed in children's books. Especially considering that many children meet with books at schools, it is of great importance that the books in the classrooms support thinking skills in terms of content. In this respect, this study is an original study that guides teachers and parents who choose books for children.

METHOD

The research design is based on the qualitative research method. Qualitative research is defined as a study in which qualitative data collection methods such as observation, interview and document analysis are used, and qualitative data collection processes are followed regarding the realistic and inclusive handling of events and perceptions in their natural course (Yıldırım & Şimşek, 2016). Since this study will analyze children's picture books, document analysis was used to collect data.

The study sample consisted of two hundred illustrated storybooks selected with the appropriate sampling method from the books in the book centers of preschool classes in the city center of Sinop in the fall term of 2019-2020. While determining the sample, the following criteria for the books were considered: to have illustrations, have a label or explanation indicating that they are suitable for the age of 4+, and be written by local authors. A checklist was created in the data collection process by considering whether critical thinking skills, analysis, interpretation, evaluation, explanation, inference and self-regulation skills were directly

or indirectly included. In addition, during the examinations, the sub-dimension of the thinking skills included in the story was added to the checklist, while sentences related to this inference were recorded.

In order to ensure validity and reliability in the study, the books were examined independently by two different experts, then comparisons were made in terms of consistency, and a third expert review was done for incompatible evaluations. The obtained data were analyzed by descriptive analysis method, and frequency and percentage values were used to interpret the data. Also, the analyses were supported by including direct quotations from the documents to reflect the data. Yıldırım and Şimşek (2016) emphasize that it is essential that validity include direct quotations in the analysis of data and to make explanations accordingly.

FINDINGS

In this section, the findings obtained from the research are presented. In the illustrated books evaluated within the scope of the study, the critical thinking skills classified by Facione (1990) which are making inferences, evaluation, self-regulation, explanation, analysis and interpretation were examined in terms of being included directly and indirectly and a general result was obtained. In addition, examples of each sub-dimension are tabulated with the quoted sentences.

Table 1. How critical thinking skills are included in illustrated children's books

Critical Thinking	Making inferences		Evaluation		Self-regulation		Explanation		Analysis		Interpretation	
	f	%	f	%	f	%	f	%	f	%	f	%
Directly	115	57.5	51	25.2	35	17.5	22	11	9	4.5	11	5.5
Indirectly	9	4.5	4	2	5	2.5	0	0	3	1.5	1	0.5
Total	124	62	55	27.2	40	20	22	11	12	6	12	6

Table 1 shows how critical thinking skills are included in the illustrated children's books examined. Table reveals that 62% of the books contain statements supporting the inference skill, followed by statements supporting the evaluation skill with 27.2%. Statements supporting self-regulation skills were used at a rate of 20%, expressions supporting explanation skills at 11%, and statements supporting analysis and interpretation skills at 6%. In numerical terms, the skill of "making inferences" is directly included in 115 books, indirectly in 9 books, "Evaluation" skill is directly included in 51 books, indirectly in 4 books, "Self-regulation" skill is directly included in 35 books and indirectly in 5 books. The skill of "explanation" is directly included in 22 books and indirectly in none of the books, and the skill of "interpretation" is directly included in 11 books indirectly in 1 book, and the skill of "analysis" is directly included in 9 books and indirectly in 3 books. It has been observed that all these thinking skills are mostly given directly in the books. Although some thinking skills are given somewhat indirectly, it has been determined that the "Explanation" skill is not included indirectly. In addition, it is seen that 136 of 200 picture children's books evaluated in terms of critical thinking skills sub-dimensions include only 1 thinking skill, 57 of them include 2 thinking skills, 3 of them include 3 skills, while only 1 book contains statements that support 4 thinking skills. In addition, the critical thinking skills discussed within the scope of the research were listed according to the rate of their place in the books and tabulated with examples and quoted sentences for each sub-dimension.

Table 2. Critical Thinking Skills: Making Inferences

Book Name	Age Group	Making inferences		Example Sentence
		Directly	Indirectly	
B:1: Kırmızı Domatesin Yolculuğu / Zeynep DOYMUŞ- Yeliz Sazak	4-5	X		B.1 : "Children, all these vegetables and fruits are here for your health." B.45: If collection meant collecting items of the same type, bluish crayons were the richest collection in the house.
B:45: Öğretmen Sınıfa Ne Getirdi/ Mavisel Yener				
B:146: Ayşe'nin Kedisi/ Gülçin Alpöge	4-5		X	B.146: They moved the bed frame away from the window so that there was no wind.

Table 2 shows the findings regarding inference skill which is one of the critical thinking skills. According to the findings, it was seen that 62% of the story books examined contained expressions supporting the inference skill. The rate of inference skill, which was seen to be included the most in the books, is given 57.5% directly and 4.5% indirectly. Looking at these numerical values, it can be seen that there is a significant difference between the direct and indirect inclusion of expressions that support this thinking skill. This situation also reveals that the authors of children's books adopt a didactic approach that is more prone to provide direct information with the concern of tutoring. In table 2, when the sample expression in B.1, which directly supports the child's inference skill is read to the child, the child may conclude that vegetables and fruits are beneficial for their health. In addition,

when the sample sentence is examined, it is seen that the heroes of the story question an event or situation and come to a conclusion. On the other hand, when the example statement in B.146, in which the inference skill is indirectly supported, is read with the child, the child may conclude that the bed should be placed away from the window, so that it is not affected by the wind.

Table 3. Critical Thinking Skill: Evaluation

Book Name	Age Group	Evaluation		Example Sentence
		Directly	Indirectly	
B:5: Büyük Sınav/ Necat Akdemir B:19: Sincapla Fare/ Ak Karton NP	4-5	X		B. 5: "Who is comfortable in the world? Those who worked before then relax." B.19: "Squirrel, know that without fear and pain, we cannot appreciate the value of health and love."
B:59: Eşeğin Tatlı Dili/ Adnan Özveri	4-5		X	B.59: "Speaking also has a rule, a method. Speaking should be within the bounds of courtesy and decency. "

It was determined that direct evaluation skill was included in the analyzed story books at a rate of 25.2%. In Table 3, when the sentence in B:5 that directly supports the evaluation skill is read with the child, the child can evaluate that more work is required to be successful. He may think he has to work on time to achieve his goals. The indirect evaluation skill was included at a rate of 2% in the analyzed storybooks. When the sample sentence in B.59, in which evaluation skill is indirectly included in the table, is read with the child, he/she can conclude that certain rules should be followed when speaking. He may think that he should not hurt the other person while speaking, and that he should be polite.

Table 4. Critical Thinking Skill: Self-Regulation

Book Name	Age Group	Self Regulation		Example Sentence
		Directly	Indirectly	
B:3: Pikniğe Gidiyoruz/ Özlem Aytek B:36: Cansu'nun Uykusu/ Alev Önder	4-5	X		B.3: Ege has always fulfilled the responsibility he has taken since that day. B36: She had to rest so that she could colour beautifully and play games.
B:143: Küçük Balık Ne Yaptı/ Aziz Sivasoğlu	4-5		X	B.143: What is that? There was food right in front of him. It was like saying "eat me". The little fish was hesitant for a moment. "Yes or not?" he thought.

In Table 4, how self regulation skills are included in the illustrated children's books is shown with examples. It was determined that the self-regulation skill was included directly at 17.5% and indirectly at 2.5% in the analyzed storybooks. When the sample sentence in B.3 in the table is read with the child, the child may realize that it is important to fulfill his responsibilities. He can begin to take care of his responsibilities. In addition, when the sample sentence in B.143, in which the self-regulation skill is indirectly supported, is read with the child, the child may think that he / she should control himself in some cases. Some situations may be pleasing to the child, but the result may not be liked by the child. In this case, the child can realize that he has to control his emotions and behavior and reflect on it.

Table 5. Critical Thinking Skill: Explanation

Book Name	Age Group	Explanation		Example Sentence
		Directly	Indirectly	
B:165: Boyama Gecesi/ Ahmet Uysal B:48: Tek Ayak / Özlem Aytek	4-5	X		B.165: Honestly, it is very easy to prepare dough. I used two glasses of flour, a glass of salt, a glass of water, a spoonful of olive oil and a glass of glue. B.48: Their arrival means the arrival of spring, which is the most beautiful season of the year.

Table 5 includes findings in the illustrated children's books related to the explanation skill, which is one of the critical thinking skills. According to the data obtained, it was seen that 11% of the expressions supporting direct explanation skills were included in the story books, and indirect explanation skills were not included. When the sample sentence in B.165 in Table 5 is read with

the child, the child can explain which ingredients are required to prepare the dough. On the other hand, when the sample expression in B.48 is read to the child, the child can comprehend and explain the relational connection between cause and effect.

Table 6. Critical Thinking Skill: Analysis

Book Name	Age Group	Analysis		Example Sentence
		Directly	Indirectly	
B:42: Ceren'in Mevsim Bahçesi/Oya Abacı B:81: Baba ve Tırtıl Arkadaşı/ Berna Yeşilova	4-5	X		B. 42: Ceren woke up one morning. She could not believe her eyes when she looked at the garden from her room window. The trees bloomed in one night. B.81: It did not look like what it is now. He was changing as he got older, learning to do something new every day. / "Without bees, there wouldn't be honey, " said the little caterpillar.
B:70: Selim'in Maceraları/ Necdet Neydim	4-5		X	B. 70: Well, you need to know cat language to understand this.

Table 6 shows examples in the illustrated children's books related to the skill of analysis, which is one of the critical thinking skills. It was determined that analysis skills were directly included in the analyzed storybooks at a rate of 4.5% and indirectly at a rate of 1.5%. When the sample sentence in B.42 in Table 6 is read with the child, the child can think about how the trees can bloom overnight and can make an inference by comparing and analyzing the existing information and the incident in the book. On the other hand, when the sample sentence in B.70, one of the indirect expressions that are rarely included in the books, is read with the child, it can be analyzed that the language they use is different from the language of the cats' agreement. He may think he needs to know spoken languages in order to understand others. Or it may be inferred that it is not necessary to only speak the language to get along.

Table 7. Critical Thinking Skill: Interpretation

Book Name	Age Group	Interpretation		Example Sentence
		Directly	Indirectly	
B:26: Minik Panda Hayvanat Bahçesinde/ Ayşen OY B:96: Düşler Teknesi/ Necdet Neydim	4-5	X		B.26: When the little panda was returning home, it said: "I wish my friends lived freely in their natural habitat." B.96: I do not like to swim, but I love the sea very much. / Who are they? I know, penguins! How stylish they are when they wear tuxedos.
B:170: Rengarenk Bir Gün/ Deniz ŞAHİN	4-5		X	B.170: She understood what her friends were thinking from their looks.

Table 7 shows examples in the illustrated children's books related to the skill of interpretation, which is one of the critical thinking skills. It was determined that interpretation skills were included directly at a rate of 5.5% and indirectly at a rate of 0.5% in the analyzed storybooks. When the sample sentence in B.26 in Table 7 is read with the child, the child may notice that the animals may be happier in their natural environment even if they are cared for in the zoo. When the sample sentence in B.170 is read with the child, the child may realize that the people who spend more time together can understand what they mean by their gestures or their feelings after a while.

DISCUSSION

According to the findings obtained in the study, it was observed that the critical thinking skills in the illustrated children's books examined were given more directly in the story texts. It was seen that in the reviewed books, inference, evaluation and self-regulation skills were mainly used. According to the research findings, it was observed that analysis and interpretation skills, which are high-level skills, are used less in illustrated children's books. It was observed that the explanation skill, which was partially included in the analyzed children's books, was directly included, and it was not included indirectly at all. When the findings are evaluated, it is understood that critical thinking skills are limited in the illustrated children's books selected from preschool education classes and examined. This result coincides with the research findings of Ceran (2019). Ceran, in his research on illustrated children's books to support critical thinking skills, determined that the examined books were insufficient in terms of content that supports critical thinking skills. He also states that this inadequacy is an indicator of adults' attitudes (authors, publishers, parents and teachers) interested in illustrated children's books about thinking skills. The fact that the books examined in this study were selected from preschool classes and that these books were insufficient in supporting thinking skills reveals that

teachers did not show the necessary attention to this issue. This result is in parallel with Ceran's (2019) study result. Similarly, Çotuksöken (2011), in his study in which he discussed the current situation and problems in thinking education, stated that the awareness of adults on developing thinking skills, which is very important for children, is insufficient.

On the other hand, the results show that critical thinking skills are limited in the illustrated children's books examined, and this is generally done directly. These results reveal the existence of a didactic approach in illustrated children's books, which is an attitude that restricts critical thinking. It is imperative to bring children together with qualified books early. There are too many illustrated children's books. However, it is seen that some of these books are of high popularity with a purely commercial concern or have low content that has undertaken the task of teaching a subject directly and has no concern for improving thinking skills.

For this reason, teachers who work with children and are aware of children's literature should be even more careful in choosing books than parents. This care and selectivity will act as a driving force in preparing more qualified books for children. Books prepared for early childhood must have content supporting critical thinking skills rather than teaching children mere knowledge or behavior. In order to develop children's thinking skills at an early age, it is necessary to include qualified books in our schools, classrooms and children's libraries that support critical thinking skills, question children with the story and drawings, and allow them to think. Erdem (2013) emphasizes that books written and drawn for children, especially local authors, should support thinking skills. Tozduman Yaralı (2020) examined the course of critical thinking from infancy to adolescence from a developmentally integrated perspective in his research. It has revealed that developmental changes and experience practices in human life require critical thinking. Therefore, critical thinking is not an innate ability of the individual but a skill that becomes competent by being supported throughout his development, and it accompanies every moment of his life. Quality children's books also support thinking skills with different perspectives offered to the readers from infancy to adulthood. According to Rundell (2020), our need for children's books does not change no matter how old and wise we are.

Illustrated children's books appeal to individuals of all ages. Adults should start reading illustrated children's books before children. Therefore, authors should write as rich story texts as the adult reader demands from adult literature while including more critical thinking skills. Adults' attitudes are critical to helping children become critical thinkers. Illustrated children's books should also make adults surprised, make them think, and ask them questions. Especially if the adult reading the book to the child in the early childhood years is surprised, the child will also be surprised. If the adult thinks and questions, there will be opportunities for thinking and questioning for the child. Thus, the transition will be made from reading to the child to reading. A meaningful way adults can support critical thinking skills is by asking questions while reading a book. When starting to read a book with the child, questions can be asked by talking about the cover, author, illustrator and publisher. This conversation is the first step that will develop the child's bond with the book and activate their thinking skills. It has been determined that adults' use of abstract and inferential questions while reading interactive books with children is a predictor of language development, one of the prerequisite skills of critical thinking (Murphy et al., 2014). New questions from children will answer adults' questions. Adults who interact with the child should have the courage to say I do not know about things they do not know (Pappas, 2017).

Illustrators that depict images as necessary as the story in children's books should include illustrations that will develop children's critical thinking skills. Some pages of the books may intentionally contrast the story and the drawings. Thus, it can be ensured that the child is curious about the difference between the illustration and story and uses critical thinking skills. Some studies do not consider illustrations in children's books as necessary. According to Lipman, Sharp, and Oscanyan (1980), Philosophers for Children do not prefer illustrated children's books. They do not show illustrations that accompany the story because children's attention may shift to different aspects of the illustrations and that it may make it difficult for children to focus on the topic under discussion.

CONCLUSION AND RECOMMENDATIONS

In illustrated children's books, games, rhymes, riddles, activity suggestions, and questions related to the book can be used that will guide parents and teachers and support children's critical thinking skills. Activities associated with the books offer opportunities for children to engage in joint discussions and be exposed to multiple perspectives in interaction with their peers. These interactions also help children discuss the meaning and solve problems collaboratively. Flexible, interactive and child-centered play contexts encourage critical and analytical thinking by empowering children to create, maintain and achieve shared goals through communication and collaboration (Murphy et al., 2014).

Samur Öztürk and Çiftçi (2019), in their study investigating families' competencies to choose qualified children's literature, concluded that families are not sufficient to choose qualified children's books. In addition, it is noteworthy that the number of books in the houses is low or there are no books in the houses, and they are not read (Arıcı & Tüfekçi Akcan, 2019). Although the father's role is determinant in the education and development of the child, studies show that fathers buy and read more miniature books for their children (Children's Foundation Report, 2006; Tezel Şahin & Tutkun, 2016). Therefore, starting with the families first, training should be given to teachers, school administrators, teacher candidates, people who take care of the child, children's library staff, and awareness activities should be carried out on how to select qualified illustrated books. Finally, according to the report prepared by the Children's Foundation of Turkey in 2006, most books published in Turkey are aimed at children aged 8-10. However, the years when the seeds of the love of reading are planted, and critical thinking skills start to be acquired are the early childhood years. Therefore, illustrated children's books that appeal to early childhood and support critical thinking skills should be

more prepared, developed, and enriched. Adults who choose books for young children, especially preschool teachers, giving importance to the thinking skills content of the books instead of their popularity will contribute to making more qualified publications in this regard.

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Statements of publication ethics

We hereby declare that the study has not unethical issues and that research and publication ethics have been observed carefully.

Researchers' contribution rate

The study was conducted and reported with equal collaboration of the researchers.

Ethics Committee Approval Information

In this study document analysis was used as a data collection technique. Therefore, ethics committee approval was not required.

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| Research Article / Araştırma Makalesi |

Pre-service Science Teachers' Epistemological Beliefs: A Q Method Study

Fen Bilgisi Öğretmen Adaylarının Epistemolojik İnançları: Bir Q Metot Çalışması

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Keywords

- 1.Epistemological beliefs
- 2.Q-method
- 3.Pre-service science teachers

Anahtar Kelimeler

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Abstract

The purpose of the study is to investigate pre-service science teachers' epistemological beliefs and the possible causes of these beliefs. This study is theoretically framed by using Schommer's multi-dimensional Epistemological Beliefs Model. This study is designed using the Q-method, which aims to reveal subjective structures, attitudes and perspectives from the viewpoint of the individuals. The sample of this study consists of 12 pre-service science teachers. Data are collected using the Epistemological Beliefs Inventory throughout interviewing with each participant separately, and all interviews are audio recorded for Q analysis. Within thirty-two items in the nine ranges of intervals, all the factors are determined by centroid factor analysis in PQ-method software. According to the analyses, participants have informed understandings about tentativeness of scientific knowledge, subjectivity, learning differences, and they mostly deny the existence of omniscient authority. It is also found that courses are taken in college, personal experiences and observations, and socio-cultural structure are effective in forming the epistemological beliefs of the pre-service science teachers. It is assumed that this study with Q-method might contribute valuable insights and have implications for research in science education and allow this method to be used more frequently in future studies.

Öz

Bu çalışmanın amacı, fen bilgisi öğretmen adaylarının epistemolojik inançlarını ve bu inançların olası nedenlerini incelemektir. Çalışmanın teorik çerçevesini Schommer'in çok boyutlu epistemolojik inanç modeli oluşturmaktadır. Bu çalışma öznel yapıları, tutumları ve bakış açılarını bireylerin bakış açısından ortaya çıkarmayı amaçlayan Q yöntemi kullanılarak tasarlanmıştır. Çalışmanın örneklemini 12 fen bilgisi öğretmen adayı oluşturmaktadır. Veriler, Epistemolojik İnanç Envanteri kullanılarak her katılımcı ile görüşmeler yapılarak toplanmıştır ve tüm görüşmeler Q analizi için kaydedilmiştir. Dokuz yığın aralığındaki otuz iki maddede tüm faktörler PQ-metodu yazılımında centroid faktör analizi ile belirlenmiştir. Bulgulara göre, katılımcıların bilimsel bilginin değişebilirliği, öznellik ve öğrenme farklılıkları ile ilgili gelişmiş görüşlere sahip oldukları ve her şeyi bilen bir otoritenin varlığını reddettikleri sonucu bulunmuştur. Öğretmen adaylarının epistemolojik inançlarının oluşumunda temel olarak üniversitede aldıkları derslerin, kişisel deneyim ve gözlemlerinin ve içinde buldukları sosyokültürel yapının etkili olduğu görülmüştür. Q-metodu kullanılarak yürütülen bu çalışmanın fen bilgisi eğitimi araştırma yaklaşımlarına önemli bir değer katabileceği ve bu yöntemin gelecekteki çalışmalarda daha sık kullanılmasına olanak sağlayacağı öngörülmektedir.

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INTRODUCTION

Epistemology, originally derived from the Greek words *epistēmē* (knowledge) and *logos* (science), is one of the subsections of philosophy and examines the structure and validity of human knowledge (Erçel, 2014). According to the widely accepted definition, epistemological beliefs are the beliefs that people have about knowledge and knowing/learning (Hofer & Pintrich, 1997).

Although epistemology and epistemological beliefs mainly were subjects of research in the fields of philosophy and developmental psychology in the past, epistemological beliefs and the variables related to these beliefs have also attracted the attention of educational researchers (Kessels, 2013). Findings of research revealed that epistemological beliefs are related to many variables such as the ability to understand and interpret texts (Kardash & Scholes, 1996), problem-solving skills related to complex issues (Schraw, Dunkle, & Bendixen, 1995), attitudes towards studying (Önen, 2011), motivation towards learning (Paulsen & Feldman, 1999), achievement goals (Braten & Stromso, 2004, 2006), self-efficacy perceptions (Köse & Dinç, 2012) and school achievement (Trautwein & Lüdtke, 2006; Schommer-Aikins & Easter, 2006; Yılmaz- Tüzün & Topçu, 2013).

In this respect, the development of epistemological beliefs has been directly or indirectly given a place among the goals of education programs. For example, in the current science curriculum of Turkey (Ministry of National Education [MoNE], 2018), helping students understand the processes related to the development of scientific knowledge is listed among the science education objectives of the country. Similarly, it is seen that epistemological beliefs are directly included in the content of the "Nature of Science" course, which is offered to pre-service teachers in the Science Teacher Education undergraduate program (Higher Education Council [YÖK], 2018). Epistemology is a term that is used to define and explain the concept of "Nature of Science" (NOS) (Lederman, 1992). Therefore, emphasis given to teaching NOS in many science curricula indirectly points to the importance of epistemological beliefs for the learning and teaching of science. Statements in American National Science Education Standards (NRC, 2000) and the Next Generation Science Standards (the NGSS Lead States, 2013) exemplify this situation.

Teachers have crucial roles in achieving the aims of curricula. Teachers first must have the necessary qualifications to help their students reach the targeted educational goals. The importance of developing in-service and pre-service teachers' epistemological beliefs can be understood better when the influences of epistemological beliefs on the time, effort and energy spent to understand any subject and perform an activity (Schommer, 1990) are considered. Similarly, teachers' abilities to successfully implement teaching strategies that are most appropriate for their students are thought to be linked to their awareness about their own epistemological beliefs as well as epistemological beliefs of their students (Chai, Khine, & Teo, 2006; Schommer-Aikins, 2004; Yılmaz-Tüzün & Topçu, 2013). This situation reveals the necessity of examining the epistemological beliefs of in-service and pre-service teachers. There are two different approaches utilized in the study of epistemological beliefs. One of these approaches is the one-dimensional approach, which was more frequently used in the early years of epistemological belief research (e.g., Perry, 1981; Baxter Magolda, 1987, King & Kitchener, 1994). According to this approach, people's epistemological beliefs develop in successive stages from simple to more advanced. The other approach is the multidimensional approach. This approach was developed by Schommer (1990) and adopted by other researchers such as Hofer and Pintrich (1997) and Conley, Pintrich, Vekiri, and Harrison (2004). According to the multidimensional approach, people's beliefs about knowledge and knowing/learning have more than one dimension, and these epistemological belief dimensions (e.g., beliefs about the structure of knowledge, learning ability, speed of learning, etc.) are more or less independent from each other (Schommer, 1990, 1994). In the extant literature, many researchers (e.g., Hofer, 2002; Zeidler, Herman, Ruzek, Linder, & Lin, 2013) argued that it would be more accurate to consider epistemological beliefs in a multidimensional way and that studies based on this assumption would yield better results and inferences for the science education community.

In her epistemological beliefs model, Schommer (1990) proposes five dimensions of epistemological beliefs: "the structure, certainty, and source of knowledge, and the control and speed of knowledge acquisition" (p.498). Two of these dimensions are epistemological beliefs about the structure of knowledge (knowledge is simple [simple knowledge], knowledge is specific [certain knowledge]). Two other epistemological belief dimensions' address beliefs about how learning occurs (learning ability is innate [innate ability], learning occurs quickly [quick learning]). Another dimension (the source of knowledge is the omniscient authority [omniscient authority]) examines people's beliefs about the source of knowledge.

Examination of the extant literature on epistemological beliefs reveals that the studies carried out with pre-service teachers mainly utilized quantitative research designs. These studies generally measured epistemological beliefs of pre-service teachers with Likert type scales to reveal factor structures of their epistemological beliefs through factor analyses and/or examine relationships of the obtained epistemological belief dimensions to other variables such as grade level, gender, academic achievement, pedagogical content knowledge (e.g., Efiltili & Coklar, 2016; Jena, 2013; Yalcin & Yalcin, 2017). However, to the best of the researchers' knowledge, no study directly straightforwardly investigated the factors that underlie pre-service teachers' epistemological beliefs.

In their study, Chai, Khine, and Teo (2006) found that pre-service teachers in Singapore emphasized the necessity of effort for learning to take place and tended to accept evaluations of experts as correct. The researchers interpreted these findings as implications for the influence of culture on epistemological beliefs. Yılmaz-Tüzün and Topçu (2013) examined the relationships of gender and science achievement to the epistemological beliefs of Turkish pre-service science teachers. Both variables were found to be related to epistemological beliefs. Inconsistency between the findings of Yılmaz-Tüzün and Topçu's (2013) study and some

other studies conducted in western cultures, which did not result in any relationship between gender and epistemological beliefs (e.g., King and Kitchener, 1994; Kuhn, 1991), was attributed to the differences in eastern and western cultures.

Research studies conducted in Turkey generally reveal that pre-service teachers exhibit more sophisticated beliefs in the Quick Learning epistemological belief dimension (e.g., Saylan Kirmizigul & Bektas, 2019; Topçu, 2011). Similarly, emphasis on the necessity of hard work and effort for learning to take place (Unlu & Dokme, 2017) and propensity for perceiving authority figures such as experts as the source of knowledge (Efilti & Çoklar, 2016) are among the typical findings of research that examined epistemological beliefs of Turkish pre-service (science) teachers. On the other hand, concerning the epistemological beliefs about the Certainty of Knowledge, while findings of some of the research studies (e.g., Topcu, 2011) indicate sophistication of pre-service teachers' beliefs in this dimension, some others reveal the existence of pre-service teachers who support the view that there is only one truth (Yenice, 2015). Findings of studies are also inconclusive regarding pre-service teachers' beliefs in Simple Knowledge (Ozturk & Yilmaz-Tuzun, 2017; Yilmaz-Tuzun & Topcu, 2008, 2013) and Innate Ability (Ozturk & Yilmaz-Tuzun, 2017; Saylan Kirmizigul & Bektas, 2019; Yilmaz-Tuzun & Topcu, 2008) epistemological belief dimensions.

This study differs from similar studies in the literature regarding the research method used. The Q method, which belongs to a mixed research design, was used in the study (Stephenson, 1955). The essential feature of the Q method is that the participants sort the judgment statements presented to them within themselves. In other words, instead of stating the extent to which they agree with each statement, as in the classical Likert-type scales, the participants rank the judgment statements from the statements that they most agree with to the statements that they agree with the least. During the sorting process, participants are asked to think aloud and explain their sorting. With this method, additional findings such as what is more important and less necessary for the participants and the groups the participants are gathered are obtained. In this respect, the Q method focuses on the different perspectives of the participants and the underlying reasons for these different perspectives. Therefore, this study made it possible to obtain more in-depth findings of the sophistication of pre-service science teachers' epistemological beliefs and interpret the obtained findings based on their statements. The research questions that guided the study are:

1. What are the epistemological beliefs of pre-service science teachers?
2. What factors are influential on pre-service science teachers' epistemological beliefs?

METHOD

This study was conducted by using the Q-method (Stephenson, 1955). In studies carried out by driving the Q-method, data are collected and analyzed quantitatively, but the results are mostly interpreted by supporting with qualitative data (Ramlo & Newman, 2011). The Q method was defined by William Stephenson as the measurement of subjectivity (Stephenson, 1955). The Q-method allows participants to reveal their feelings, thoughts and beliefs about a topic by sorting the statements. The selected statements are called Q sentences. Despite its mathematical background, the purpose of the Q-method is to present participants' subjective structures, attitudes and perspectives from their own line of vision (Brown, 1996).

Participants

The sample of this study consists of 12 (6 female; 6 male) pre-service science teachers (PSTs) (average age: 21) on their 3rd and 4th year at a state university in the Eastern Black Sea region of Turkey. The purpose of including the 3rd and 4th year pre-service teachers in this study was that these pre-service science teachers have taken the basic science education courses (e.g., physics, chemistry, biology, introduction to educational sciences, educational psychology, etc.). The participants of this study also took the "Inquiry-Based Science Teaching" and "Nature of Science" courses given by the authors of the study, thus gaining familiarity with the concept of epistemological belief. As a result, it was supposed that the 3rd grade (3 female, 3 male) and 4th grade (3 female, 3 male) pre-service teachers included in the study could better express themselves about the concepts such as science, knowledge, and ways of obtaining knowledge. While showing the findings of the study, each pre-service teacher was coded to indicate their grade level and gender (e.g. TF for a female participant in the 3rd year; FM for a male participant in the 4th year). In order to ensure maximum diversity (Creswell, 2007), it was ensured that the pre-service teachers who voluntarily participated in the study had a homogeneous distribution in terms of gender and grade level. A pre-interview for sampling purposes or a measurement tool for readiness was not conducted. Since the aim of a Q study is to identify typical representations of different viewpoints and to reveal how different viewpoints are represented, rather than to find the proportion of individuals with certain viewpoints (Akhtar-Danesh, Batunann, & Cordingley, 2008; Simons, 2013), the small number of participants in such studies does not pose any disadvantage (McKeown & Thomas, 1998; Valenta & Wigger, 1997).

Data Collection Tool

The Epistemological Beliefs Inventory (EBI) developed by Bendixen, Schraw and Dunkle (1998) was used as the data collection tool in the study. The Epistemological Beliefs Inventory is theoretically based on Schommer's (1990, 1994) epistemological beliefs model. In this context, the 32 items that make up the inventory (7 of them are reverse items) consist of statements containing judgments that will reveal the respondents' beliefs in five epistemological belief dimensions (*simple knowledge, certain knowledge, innate ability, quick learning, and omniscient authority*). Studies show that the inventory allows to obtain reliable and valid data (Bendixen et al., 1998; Schraw et al., 1995). The Turkish version of the inventory (Tuncay-Yüksel, 2016; Tuncay-Yüksel, Yılmaz-Tüzün, & Zeidler, 2015) gives the desired results in terms of its psychometric properties. According to these studies, it was

determined that the data obtained from the inventory were gathered under five factors in accordance with Schommer's (1990, 1994) Epistemological Beliefs Model, and the reliability values of these factors (mean inter-item correlation: .20 to .28) were in the desired range (Pallant, 2007). The Epistemological Beliefs Inventory was presented to the participants through open-ended interviews. In the interviews, in accordance with the nature of the Q method, it was aimed to collect data about how the participants sorted the statements in the scale, the reasons behind these sorting, and how they made these sorting.

Data Collection Process

In this study, each pre-service teacher was asked to sort the Q statements (32 epistemological belief statements in the Epistemological Beliefs Inventory (Bendixen et al., 1998)) as shown in Figure 1, from most agree (+4) to least agree (-4). The Q set consisting of 32 statements in the Epistemological Beliefs Inventory was given to the pre-service science teachers as randomly numbered cards. The pre-service science teachers first divided the random cards into three groups as "I agree", "I do not agree" and "I am undecided", and then they sorted the statements in each group according to their most agreeing to least agreeing. As a result of these sorting, a distribution as in Figure 1 was obtained. During the ranking process, participants were reminded that they were free to change their sorting at every stage of the process. In this way, pre-service teachers made changes in their sorting along with their justifications. While the pre-service teachers were sorting the statements, the researchers asked the participants to explain the statement they put in each range and tried to reveal the reason(s) underlying this sorting by asking why the statement was in that order. All interviews were audio-recorded for further analysis.

-4	-3	-2	-1	0	+1	+2	+3	+4
25	29	21	17	26	4	22	2	6
	28	19	10	13	3	30	20	
	23	16	8	14	11	32	24	
		27	9	7	12	18		
			31	15	5			
				1				

Figure 1. Example of classification scheme for a Q sorting technique with 32 expressions

Data Analysis

Q sorting data for all participants were entered into PQMethod (Schmolck, 2014), a program designed explicitly for Q analysis. After the obtained Q types were sent to factor analysis, the factors were obtained using the centroid factor analysis (CFA) (Brown, 1980; Schmolck, 2008; Stephenson, 1955) method, which is a factor extraction method is frequently used in the Q method studies. Principal component analysis (PCA) was performed for the rankings in this study, but no statistically significant aggregation was achieved. In Q studies, PCA extracts unrelated linear combinations of observed Q-varieties. Generally, this method analyzes all variance in variables (Q-kind). The use of centroid factor analysis in the Q method and its full explanation were made by Brown (1980). CFA is an approximation of principal axis factor analysis (PAF) in other statistical programs. However, the technical difference between them is that in PAF, the sum of squares of "loads" is maximized, whereas in CFA, the average of "loads" is maximized. Geometrically, while PAF provides a set of orthogonal factors, while factors extracted using CFA do not need to be orthogonal (Akhtar-Danesh, 2017). CFA is the only method that extracts non-orthogonal factors.

Unlike PCA and PAF, CFA is not included in major statistical programs (such as SAS, SPSS, Stata, and R), while it is available to Q method users through the PQMethod program. For this reason, it was used as factor analysis in this study. The significance of the factors was revealed by using graphical rotation and Varimax rotation analysis.

As a result of the analyses, tables were created for each factor. Among these tables is a representative Q-rank for each factor. In these tables, the Q ranking values (columns indicated by Q) indicate to what extent the pre-service teachers in the relevant factor agree with the corresponding item within the range of -4 (strongly disagree) to +4 (strongly agree); Z-score values (columns indicated by Z) represent standardized score lines of the respective Q values. In addition, the proportion of expressions representing consensus and disagreement among the factors was also reported in the outputs of the Q analyzes (values expressed by the explanation variance (%) in the Tables) (Brown, 1980; McKeown & Thomas, 1988). Each factor obtained in the Q method represents a different perspective within the group. While every Q ranking is subjective, the factors identified in the Q are based on concrete behavior and are typically reliable and repeatable (Brown, 1980). The audio-recorded interview data was used to help interpret the factors obtained from the Q analysis. All interview transcribes were coded by making content analysis in the Hyper-research program. The researchers named the factors using the dimensions in Schommer's (1990, 1994) Epistemological Beliefs Model, the Q-rank values corresponding to the minimum and maximum factor loads in the outputs, the Z-score values, the specific items, and the statements of the participants in the interviews. The validity and reliability of the research in the Q method, which is a mixed-method, is considered different from the quantitative research methods. There are no external criteria to evaluate an individual's point of view (Friedman & Wyatt, 1997). The rankings made by each individual are accepted as a valid expression of their views (Brown, 1996).

FINDINGS

According to the results of the Q analysis, the factors determined as a result of the centroid factor analysis were rotated in a graphical rotation and only one factor, namely the common factor (Tentativeness of knowledge: Relativity of truth) was determined. As seen in Table 1, 11 out of 12 pre-service teachers (except the TF_9 coded pre-service teacher) were loaded in this factor in a meaningful way. The common factor explained 47% of the common epistemological belief views of the pre-service science teachers (Table 1).

Table 1. Factor matrix with an X indicating a defining sort

Participants	Common Factor
FM_1	0.6153 X
FF_2	0.8012 X
TF_3	0.5008 X
FF_4	0.8819 X
FF_5	0.8961 X
TM_6	0.5997 X
FM_7	0.6167 X
FM_8	0.7935 X
TF_9	0.4479
TM_10	0.5574 X
TF_11	0.6235 X
TM_12	0.7120 X
(%) Expl. Var.	47

Mean: .00; St. Dev: 2.032

* F: 4th grade pre-service teacher; T: 3rd grade pre-service teacher; M: Male; F: Female (e.g.; FM_1: Coded 1, 4th grade male pre-service teacher)

When the factors obtained as a result of the centroid factor analysis were rotated in Varimax rotation, a model was formed in which the participants were distributed into 3 factors. The three factors that emerged as a result of the Varimax rotation (these subgroups refer to the coexistence of the participants in terms of similar views) reflect the epistemological belief statements of the pre-service teachers in which they accumulate statistically significant. These factors explain 22%, 20% and 19% of all pre-service teachers' common epistemological belief views, respectively (Table 2). As a result of this rotation, 3 pre-service teachers (FF_2, TM_6, TF_11) loaded in factor 1 (Learning ability: Relationship between success and intelligence); 5 pre-service teachers (FM_1, TF_3, FM_5, TM_10, and TM_12) loaded in factor 2 (Source of knowledge: Suspicion against authority); and 4 pre-service teachers (FF_4, FM_7, FM_8, and TF_9) were included in factor 3 (Simplicity of knowledge: Desire and effort in learning) (Table 2).

Table 2. Factor matrix with an X indicating a defining sort

Participants	Factors		
	1	2	3
FM_1	0.3834	0.5596 X	0.1131
FF_2	0.8680 X	0.2732	0.3065
TF_3	0.1690	0.4541 X	0.2298
FF_4	0.5307	0.3503	0.6516 X
FF_5	0.4595	0.6517 X	0.4079
TM_6	0.6478 X	0.2810	0.1340
FM_7	-0.0974	0.5610	0.6958 X
FM_8	0.4906	0.3055	0.5828 X
TF_9	0.2142	0.0758	0.5256 X
TM_10	0.2177	0.6086 X	0.1355
TF_11	0.6923 X	0.2734	0.3211
TM_12	0.2445	0.6432 X	0.4123
(%) Expl. Var.	22	20	19

Mean: .00 ; St. Dev: 2.032

Common Factor: Tentativeness of Knowledge: Relativity of Truth

This factor, which emerged as a result of the graphical rotation, includes the most and least accepted epistemological belief statements on which 11 out of 12 pre-service science teachers (Table 3).

Table 3. The Common Factor: Four most and least agreed to statements by all pre-service teachers

EBI items	Statements	Grid position	Z score
2	Truth means different things to different people	+4	1.984
6	Absolute moral truth does not exist	+3	1.725
24	The more you know about a topic, the more there is to know	+3	1.646
20	Children should be allowed to question their parents' authority	+3	1.50
...
28	People who question authority are trouble makers	-3	-1.264
21	If you haven't understood a chapter the first time through, going back over it won't help	-3	-1.309
23	The moral rules I live by apply to everyone	-3	-1.629
25	What is true today will be true tomorrow	-4	-1.978

As a result of the analysis, almost all of the pre-service teachers argued that there is no single truth both scientifically and morally. They thought that a knowledge that is correct today may change in the future and that moral rules should be different for everyone. While the pre-service teachers expressed their views on the tentativeness of knowledge, they especially emphasized the effects of the *"Inquiry-Based Science Teaching"* and *"Nature of Science"* courses they took on their epistemological beliefs.

"Social or scientific things that are considered true today may change in the future. For example, while it was accepted that girls should not go to school in the past, today, on the contrary, women have become the leaders of society. Or, scientifically, while it was believed that the atom was a sphere, it was later said to be surrounded by electrons, with neutrons and protons inside. Maybe in the future this will change and they will bring another explanation. In short, as we often repeat in nature of science course, there is no single truth and what is considered true today may change in the future." (FF_5)

"The effect of social and cultural life on moral rules is quite high. Thus, what's right for me may not be right for someone else. In fact, everyone creates their own rules." (FM_1)

"As we said in our lesson, scientific knowledge, whether it is theories or laws, may change in the future with the effect of the development of technology in the light of new data and evidence. For example, the laws and theories of classical physics, especially known after Einstein's research, changed and formed the basis of modern physics." (FF_2)

Pre-service teachers also stated that learning never stops and that there are new things to be learned and discovered throughout life. In addition, they thought that a person's rapid or slow learning of something may depend on many factors. Pre-service teachers argued that people have different backgrounds and learning abilities, and that things that cannot be learned at first can be learned later. They stated that these views were formed by their personal experiences and observations.

"Learning is a lifelong process. No one can say that "I know everything", on the contrary, the more they learn about a subject, the more they realize how much more there is to learn. So, the more you know about a subject, the more you realize how much you don't actually know. At least that's how I've experienced it in my own life." (FM_8)

"The ability to learn is different in every living thing. There are many factors that affect this. Some people understand immediately when they first read it, while others need to read more than once to learn. For example, I have two younger brothers and they are completely different from each other when they learn something. In fact, their perception levels are different. While some people are easy to learn visually, others learn better during physical activities. Therefore, I think that generalization should not be made on this subject." (TF_3)

In addition, almost all of the pre-service teachers argued that both adults and children should criticize and live more freely instead of accepting the authority established on them. They thought that authority often harms people and restricts children's critical thinking and creativity in particular.

"Having authority over someone and making him do whatever you want causes that person to lose self-confidence and not be able to think creatively and critically. I don't do anything that someone who considers himself to be an authority says. I inquiry first and only then do it if I'm convinced it's true." (FM_7)

"If a parent who has authority over their child wants them to do whatever they say without question, it creates a generation that is oppressive, distorted, unquestioning and uncritical. This will negatively affect both their school, work and social life in the future and prevent them from being successful." (TF_3)

Factor 1: Learning Ability: Relationship between success and intelligence

In this factor, in which the FF_2, TM_6 and TF_11 coded pre-service teachers are loaded in a statistically significant way, the statements most and least agreed with by the pre-service teachers are given in Table 4. Just like in the common factor, the pre-service teachers in this factor stated that there are no definite moral truths, that moral rules can vary from one society to another society, from one religion to another, from one family to another family and even from one person to another. They argued that it should be respected.

Table 4. For factor 1, four most and least agreed to statements by pre-service teachers

EBI items	Statements	Grid Position	Z score
6	Absolute moral truth does not exist	+4	1.843
2	Truth means different things to different people	+3	1.697
32	Some people are born with special gifts and talents	+3	1.571
4	People should always obey the law	+3	1.445
...
29	Working on a problem with no quick solution is a waste of time	-3	-1.445
25	What is true today will be true tomorrow	-3	-1.571
23	The moral rules I live by apply to everyone	-3	-1.591
15	How well you do in school depends on how smart you are	-4	-1.697

"I don't think there is a single moral right. In other words, what is considered true may differ from society to society, and even from family to family. For example, some societies think that it is immoral for girls to wear short skirts due to their religion, but I think that morality is not about people's clothing. If the societies respect differences, they can develop more." (FF_2)

The pre-service teachers who loaded in this factor stated that although some people are born with special abilities and skills, they did not agree that students' success at school is directly related to how smart they are.

"We need to separate the concept of success from the concept of intelligence. There are many factors that affect success. Being smart is often equated with success in exams and school in our society. However, although some people are very intelligent, they who have anxiety in exams, whose psychology is broken because they cannot find enough peace in their family, or who fail because they do not study a lot are seen as stupid. Although some people are born with special abilities, success is something that can change with environmental factors." (TM_6)

"Many people who I believe to be smart, who can think quickly and make decisions, fail in school. I think that in order to be successful in school, it is necessary to be hardworking rather than smart." (TF_11)

Table 5 shows the views that statistically distinguish pre-service teachers in factor 1 from pre-service teachers in other factors according to their epistemological beliefs. Accordingly, it was observed that the pre-service teachers did not agree with the view, which especially pre-service teachers which loaded in other factors were undecided, that how successful they were at school was related to how smart they were. Also, it was seen that the pre-service agreed with the view, which pre-service teachers who loaded in other factors were mainly undecided, that all people should always obey the law.

Table 5. Distinguishing Statements for Factor 1

EBI Items	Statements	Factor 1		Factor 2		Factor 3	
		Q	Z	Q	Z	Q	Z
4	People should always obey the law	3	1.45*	0	-0.21	0	-0.19
20	Children should be allowed to question their parents' authority.	2	0.80	4	1.85	3	1.65
15	How well you do in school depends on how smart you are	-4	-1.70*	0	-0.01	-1	-0.31

(P < .05 ; Asterisk (*) Indicates Significance at P < .01)

Both the Factor Q-Sort Value (Q) and the Z-Score (Z) are Shown

"Laws are the things that help keep society alive. Laws are made to keep people away from committing crimes, infringing on other people's rights or disturbing the peace of society and to bring society to modern levels. So everything would be better if people obeyed the law." (FF_2)

Factor 2: Source of Knowledge: Suspicion Against Authority

In this factor, where FM_1, TF_3, FF_5, TM_10, and TM_12 coded pre-service teachers are included in a statistically significant way, the most and least accepted expressions by the pre-service teachers are given in Table 6. As a result of the analyzes, the pre-service teachers who loaded in this factor stated that people should not bow unquestionably to any political, cultural, religious or family-established authority. Also, they argued that people should stand upright and question the pressure of the authority.

“Whatever someone in authority tells me, I do the opposite. Because I am a free-spirited person who wants to do what I believe and want. When someone forces me to believe or want me to do something, it makes it disliked and I don't do it. I think everyone should stand up for their own ideas and life. Even if it's my dad I'll ask why, if it makes sense I'll do it.” (TM_10)

“People should question everything and accept nothing blindly without researching it. I think we live in a very oppressive society. In particular, the pressure and authority, who the principal in the school, the teacher in the classroom, or the words of the parents at home, that society puts on people, should not be accepted without question. Of course, respectfully...” (FF_5)

Table 6. For factor 2, four most and least agreed to statements by pre-service teachers

EBI items	Statements	Grid Position	Z score
20	Children should be allowed to question their parents' authority.	+4	1.852
2	Truth means different things to different people	+3	1.571
6	Absolute moral truth does not exist	+3	1.459
24	The more you know about a topic, the more there is to know	+3	1.456
...
19	If two people are arguing about something, at least one of them must be wrong	-3	-1.236
27	When someone in authority tells me what to do, I usually do it	-3	-1.675
25	What is true today will be true tomorrow	-3	-1.747
28	People who question authority are troublemakers	-4	-1.950

The pre-service teachers loaded in this factor thought that there are no definite moral truths, just like in the common factor, that the truths known today may change in the future, and that the concepts defined as truth may mean different things for different people.

“In fact, before I took the nature of science and inquiry-based science teaching course, I believed there was only one answer to everything. But I don't think there is such a thing as “true” anymore. “True” is a relative concept, it varies from society to society, culture to culture, and even person to person. Even scientific theories and laws can change over time in the light of new data, although they are based on very strong evidence. That's why I believe what is true today may change in the future.” (FF_5)

Table 7 shows the statements that statistically distinguish pre-service teachers in factor 2 from pre-service teachers in other factors according to their epistemological beliefs. Accordingly, the pre-service teachers in this factor agreed with the view that intelligent people are naturally intelligent, which is a view generally rejected by the pre-service teachers in the other factors. They stated that they made these views by observing the people living around them. Also, on the contrary to the view that the pre-service teachers loaded in the other factor mostly disagree with the view that too many theories make things complicated, the pre-service teachers in this factor argued that more theories are needed to understand the universe because the theories are the explanations of observable and unobservable events.

Table 7. Distinguishing Statements for Factor 2

EBI items	Statements	Factor 1		Factor 2		Factor 3	
		Q	Z	Q	Z	Q	Z
26	Smart people are born that way	-2	-0.65	1	0.63*	-2	-0.80
10	Too many theories just complicate things	1	0.52	-2	-1.05*	1	0.48
27	When someone in authority tells me what to do, I usually do it	0	-0.13	-3	-1.68*	-2	-0.71
28	People who question authority are troublemakers	-1	-0.52	-4	-1.95	-2	-1.24

(P < .05 ; Asterisk (*) Indicates Significance at P < .01)

Both the Factor Q-Sort Value (Q) and the Z-Score (Z) are Shown

"I believe intelligence is an innate trait. For example, I see around me that children whose parents are smart are also smart." (FM_1)

"Theories are explanations of observable or unobservable phenomena or laws. In order to understand the universe and the natural world around us, we need explanations that scientists put forward with long efforts and strong evidence. These explanations make things clearer rather than complicating them." (TM_12)

Factor 3: Simplicity of Knowledge: Desire and Effort in Learning

In this factor, in which the FF_4, FM_7, FF_8, and TF_9 coded pre-service teachers are loaded in a statistically significant way, the statements the most and least agreed with by the pre-service teachers are given in Table 8. As a result of the analyses, the pre-service teachers loaded in this factor emphasized that learning continues throughout life. Also, they stated that when faced with a situation such as not being able to learn or not learning quickly, people should not lose hope, this is a normal situation, therefore, it is necessary to effort to learn.

Table 8. For factor 3, four most and least agreed to statements by pre-service teachers

EBI items	Statements	Grid Position	Z score
24	The more you know about a topic, the more there is to know	+4	2.014
2	Truth means different things to different people	+3	1.898
20	Children should be allowed to question their parents' authority.	+3	1.647
14	I like teachers who present several competing theories and let their students decide which is best	+3	1.508
...
16	If you don't learn something quickly, you won't ever learn it	-3	-1.508
21	If you haven't understood a chapter the first time through, going back over it won't help	-3	-1.615
25	What is true today will be true tomorrow	-3	-1.623
23	The moral rules I live by apply to everyone	-4	-1.759

"Learning new things is like an endless ocean. The more you learn new things, the more you want to learn and it never ends." (FM_7)

"Learning is not something that happens immediately. The important thing is to ensure permanent learning. If we don't learn something right away when we read it, I think we should try and try our best to learn it. I think anyone can learn anything if they try enough." (FM_8)

"In a book I have read, it said that human beings only know 1% of the universe. As scientists find something new, it actually opens the door to other unknown things. There is much more to learn." (FF_9)

The pre-service teachers loaded in this factor underlined that, just like other pre-service teachers loaded in other factors, there is no single truth and that the scientific knowledge that we accept as correct today may change in the future.

"Scientific theories and laws that are known to be true today may change in the future. For example, it was believed that the earth was flat for many years, then it was said that the earth was round and as a result of the observations, it was stated that it was in the form of an ellipse. Just like the studies on the shape of the atom." (FM_8)

Table 9 shows the statements that statistically distinguish pre-service teachers in factor 3 from the pre-service teachers in other factors according to their epistemological beliefs. Accordingly, on the contrary to the pre-service teachers who loaded in the other factors, the pre-service teachers who loaded in this factor stated that the really smart students should study at least as much as the other students, and they argued that studying is more important than intelligence. Another distinctive view is that the pre-service teachers who loaded in this factor were undecided about the view that parents should teach their children everything about life, which is the view the other pre-service teachers usually agreed with. Accordingly, the pre-service teachers stated that a person can learn many things from his/her family, as well as from books, teachers, friends, television or through her own experiences.

"To be successful in school, it is necessary to study regularly rather than being smart. If a student who is very smart does not study, I think it is impossible for him/her to be successful in school." (FM_8)

"Although family education is very important, children actually learn many things from their friends, teachers, television, internet, or books. I do not agree with the view that parents should teach children everything." (FF_9)

Table 9. Distinguishing Statements for Factor 3

EBI items	Statements	Factor 1		Factor 2		Factor 3	
		Q	Z	Q	Z	Q	Z
6	Absolute moral truth does not exist	4	1.84	3	1.46	1	0.44*
3	Students who learn things quickly are the most successful	-2	-1.17	-1	-0.28	1	0.40
1	It bothers me when instructors don't tell students the answers to complicated problems	-2	-0.92	-1	-0.68	0	0.18
7	Parents should teach their children all there is to know about life	2	1.17	2	0.78	0	-0.17*
8	Really smart students don't have to work as hard to do well in school	1	0.65	1	0.67	-2	-0.91*
16	If you don't learn something quickly, you won't ever learn it	-2	-0.65	-1	-0.55	-3	-1.51

(P < .05 ; Asterisk (*) Indicates Significance at P < .01)

Both the Factor Q-Sort Value (Q) and the Z-Score (Z) are Shown

DISCUSSION, CONCLUSION AND RECOMMENDATIONS

In the present study, pre-service science teachers' epistemological beliefs and the factors underlying those views were examined using the Q-method. The results of the Q analysis and the findings obtained through the interviews showed that the pre-service teachers who participated in the study generally had advanced epistemological beliefs, as can be understood from their Z scores. In particular, when the common factors obtained through the graphical rotation were examined, it was determined that most of the pre-service teachers agreed on the tentativeness of knowledge. The PSTs stated that they strongly agreed with the statements reflecting the relativity of truth. In parallel, the participants showed a common stance that they disagreed with the statements referring to the certainty of knowledge dimension in Schommer's (1990, 1994) Epistemological Beliefs Model. Results showed that pre-service teachers gave this epistemological belief dimension the most importance. This finding supports the findings of some of the previous research studies conducted in Turkey (e.g., Efiltili & Çoklar, 2016; Topçu, 2011). When the statements of the pre-service teachers that were expressed during the interviews are examined in detail, it might be said that they attributed the tentativeness of knowledge and truth to individual, social and cultural differences and the dynamics brought by time. It is striking that the pre-service teachers often referred to the "Nature of Science" course they took in their undergraduate program to support their views.

Another striking finding of the study was the negative attitude of the participants towards authority. Almost all pre-service science teachers stated that they rejected all kinds of authority (political, cultural, religious, family, etc.) and saw authority figures as a threat to their freedom. At first glance, it can be thought that this opposition of the pre-service teachers to authority and authority figures is a natural feature of the age group they belong to (Sadullah, 2008). However, the findings obtained from the interviews show that these attitudes of pre-service teachers are also related to their epistemological beliefs. That is, as can be seen in the factor obtained through the varimax rotation of the collected data (Source of Knowledge: Suspicion Against Authority), the pre-service teachers stated that they denied the existence of an omniscient authority as the source of knowledge and that any knowledge should be questioned regardless of its source. In addition, the participants tried to support the validity of their arguments by drawing attention to the necessity of the dissemination of questioning for achieving healthy individuals and societies.

The pre-service teachers who drew attention to the importance of questioning to acquire knowledge also emphasized the importance of desire and effort in the learning process. Their responses reflected more sophisticated beliefs in the Simple Knowledge epistemological belief dimension proposed in Schommer's (1990, 1994) Epistemological Beliefs Model. More specifically, the participants stated that knowledge is not a collection of facts independent of each other. On the contrary, each piece of knowledge is related to each other, and the phenomenon called knowledge exhibits a complex structure. Therefore, every piece of knowledge opens the door to another unknown. Notably, the pre-service teachers who were factorized under the "Simplicity of knowledge: Desire and effort in learning" factor emphasized the importance of lifelong learning. These pre-service teachers stated that there is no single source of knowledge and that knowledge is not only transmitted from a source such as family but also obtained through individuals' own lives (e.g., reading books, friendships, individual experiences, etc.). It is also possible to see the emphasis put on the importance of desire and effort in the learning process in the epistemological beliefs of the pre-service teachers about learning ability. Remarkably, the pre-service teachers included in the "Learning Ability: Relationship between success and intelligence" factor offered a consensus that success cannot be equated with intelligence. Although these pre-service teachers agreed that some people are born with unique abilities and skills, they stated that success could not be seen as a direct result of intelligence. Instead, the participants emphasized that many factors affect success, including success in school/university. According to these pre-service teachers, learning ability is a phenomenon that can be developed.

Similarly, the teacher candidates stated that everyone could learn anything if enough effort was required. Considering that the study participants were science teacher candidates in their junior and senior years, the findings seem to support previous studies

(e.g., Sutton et al., 1996), which show that epistemological beliefs of pre-service teachers increase as they approach graduation. Based on our findings, we can claim that the epistemological beliefs of the PSTs about knowledge and knowing/learning were promising for their future pedagogical applications. However, of course, it is necessary to carry out studies about the reflection of epistemological beliefs on (pre-service) teachers' pedagogical practices in order to be able to make more accurate inferences.

The present study's findings revealed an interesting situation regarding the attitude of the pre-service teachers towards authority. Contrary to the findings of previous studies (Efiltili & Çoklar, 2016), the participants generally took a common stance against religious, political, cultural and social (e.g., family, principal, teacher, etc.) authority. However, they kept laws out of this situation. The participants stated that they saw laws as a necessity for the healthy functioning of society and the protection of individual rights. In line with this view, they stated that everyone should obey the laws. In the literature, epistemological beliefs are proposed to have a cultural basis (Hofer, 2008). For instance, Pye and Pye (1985) concluded that authority figures, including laws, are perceived as an acceptable and even necessary phenomenon for social and personal security in many Asian countries. Findings of the present study, when taken together with Tuncay-Yüksel's (2016) study in which epistemological beliefs of 1524 pre-service science teachers studying in different provinces of Turkey reveal that Pye and Pye's argument may also be valid for the Turkish culture.

When the statements given by the pre-service teachers during the interviews were examined, it was seen that the courses they took at the university, their personal experiences and observations, and the country's socio-cultural structure were mainly effective in the formation of their epistemological beliefs. When these factors are examined according to the Epistemological Beliefs Model (Schommer, 1990, 1994), which constitutes the theoretical background of the study, it is seen that the courses taken by the pre-service teachers at the university were predominantly effective in the formation of their epistemological beliefs about the structure of knowledge (i.e., specific knowledge, simple knowledge). Moreover, the participants frequently expressed the positive effects of the "Inquiry-Based Science Teaching" and "Nature of Science" courses on their views on the source of knowledge and its tentative nature. In parallel with Lederman's (1992) definition of the nature of science, this situation supports the close relationship between views on the nature of science and epistemological beliefs and, thus, can be considered as a clue showing that development of views on the nature of science also supports the development of more sophisticated epistemological beliefs. Moreover, based on the relationships of epistemological beliefs to views about learning and teaching and pedagogical knowledge and practices (Chai et al., 2006; Schommer-Aikins, 2004; Yılmaz-Tüzün and Topçu, 2013), it is suggested that epistemological beliefs should be explicitly and reflectively included in NOS courses offered in education faculties.

The study's findings revealed that personal experiences and observations were more effective in forming epistemological beliefs related to learning (i.e., ability to learn, speed of learning). The pre-service teachers often gave examples from their personal lives while justifying their views about the epistemological belief statements, which were presented to them during the interviews. As stated previously, most of the participants frequently emphasized the importance of hard-working work and effort for learning to occur.

Finally, it can be argued that the socio-cultural features of the country that the participants belong, which includes religion and traditions, were influential in shaping their epistemological beliefs about the source of knowledge. The pre-service teachers drew attention to the authoritarian feature of their society and stated that this should change, and all types of authority should be questioned. This situation supports the predictions concerning the effect of socio-cultural life on epistemological beliefs as put forward by Zeidler et al. (2013).

This study will make significant contributions to the literature by revealing underlying factors of pre-service science teachers' epistemological beliefs. At this point, it should be cautiously acknowledged that the conclusions mentioned above are the inferences made based on the statements of our participants. However, given that no study in the extant literature will enable researchers to decide which factors are more influential on which epistemological belief dimensions, inferences drawn from the present study have significance. It is suggested that future studies should be designed to examine the factors underlying epistemological beliefs in more depth and fill the gap in the literature.

Another critical point that distinguishes this study from similar studies in the literature and makes it valuable is the research method used. The Q method includes the benefits of both qualitative and quantitative research by revealing aspects of a subjective phenomenon that will emerge in a way that reflects individuals' points of view (Dennis & Goldberg, 1996). Considering the advantages of the Q method and the fact that it is a new approach in science education research, it is anticipated that this study will add significant value to science education research approaches and allow this method to be used more frequently in future studies. In addition, applying the data collection tool to larger samples and conducting more detailed interviews with subgroups selected from the samples may be recommended for future studies.

Declaration of Conflicting Interests

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Statements of publication ethics

We hereby declare that the study has not unethical issues and that research and publication ethics have been observed carefully.

Researchers' contribution rate

The study was conducted and reported with equal collaboration of the researchers.

Ethics Committee Approval Information

"Ethics Committee Approval Certificate" was obtained with the decision number 44079388-18 from Giresun University Scientific Research and Publication Ethics Committee at the meeting dated 25/07/2018 and numbered 2018-18/2.

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