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Message from the Editor,

I am very pleased to inform you that we have published the second issue in 2023. As an editor of International Online Journal of Primary Education (IOJPE), this issue is the success of our authors, very valuable reviewers who undertook the rigorous peer review of the manuscripts, and those of the editorial board who devoted their valuable time through the review process. In this respect, I would like to thank to all reviewers, researchers and the editorial board members. The articles should be original, unpublished, and not in consideration for publication elsewhere at the time of submission to International Online Journal of Primary Education (IOJPE). For any suggestions and comments on IOJPE, please do not hesitate to send me e-mail. The countries of the authors contributed to this issue (in alphabetical order): Azerbaijan and Turkey.

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Volume 12, Issue 1 (2023)

Table of Contents

Research Articles

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International Online Journal of Primary Education *2023, volume 12, issue 2*

ACADEMIC SELF-EFFICACY, ACADEMIC PROCRASTINATION, AND WELL-BEING: A MEDIATION MODEL WITH LARGE SAMPLE OF AZERBAIJAN

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Abstract

This study investigated the relationship between academic self-efficacy, academic procrastination, and well-being among Azerbaijani participants. The data was collected from 1657 participants who completed self-reported questionnaires measuring academic self-efficacy, academic procrastination, and well-being. The analyses of the study involved the use of correlation and structural equation modeling. The results of the structural equation modeling revealed that academic procrastination partially mediated the relationship between academic self-efficacy and well-being. The bootstrapping procedure also confirmed that the indirect effect of academic self-efficacy on well-being through academic procrastination was significant. Specifically, the data showed that higher levels of academic self-efficacy were associated with greater well-being, while higher levels of academic procrastination were associated with lower well-being. These findings add to the current understanding of the complex interplay between academic self-efficacy, procrastination, and well-being and may have important implications for interventions aimed at promoting academic success and well-being among students. Additionally, the study discusses the limitations and future research directions related to this topic.

Keywords: Academic self-efficacy; academic procrastination; wellbeing; Azerbaijan.

INTRODUCTION

Adolescence is a period of a transition from childhood to adulthood, requiring new psychological adaptations and characterized by dramatic changes in almost all aspects of an individual's life (Moksnes et al., 2014). Adolescence is characterized by rapid physical, emotional, social and cognitive changes (Kieling et al., 2011). Furthermore, individuals experience non-confirmation of their own physical development. While adolescents struggle to see themselves as capable of overcoming the anxiety, tension, and hopelessness, the physical inferiority they experience regarding their changing appearance contributes to decreased self-esteem (Aliyev, 2018; Satici, 2020). Adolescence is also a milestone when individuals discover their academic abilities and define their academic interests (Andretta & McKay, 2020). Dramatic changes and stress experienced at that period include increasing personal needs and demands, coping with parental and school requirements as well as with problems in interpersonal relationships (Byrne et al., 2007; Moksnes et al., 2010).

Mental health is characterized as mental well-being where a person can figure out their potential, overcome challenges, study efficiently and successfully and help society in various ways (Merlo & Vela, 2022; WHO, 2007). Well-being is defined as a condition in which individuals experience more positive feelings rather than negative ones and demonstrate sufficient life satisfaction (Diener, 2009). Accordingly, individuals who enjoy their interpersonal relationships, academic achievements, mental health, career, and personal life, tend to experience higher levels of subjective well-being (Myers & Diener, 1995; Ronen et al., 2016). Therefore, it is important to assist adolescents in developing successful coping skills, setting realistic and convincing expectations and being able to regulate them (Coskun et al., 2022). Higher levels of well-being are commonly associated with adolescents' academic achievements and their expectations at school (e.g., Shoshani et al., 2016; Tian et al., 2017). Simsaroğlu Beydola et al. (2022) found a significant negative correlation between hopelessness and wellbeing/life satisfaction in their recent study. Meanwhile, lower levels of well-being are more likely to present with self-destructive behavior, suicide attempts, and self-inflicted injuries (UNICEF, 2020).

Well-being refers to a person's emotional reactions and judgments about their life activity (Diener et al., 1999; Maker-Castro et al., 2022). Researchers have long conducted studies on well-being risk factors, including cultural, religious, economic, and social background. In these studies, they tried to determine major correlates of higher well-being, develop hypotheses, and put forward certain model proposals related to it. One of the main concepts related to individuals' levels of well-being is the concept of self-efficacy, defined by Bandura (1997). According to this concept, an individual with higher self-efficacy makes more effort to overcome difficulties and exhibits better resilience (Bandura, 1997). In this regard, self-efficacy allows individuals to interpret potentially threatening difficulties as manageable, reduce anxiety and negative thinking and positively regulate their emotional state (Carr, 2016), thus increasing well-being.

Academic self-efficacy is expressed as the perception of the abilities and qualities that guide individuals' determination to achieve success and educational goals (Sirois, 2004). Direct and indirect experience, social cues, and physical and emotional states are the main elements that make up self-efficacy. Individuals with high academic self-efficacy believe they can overcome difficulties, work hard, and persevere to achieve their goals. By setting challenging goals, they expect their efforts to yield positive results. They attribute failure not to the lack of talent or intelligence, but to the lack of effort or unforeseen external circumstances. Students with high academic self-efficacy are goal-oriented and are more actively involved in the learning process (Bandura, 1997). These qualities enable them to achieve success in school life, which respectively leads to an increase in academic self-efficacy and well-being (Pajares, 1996; Hampton, 2004).

People with high academic self-efficacy have self-confidence in that subject, and this confidence is reflected in their behavior. People with low self-efficacy may exaggerate problems and believe they are more difficult than they really are. This also increases stress and depression and narrows the problem-solving perspective. On the other hand, high self-efficacy allows a person to approach

difficult tasks and activities more comfortably (Pajares, 1996). Consequently, it can be said that individuals' self-efficacy is a predictor of wellbeing.

Research suggests that academic procrastination may play a mediating role in the relationship between academic self-efficacy and well-being. Procrastination is defined as the conscious delay in the time of behavior that a person is responsible for (Hill et al., 2022; Solomon & Rothblum, 1984). More specifically, procrastination behavior can be defined as the behavior of postponing an important task that an individual has the potential to do and has decided to do in advance, without a logical reason (Grecco, 1984). Studies on the prevalence of student procrastination confirm that a significant proportion of students develop procrastination behavior, such as doing homework, preparing for exams, or completing assignments at the end of the semester or the last minute (Solomon & Rothblum, 1984). Academic tasks are postponed in favor of activities which make people feel well such as spending time on the Internet, watching TV, sleeping, meeting friends, and relatives (Thibodeau, & Blunt, 2000; Solomon & Rothblum, 1984). In various literature studies, academic procrastination behavior; ineffective study strategies (Chissom & Iran-Nejad, 1992), low grade point average, difficulty completing homework, unplanned study habits (Martín-Puga et al., 2022; Senecél et al., 1995), unrealistic excuses, anxiety, fear of failure, depression, irrational thinking, low self-confidence (Ferrari et al., 1995; Solomon & Rothblum, 1984).

One of the positive effects of academic self-efficacy is its influence on academic procrastination. Haycock, McCarthy, and Sky (1998) reported that individuals with academic self-efficacy were less likely to procrastinate. Ferrari, Parker, and Ware (1992) similarly found that better academic self-efficacy predicted lower academic procrastination. Klassen, Krawchuk, and Rajani (2008) concluded that students with academic self-efficacy have lower procrastination tendencies.

Procrastination resulting from low academic self-efficacy can be a major barrier, leading to school-related problems (e.g., low grades) and stress-related physical discomfort (Solomon & Rothblum, 1984; Tice & Baumeister, 1997; Johnson et al., 2000; Pychyl & Shanahan, 2007). It may even lead to dropping out of school (Knaus, 1998). As İra and Yalçın (2015) emphasized, while schools face their own set of challenges, it is important for managers and teachers to be aware of external developments and renew themselves constantly to find suitable solutions to school-related problems. Also, according to the results of the conducted research, this study aims to reveal the relationship between academic self-efficacy and well-being of adolescents and to determine whether procrastination has a mediating effect on this association. Therefore, the study aims to achieve several sub-objectives, including (1) examining the association between academic self-efficacy and well-being, (2) determining the relationship among academic self-efficacy, burnout, and well-being, (3) investigating the level of procrastination among adolescents, and (5) determining whether procrastination has a mediating effect on the relationship between academic self-efficacy and well-being. By addressing these sub-objectives, the study aims to provide a comprehensive understanding of the factors influencing the well-being and to offer practical recommendations for enhancing their academic self-efficacy and reducing procrastination.

METHOD

Model of the Research

The study employed a correlational research design. Within this design, a structural equation modeling technique was utilized to test the mediation model examining the relationship between academic self-efficacy, academic procrastination, and well-being in a large sample of Azerbaijani students**.**

Participants and Procedure

A process of convenience sampling in different schools of Baku was used in this study. The sample consisted of 1657 participants, among which 943 (56.9%) females and 714 (43.1%) males. Half of the participants are satisfied with their relationships with their peers (64.7%). A similar ratio is also valid for relations with teachers (satisfied = 64.6%, partially satisfied = 29.0%, not satisfied = 6.5%). Data

was collected online only from volunteer adolescents. The Helsinki Declaration was taken into consideration and the research approval was given by the Psychology Scientific Research Institute Ethics Committee (Number: T-230).

Measures

The Tuckman Procrastination Scale was designed to assess individual procrastination types (Tuckman, 1991). The measurement tool was composed of 16 items (e.g. "I procrastinate unnecessarily on finishing things, even if they are important") rated on a 4-point Likert scale from 1 "Strongly disagree" to 4 "Strongly agree". This scale has a single factor construction with a loading of .40 or higher and reliability coefficient α = .89. In the present study, Cronbach's alpha coefficient measured .83.

The Academic Self-efficacy Scale was designed by Jerusalem and Schwarzer (1981) to determine adolescents' sense of academic self-efficacy. The scale consists of seven items (e.g. "I know very well what I have to do to get a high grade"). Items are rated on a 5-point Likert-type (from 1 "True for me" to 5 "False for me"). In the present study, Cronbach's alpha coefficient measured .70.

The Adolescent Subjective Well-Being Scale was developed to determine the level of well-being of adolescents. There were four factors which are known as "satisfaction with family relationships", "satisfaction with significant others' relationships", "life satisfaction", and "positive feelings", explaining 61.64 % of the scale variance, which consisted of 15 items (e.g. "I am usually smiling") (Eryilmaz, 2009). The internal consistency for the scale was α = .86. In the present study, Cronbach's alpha coefficient is .88.

Data analysis

The statistical analysis was conducted using IBM SPSS Statistics 22 and AMOS Graphics. Descriptive statistics were computed. Then, Pearson's correlation analyses were conducted to test the correlations among the study variables. Structural equation modeling (SEM) was employed to examine the relationship between academic self-efficacy and adolescents' wellbeing, as well as the mediating role of academic procrastination. The model fit was estimated with several fit indices, as recommended by Hu and Bentler (1999): χ^2/df ratio (value should be < 5.0), SRMR and RMSEA (values should be < 0.08), CFI, GFI, IFI, and TLI (values should be > 0.90). The accepted level of significance in the study is .05. ....

RESULTS

Descriptive statistics as well as Pearson correlations of all study variables are presented in Table 1. Academic self-efficacy was positively correlated with wellbeing (r = .376, p<.001) and negatively correlated with academic procrastination (r = -.340, p<.001). Wellbeing was negatively correlated with academic procrastination (r = -.419, p<.001).

Table 1. Descriptive Statistics and Correlations among Study Variables (N = 1657)

Variable	Academic self-efficacy	Academic procrastination	Wellbeing
Academic self-efficacy	–		
Academic procrastination	-.340**	–	
Wellbeing	.376**	-.419**	–
Mean	19.48	38.03	52.67
Standard deviation	3.13	8.34	7.02
Skewness	-.679	-.106	-1.32
Kurtosis	.607	-.586	1.67

** p < .001

Measurement Model

Firstly, a measurement model was examined with three latent variables (academic self-efficacy, academic procrastination, and wellbeing) and nine observed variables. The fit indices of the measurement model were as follows $\chi^2_{(24,\ 1657)}$=116.80, p<.001; χ^2/df=4.86; CFI=.982; GFI=.985;

IFI=.982; TLI=.973; SRMR=.0292; RMSEA=.048 C.I. [.040, .057]. All standardized factor loadings were significant ranged from .613 to .880 (*ps*<.001).

Structural Model

We assessed the mediating role of academic procrastination on the relationship between academic self-efficacy and adolescent wellbeing after controlling for gender and age (see Figure 1). According to the goodness of fit indices, the results revealed that hypothesized mediation model had an acceptable fit $\chi^2_{(37,\ 1657)}$=146.37, *p*<.001; χ^2/df=3.95; CFI=.979; GFI=.985; IFI=.979; TLI=.969; SRMR=.0276; RMSEA=.042 C.I. [.035, .050]. The direct effect of academic self-efficacy on academic procrastination was significant (β=-.460, *p*<.001). In addition, the direct effect of academic procrastination on wellbeing was also significant (β=-.322, *p*<.001). To investigate the indirect effects for significance, we used a bootstrapping procedure with 5000 bootstrap resamples conducted on the mediation model. Bootstrapping procedure indicated that the relation between academic self-efficacy and wellbeing was partially mediated by academic procrastination (indirect effect=.148, 95% CI=.119, .184).

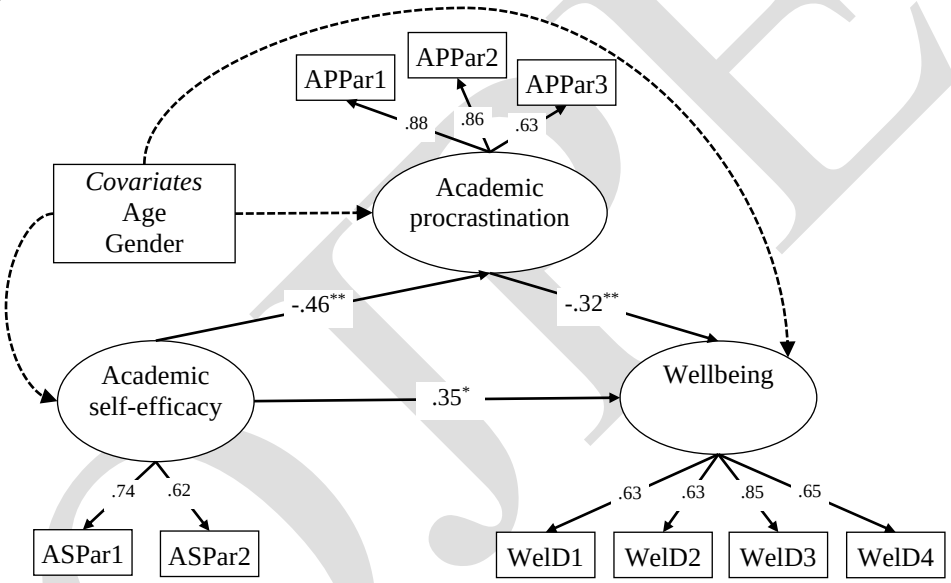

Figure 1. Standardized Parameter Estimates for the Mediated Model. ** *p* < .01

DISCUSSION, CONCLUSION, and SUGGESTIONS

Well-being is a state in which people experience more positive than negative emotions and are satisfied with their lives (Diener et al., 1999). As well-being is an important part of quality of life, measuring it is crucial to understand how people improve their lives. For example, the mental health, personal development, communication with others, and academic achievements of a teenager with high well-being are significantly improved by the positive influence of teachers and staff within the education system (Fasola & Osisanya, 2022; Palak & İra, 2022). The results of this study confirmed our hypotheses that academic procrastination mediates the relationship between academic self-efficacy and adolescent well-being.

Academic self-efficacy in our study was negatively associated with procrastination behavior. A review of the literature appears to have similar research findings. Chemers, Hu, and Garcia (2001) stated that adolescents with high academic self-efficacy make more use of mental methods useful for learning, managing their time and learning situations more effectively, and are better at controlling and regulating their efforts. Bandura argued that high self-efficacy positively influences task initiation and persistence, while low self-efficacy results in avoidance of productivity and less persistence. Remorse, guilt, fear, anxiety and stress that emerge in adolescents as a result of failure to fulfill

academic tasks and the negative perception of their potential are related to the decline in their well-being (Glick et al., 2014; Pychyl et al., 2000; Steel, 2002). In other words, college students who postpone academic work and responsibilities are struggling with poor mental health. In addition, this may be because individuals with higher academic self-efficacy have more confidence in their ability to perform well academically, and therefore may be less likely to avoid tasks or engage in procrastination behaviors. Additionally, individuals with higher academic self-efficacy may have more effective strategies for managing their time and learning situations, which can lead to increased productivity and a reduced likelihood of procrastination.

Research has shown that adolescents' well-being is directly influenced by academic procrastination. There is a negative correlation between academic procrastination and adolescents' well-being (Savithri, 2014; Sawitri & Ariati, 2011; Tamini et al., 2013). Correspondingly, the low levels of adolescent's well-being is induced by stress factors, which is triggered by demonstrating academic procrastination tendencies and avoiding executing academic duties (Wright et al., 2017, Çelik & Odaci, 2020). Further results indicated that common negative feelings which emerge in adolescents such as remorse, guilt, fear, anxiety, and stress are related to the decline in their well-being because of postponement of required actions to fulfill academic tasks and the negative perception of their potential. (Glick et al., 2014; Pychyl et al., 2000; Steel, 2002). Academic procrastination can lead to negative outcomes such as decreased academic performance, increased stress and anxiety, and decreased well-being. When students procrastinate, they may not have enough time to complete their tasks properly, leading to rushed and lower-quality work. Additionally, the stress and anxiety caused by procrastination can have a negative impact on their mental health and overall well-being. Therefore, academic procrastination is generally considered to be harmful and can have a significant impact on students' academic and personal lives.

The findings indicate that procrastination played a mediating role in the relationship between self-efficacy and well-being. In other words, study confirmed that adolescent's well-being is both indirectly and directly affected by self-efficacy. Well-being is directly influenced through the mediating role of procrastination. According to similar research, adolescents who have a high level of self-efficacy believe in their abilities to take action to complete academic tasks take their responsibilities and duties and consequently get high well-being (Pychyl & Little, 1998). In addition, there is an inversely proportional relationship between procrastination and well-being. Moreover, low levels of self-efficacy compose more negative expectations in adolescents about their future, decrease their life satisfactions and eventually lead to weakened well-being (Caprara et al., 2006). From this aspect, a positive relationship was defined between adolescents' self-efficacy and well-being through mediating role of procrastination.

Limitation

This study has some limitations which are essential to be wary when evaluating the research. Firstly, the fact that the research is oriented and sensitive age groups are considered, the risks of random analysis were possible in the questionnaire survey of the research. There were some limitations in our research, as in every research. The second limitation of our study was that the research was mainly conducted among adolescents living in the capital city Baku and the adjoining Absheron Peninsula, which limits the generalizability of the study. The research did not cover other cities and towns, it was not possible to fully state the accuracy of the results. If the research was also conducted in remote areas, it is not known what the differences we will get in the results. Another limitation is that the study only covers the psychometric characteristics of adolescents, their educational life, academic autonomy, persistence, and psychological well-being; it cannot be generalized to other age groups. However, this study generalized the main problematic age periods of educational life. In future research, a comprehensive solution to these problems can be discovered.

Implications

The findings of this study have important implications for educational institutions and policymakers. First, promoting academic self-efficacy among students should be a priority. By enhancing students'

belief in their own capabilities to succeed academically, schools can contribute to improved academic performance and reduced academic procrastination. This can be achieved through interventions such as targeted support programs, mentoring initiatives, and promoting a growth mindset. Second, fostering student well-being should be integrated into the education system. Recognizing the intricate relationship between well-being and academic outcomes, schools should implement strategies that prioritize the physical, emotional, and social well-being of students. This can be accomplished through the provision of comprehensive support services, promoting positive school climate, and fostering healthy coping mechanisms.

Conclusion

This was the pioneer study in Azerbaijan assessing the association between self-efficacy, academic procrastination, and mental well-being in relation to the educational process. Although this study ensures data about the relationship between academic self-efficacy, procrastination and well-being, some suggestions can be made to researchers and practitioners.

Suggestions for researchers

Conducting longitudinal studies to further examine the relationship between self-efficacy, academic procrastination, and mental well-being in Azerbaijan would be useful in understanding the long-term effects of these factors. In addition, it would be beneficial for future research to investigate the impact of various factors, such as personality traits, cultural background, and family dynamics, on adolescents' well-being.

Suggestions for practitioners

Educational facilities in Azerbaijan should implement well-being programs to reduce the rate of academic procrastination among students. In addition, school counselors and mental health care professionals can develop intervention programs, such as psychotherapy groups or group counseling, to help students struggling with poor self-efficacy and poor mental well-being. Research can be conducted to evaluate the effectiveness of these programs. Practitioners should also consider the cultural context of Azerbaijan and its potential influence on academic procrastination and mental well-being.

Ethics and Conflict of Interest

The research was conducted following the guidelines stated in the Helsinki Declaration. This study received approval from the Ethics Committee of the Psychology Scientific Research Institute (Number: T-230). No conflict of interest exists for this manuscript for any of the researchers.

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MODELING OF READING PROBLEMS EXPERIENCED BY PRIMARY SCHOOL STUDENTS THROUGH ARTIFICIAL NEURAL NETWORKS

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Abstract

The aim of this study is to investigate the causes of reading problems experienced by third-grade students because of the instructional malpractices in education and develop a modeling with artificial neural networks. It was carried out according to the exploratory sequential model and consisted of two stages. In the qualitative part, a data pool with 35 items is created for the shortcomings caused by educational practices that underlie the reading problems experienced by the students through the opinions of 47 classroom teachers participating in this study. The second part is where the checklist designed based on the data obtained in the first part is administered to 174 classroom teachers who lecture the third graders. The numerical values are processed into MATLAB, and two different models, forecast and classification models, are developed for the shortcomings caused by educational practices that underlie the reading problems experienced by the students through artificial neural networks. In this regard, this study intends to identify solutions to the potential reading problems that students may experience due to the shortcomings caused by educational practices before they arise, and to develop preventive actions.

Keywords: Reading, reading difficulty, artificial neural networks, education and training.

INTRODUCTION

Reading, one of the most effective ways of learning (Adalı, 1990; Bamberger, 1990; Devana & Agustiani, 2019; Richardson, Morgan, & Fleener, 2012) is a key skill to cope with the abundance of information in this rapidly changing and developing technology world and to obtain the correct information (Sangkaeo, 1999). That said, students need to be able to benefit from the information they learn by reading, and thus, reading skills still remain important today (Organisation for Economic Co-operation and Development, 2000). Good reading skills contribute to academic achievement for students, as well as significantly help them when they become adults in today's societies which are based on knowledge (Eurydice, 2011).

Reading, which enjoys the interaction of psychological, sociological, economic, cultural, and educational factors, is considered as a complex activity, making a single definition of reading elusive to make (Özbay, 2006). Therefore, a whole number of different definitions of reading are available. Some of them are as follows:

Reading, a magical process (Akyol, 2016), is performed through the means of the eye and for the purpose of brain activity (Ruşen, 1999). A mental and intellectual activity (Özdemir, 2011), reading is one of the most effective ways to improve language skills and personality (Bamberger, 1990).

Reading is an activity that enhances the intellectual world of an individual, contributes to the accumulation of knowledge, helps developing an aesthetic point of view, and also creates a source of happiness for an individual (Tural, 1992). Not merely about seeing words or sentences, reading entails certain mental activities beyond seeing so that understanding can be achieved (Dökmen, 1994). From this standpoint, reading is a complex activity that involves the eye seeing, recognizing the writing and the mind trying to understand it; and it also includes mental, affective, and dynamic processes (Nas, 2003). But knowledge of characters and reading technics alone are not sufficient to develop real reading societies (Sangkaeo, 1999). Noting that every reader is a literate, but not every literate can be a reader, Özdemir (2004) emphasizes the aspect of reading that differs from literacy and its importance.

Students improve their reading skills acquired in school over time and as they grow through the grades. As reading skills improve and are more and more needed to learn the curriculum, reading, which is the means of obtaining knowledge, gains a new significance for students (Duke & Carlisle, 2011). After the first years in which basic reading is taught and skills are gained, students move from the stage of learning to read to the stage of "reading to learn" (Eurydice, 2011). Possible gaps and delays in reading skills increase in the following school years and the subsequent learning process (Chall et al., 1990). Although reading instruction is significant for academic achievement and school learning, its importance also lies in social life. In this sense, Dwyer (cited from Chiariello, 2018) considers reading skill as the difference between being included in social life and being excluded from society.

Problems in reading skills are a learning disability that affects not only the academic success of students in the school environment (Hakkarainen, Holopainen & Savolainen, 2013; Norbury, Gooch, Baird, Charman, Simonoff, & Pickles, 2016; Smart, Youssef, Sanson, Prior, Toumbourou, & Olsson, 2017; Suggate, Schaughency, & Reese, 2013) but also their social life and future life (Çayır & Balcı, 2017; Türkmenoğlu & Baştuğ, 2017) and necessitate early intervention (Çayır & Balcı, 2017). Waiting for such problems in reading to resolve themselves will lead to even greater problems (Chall et al., 1990). It is considered as highly unlikely that the lagging children in literacy and language skills that can be developed throughout life will overcome these deficiencies without getting any special help (Chall et al., 1990). That said, if prevention work is not undertaken regarding the cause of reading difficulties experienced by students, these difficulties continue to be present over time will reduce the effectiveness of future prevention efforts.

It is a national and priority goal in the United States to ensure that all students fully acquire reading skills by the end of the 3rd grade (Wonder-Mcdowell, Ray Reutzel, & Smith, 2011). In this regard, the first three grades after the student has learned reading are considered as critical; during these grades, reading instruction is important. Indeed, it is assumed that children in the fourth grade have completed the stage of learning to read and moved into the stage of reading to learn (Dickinson & McCabe, 2001; Snow, Burns, & Griffin, 1998; Spangler, 2016; Spear-Swerling, 2006). Children who learn to read in this process will progress step by step in order to become fluent readers in a short time with the reading environments and experiences to be presented to them. On the contrary, children who have not fully acquired their reading skills will have problems in reading; when a preventive or intervening approach is not taken to these problems, reading problems will continue to increase in the following academic years.

Difficulties experienced by an individual while reading due to lack of any of the reading skills such as correct recognition and analysis of written codes, fluent reading, reading comprehension, adequate vocabulary are defined as reading difficulties (Özsoy, 1984). The Diagnostic and Statistical Manual of Mental Disorders published by the American Psychiatric Association (2013) considers reading disability as a type of Specific Learning Disability and defines it as problems in word reading accuracy, reading speed, reading fluency, and reading comprehension skills, although the individual has a level of intelligence required by his/her chronological age. Reading difficulties, the main reason of academic incompetence, are a learning problem often experienced by students (Ergül, 2012).

Problems in reading encountered by children are the most common reason why they are diagnosed with learning disabilities (Denton, Montroy, Zucker, & Cannon, 2021; Fletcher, Lyon, Fuchs, & Barnes, 2018; Snowling, & Hulme, 2012; Stanford & Oakland, 2000).

Foremost among the reasons for such problems experienced by children with reading difficulties are facilities at home, previous school experiences, sensory deficiencies, and low levels of intelligence (Dolch, 1940). Vellutino, Fletcher, Snowling and Scanlon (2004) suggest strong evidence that most of the reading difficulties that arise in the early years are caused not by cognitive deficiencies, but by a lack of experiential and didactic approaches. It is reported that the problems of children who have reading problems in the first years of their education continue in the following years as well (Bruck, 1992; Dickinson & McCabe, 2001; Nation, 2019).

It is of paramount importance to recognize the reading difficulties experienced by students as early as possible, to intervene and minimize these problems so that they cannot lead to greater problems (Dowdall, Melendez-Torres, Murray, Gardner, Hartford, & Cooper, 2020; Flowers et al., 2001; Gersten, Haymond, Newman-Gonchar, Dimino, & Jayanthi, 2020; Kuhn & Stahl, 2003; Schwanenflugel et al., 2006; Torgesen, 2002). Further, several researchers report that the third grade is of a critical importance in this regard (Hebbecker, Förster, & Souvignier, 2019; Iii, Simmons, & Kame, 2001; Jenkins, Fuchs, Van den Broek, Espin, & Deno, 2003; Peng, Fuchs, Fuchs, Elleman, Kearns, Gilbert, … & Patton III, 2019). Thus, identifying possible reading problems that may occur at an early stage and allocating resources for prevention efforts are critical (Lovett, Frijters, Wolf, Steinbach, Sevcik, & Morris, 2017; Torgesen, 2002; Zijlstra, Van Bergen, Regtvoort, De Jong, & Van Der Leij, 2021); in this regard, schools, families, and policy makers have key responsibilities (Chall et al., 1990).

Research show that although they have no identified or diagnosed deficiencies, some of the students have difficulties in learning reading (Bryant, Bryant, & Smith, 2016). Similarly, Tunmer (2008) evaluates the difficulties experienced by readers in two categories as reading difficulties caused by dyslexia and reading difficulties not linked to dyslexia.

Accordingly, it is required to implement the necessary intervention programs for students with reading problems who have learning difficulties or have been specifically identified as having reading difficulties. However, regarding the identification of reading difficulties, there are students who are not or cannot be included in this group, which remains as an important problem. Thus, reaching out to each child with such difficulties should be one of the priorities of both the education system and teachers. Therefore, it is important to identify the reading problems experienced by students and caused by non-cognitive reasons.

There has been no study in the Turkish literature that thoroughly investigates the non-cognitive causes of reading problems experienced by students. Moreover, no research carried out especially in the field of educational sciences and involving primary schools, has studied artificial intelligence applications. In the relevant literature, there are studies on primary school students who have not been identified as having reading difficulties but experience problems in reading. However, many of such studies (Akar, 2017; Akyol & Ketenoğlu Kayabaşı, 2018; Akyol & Kodan, 2016; Çeliktürk Sezgin & Akyol, 2015; Dağ, 2010; Özkara, 2010; Şahin & Kardaş İşler, 2016; Türkmenoğlu & Baştuğ, 2017; Uzunkol, 2013; Yüksel, 2010) are performed with a small sample of students (all of them, except for one study, are carried out with one student) and offer individual support practices aimed at eliminating reading difficulties. Some research highlight the individual competencies (incompetencies) of the students and some of their characteristics of their families while addressing the reading problems. Nevertheless, they fail to adequately emphasize the school where students spend most of their time as well as educational practices as the causes of reading problems.

It is reported that progress has been made towards the elimination/reduction of reading difficulties through individual support practices. Yet, reaching all students who have problems in reading even though they have not been identified so, will bring along some difficulties. The need for an instructor,

the need for a place to perform the implementation, and scheduling problems are just some of them. Knowing the possible problems that students may have or will experience and the causes of these problems in advance as well as developing preventive practices to eliminate the causes of the reading problems before they arise, are of paramount importance to produce solutions to the reading problems before they occur. In this regard, schools and educational practices are valuable. Reading problems directly affect reading success. The aim of this study is to investigate the causes of reading problems experienced by third-grade students because of the instructional malpractices in education and develop a modeling with artificial neural networks.

METHOD

Although there are quite a large number of patterns of the mixed method, Creswell and Plano Clark (2018) distinguishes six designs: convergent parallel, explanatory sequential, exploratory sequential, embedded, transformative and multiphase pattern. This study benefits from exploratory sequential design, one of the mixed method designs. This method assumes that all events and phenomena have both qualitative and quantitative dimensions, and it is necessary to examine both dimensions to make sense of these events and phenomena through a holistic, rich approach (Yıldırım & Şimşek, 2016). The mixed method design includes both approaches in a single study and aims to minimize the weaknesses of both approaches (Johnson & Onwuegbuzie, 2004).

The exploratory sequential design prioritizes the qualitative dimension of research and then moves into the quantitative part after the data are collected and analyzed in the qualitative part, making this design a two-stage sequential mixed method (Creswell & PlanoClark, 2018). Thus, the qualitative method has been applied at the first part of this research. After the analysis of the data obtained through this first part, the quantitative part of the research has been constructed.

Participants

In the qualitative and quantitative stages of the research, different participants were studied.

Sampling for the Qualitative Part

In the qualitative part of this study, which uses purposeful sampling method for data collection, teachers who lecture students with problems in reading and understanding what they are reading in their classrooms are included in the sampling. Further, this study follows two main criteria for the sampling of the teachers: 1) Having a student who participated in the REPPS (Remedial Education Program in Primary Schools) for the Turkish language course in the 2018-2019 or 2019-2020 academic years and 2) Having at least one student who participated in the REPPS in the classroom. Thus, a total of 43 primary schools in eight different districts, two of which are central districts in the city of Eskisehir, Turkey were determined, and a survey form was provided to 37 volunteer classroom teachers meeting the stated criteria in 32 different schools. Also, data were collected from another 10 teachers through face-to-face interviews. That is, the participants who were interviewed are different from the teachers who filled the survey form. The number of participants was contingent upon the amount of the data collected and the saturation point of the sampling. The saturation point is reached when the researcher decides that s/he has obtained sufficient data as the data and concepts seem to become repetitive (Yıldırım & Şimşek, 2016).

Sampling for the Quantitative Part

The quantitative data are collected through the non-selective sampling method, one of the probability-based sampling methods. The teachers who lecture the third-grades in public schools in Eskisehir participated in the quantitative part of this research. According to the statics of the Turkish Ministry of Education for formal education in the 2017-2018 academic year, the number of branch teachers to lecture the third-grades in Eskisehir in the 2019-2020 academic year is estimated to be 480 (Ministry of National Education, 2018). In the determination of the sampling size, the criteria proposed by Yazıcıoğlu and Erdoğan (2014) were followed so that the sampling could represent the population. They argue that a sampling size of 165 is sufficient for a population size of 500; this study has been performed with 174 teachers.

Data Collection Tools
Different data collection tools were used in the qualitative and quantitative stages of the research.

Data Collection Tools in the Qualitative Part
A survey with open-ended questions is used as the data collection tool in the qualitative part of this study. Akalın (2018) divides the questionnaire into two different categories. These are the survey form completed by the participants using only paper and pencil and the interview conducted by the researcher to obtain the information from the participants. Accordingly, the data in the qualitative part of this research were collected through a survey with open-ended questions and face-to-face interviews where the same questions were directed to a different group of participants.

The qualitative part intended to answer the following question: "What are the instructional malpractices in education which caused the basis of the reading problems?"

Data Collection Tools in the Quantitative Part
In the qualitative part, a survey form and a new checklist were designed by analyzing the data obtained from the interviews and these were intended for use in the quantitative part. In general, terms, a checklist is a list that ranks performance indicators (Russell & Airasian, 2011). That said, a 35-item checklist was formed to identify the shortcomings caused by educational practices that underlie the problems that students experience in reading.

In the quantitative part, the teachers were told to "Mark the errors caused by educational practices that underlie the problems that students experience in reading." Moreover, they were asked to mark the items they suppose appropriate (by themselves) in the checklist of 35 items.

Implementation
In order to collect the data, a research permit was granted by the Governor's Office of Eskisehir upon the request of the Rectorate of University. In the qualitative part, the open-ended question of "What are the shortcomings caused by educational practices that underlie the problems that students experience in reading?", which was designed by the researcher, was directed to the teachers (n= 37) and their written responses were obtained. Then, the same question was directed to the teachers who did not fill the survey form (n= 10) and the answers of the teachers were recorded in the interview form. The data collected in this part were analyzed through qualitative analysis methods and a new checklist was formed for use in the quantitative part.

The checklist with 35 items was applied to the classroom teachers (n= 174) lecturing the third-graders in the quantitative part. The data were coded as "1" (representing the teachers who agreed with the items specified in the checklist) or as "0" (representing the teachers who did not agree with the items of the checklist), and then transferred to the artificial intelligence application MATLAB for modelling with artificial neural networks.

Data Analysis
Qualitative Data Analysis
The answers given to the questionnaire and the data obtained from the in-depth face-to-face interviews were made with content analysis and descriptive analysis methods (Yıldırım & Şimşek, 2016), which are data analysis methods used in qualitative research. In the next step, "description", "analysis" and "interpretation" steps were put into practice in data analysis. The answers were given to the survey questions were examined, each question was evaluated and analyzed independently of each other. Responses to open-ended questions were coded, and themes related to the question were created (Ali Balcı, 2016). The answers given by the participants (n=10) in the in-depth face-to-face interviews were analyzed by descriptive analysis method. Responses were coded and conceptualized. The items determined by this analysis were added to the data obtained from the questionnaire. With the analysis of the answers, 35 items were created for the errors caused by the education-teaching practices at the source of the students' reading problems.

Qualitative data were analyzed in categories and the created items were reported. It was presented to the three interviewees for participant confirmation. Participants did not give any negative feedback about the items. Next step a checklist was prepared with 35 items in order to use it in the quantitative phase of the research.

Quantitative Data Analysis

In the quantitative dimension of the research, the data gathered with the prepared checklist were coded and then transferred to the excel program. The data are coded as "1" and "0". The items marked by the teachers were coded as "1" and the items not marked as "0". The coded data was transferred to the MATLAB program and a separate modeling was developed for each category with artificial neural networks.

Data Analysis for the Forecasting Model. In MATLAB application, all data should be converted to numeric values and normalized. First, the data was transferred to the Excel program. The items that the teachers stated and chose as a problem were indicated with a value of "1", and the items that they did not consider as a problem were indicated with a value of "0". These data were processed as input values to the MATLAB application.

Difficulty values were calculated for each of the problems coded as "1" and "0". These values were obtained by calculating the ratio of teachers who preferred the specified items to the total number of teachers. For example, the difficulty value created for an item marked by 66 participants was calculated by dividing 66 by 174.

A Classifying Model for Data Analysis. In order to create the classifying model, the total difficulty values stated by the teachers were categorized in two different levels as "high" and "low". High and low difficulty levels were calculated with the following formula: The difference between the highest total difficulty level stated by the teachers and the lowest total difficulty level was divided into two. For example, the highest value among the total difficulty values determined is .644, while the lowest value is .046. The number .299, obtained by dividing .598, which is calculated as the difference of two numbers, by two, represents the limit between high-level and low-level difficulty values. In this context, in the classification architecture to be organized for students' reading problems, total difficulty values higher than .299 mean high level difficulties, while total difficulty values lower than .299 mean low level difficulties. represents.

RESULTS

This section presents results on the analysis of data obtained from the opinions of the teachers on the shortcomings caused by educational practices that underlie the problems that students experience in reading.

Qualitative Findings

In this stage of the study, the teachers were asked the following question: "What are the shortcomings caused by educational practices that underlie the problems that students experience in reading?" Table 1 offers the findings on the shortcomings caused by educational practices that underlie the problems that students experience in reading by theme and item. The teachers interviewed under this study are coded with the letter "I" code, and they were referred to as "I1, I2, I3..." For the teachers who participated in and contributed to this study, the letter "P" was used, and they were referred to as "P1, P2, P3..."

Based on the answers of the teachers, this study identified six themes on the shortcomings caused by educational practices that underlie the problems that students experience in reading. These themes are "Teaching Program-Curriculum", "Legislation", "School", "Teacher", "Classroom" and "Textbook." Table 1 shows that a total of 35 items are identified based on these themes. The opinions expressed by the teachers in the education system and their contribution to eliminate these shortcomings may be an advantage.

Table 1. Distribution of the shortcomings caused by educational practices that underlie the reading problems experienced by the students

Teaching Program - Curriculum	**Codes**	
The design of the curriculum failing to recognize individual differences	P1, P9, P11, P14, P30, P35	I2, I7
Not allocating enough time for extracurricular reading	P22	I1, I4, I9
Lack of consensus on writing method	P3	
The mandatory implementation of only a single method in reading instruction	P7, P24, P37	I7
Efforts to keep up with the curriculum and achievements		I1, I3, I5
Activities outside the teaching program	P13	
Changes in primary literacy instruction	P21	I2
Italic-cursive writing application	P23	
Lack of regional curriculum applications	P28	
Achievements in the Turkish language course being mostly grammatically focused	P22	
Legislation		
No chance of repeating the grade	P1, P2, P6, P37	
Early school starting age	P3, P10, P29	I2
Multi-grade classroom teaching practices	P9	I8
Changes in teaching staff (timed/untimely)		I4
Lack of a mechanism to monitor reading progress		I6
School		
Poor physical infrastructure of schools	P30	I3, I7, I8, I10
Lack of technology and materials	P19	I3, I5, I6
Lack of practices that encourage reading	P22	I7
Lack of library	P26	I7
Reading activities not being valued at the school level	P32	I8
Failure to provide encouraging reading environments		I5
Lack of up-to-date and qualified books in school libraries		I1
Teacher		
Teachers' lack of professional competence	P9, P22, P30	I2, I5, I10
Teachers' failure to adequately support students with reading problems	P33, P37	I2, I3
Teachers' preference for books or reading materials that are not appropriate for the grade level	P34	I4, I9
Attaching great emphasis and importance to evaluation in the form of tests	P17, P18, P23	
Competitive approach towards reading instruction among teachers	P20	I10
Teachers with no reading habits	P32	I8
Hasty approach to reading instruction	P13	
Exam-oriented teaching	P23	
Teachers' lack of interest in reading	P13	
Classroom		
Crowded classrooms	P13, P29, P37	I8, I10
In-class competition/competitive climate	P13	
Textbook		
Texts in the textbooks too advanced for students	P22	I1, I9, I10
Uniformity of textbooks	P23	I6

However, this may also imply that the Turkish Ministry of National Education fails to ask the opinions of teachers or consider the solutions proposed by them in order to eliminate these shortcomings. Indeed, one of the teachers interviewed gave a wry smile and shook his/her head, pointing to the voice recorder, after s/he was asked this question, which also supports this assumption. The body language and attitudes of this teacher asked this question may simply indicate that s/he has something to say about this, but chooses not to for some other reasons. Although this teacher expressed his/her thoughts on the question, it is plausible to argue that s/he also had a lot more to say but was unable to.

One of the teachers participating in this study commented on the curriculum: "*We are constantly remarking on the curriculum, but nothing has changed. I mean, the curriculum is very dense, seems very dense to me. In elementary school, they just need to learn reading, writing, four modes of operation that will support them in their daily life. We offer them so much information, but it seems that it is in vain. That is, all these information are too abstract for them."* (P7). It can be thus claimed that the authorities fail to take into account the opinions expressed by teachers.

A teacher who believed that the association of reading with the Turkish language course is one of the shortcomings stated that: "*We should not perform reading activities only during the Turkish language courses. I mean, in my opinion, this is a problem related to instruction. As a matter of fact, reading is not linked to the Turkish language course. I think reading hours or reading sessions must be held. If these problems are resolved, the shortcomings in reading comprehension will be hopefully eliminated too.*" (I1) and emphasized that more reading activities should be performed outside the course.

A teacher who thinks that early school starting age is one of the shortcomings caused by educational practices, stated that: "*You know, the school starting age is reduced; due to the relevant legislation, some children have been granted to start school earlier and children of kindergarten age have been given the right to start school. And the parents rush to send their children to school. I think that if the school starting age is decided after consulting with a teacher and evaluating the child's readiness, this would allow better testing slow reading among today's children and their verbal and mathematical readiness for courses; we could improve children's level of education further.*" (P2).

Mentioning the mandatory use of only a single method for reading instruction, (P7) said that: "*The use of a single method in reading instruction, the overlooking of other methods prevents us benefiting from the positive aspects of the known methods.*" and thus clearly believed that this may cause reading problems. Another teacher emphasized the weaknesses of the sound-based sentence approach, which is the only and mandatory method applied in the literacy instruction in Turkey: "*In general, reading comprehension is a problem related to education provided in our country. I see this problem as a disadvantage of the sound-based sentence method, which is applied to help students become literate. Some students have difficulty in learning from part to whole and when they do not make enough effort for reading comprehension, they experience problems in understanding the whole."* (P24).

One of the teachers, highlighting the shortcomings of the curriculum designed for the entire country and implemented mandatorily, argued that the curriculum should be designed on a regional and local basis, in accordance with the sociocultural structure of the region and individual differences: "*The teaching program is being tested on a certain population and fails to support and to meet the need in the whole country region by region, province by province and district by district. Educational practices are not designed to meet the needs and desires of children, and these practices are developed and implemented based on the general situation.*" (P22).

Asserting that the reading progress of students should be supervised through an administrative mechanism that covers the school administrations and the higher authority levels, a teacher expressed: "*Reading habits among children are developed already through projects. Generally, schools carry out these projects. But for example, under a larger roof, the National Education Directorates fail to carry out such projects and supervise all schools properly; so, they fail to supervise the reading progress of children, as well as their development. So mostly, such supervision is performed by teachers. Only school principals or other higher-ranked staff in schools do not involved in this supervision process; the reading progress of children is not monitored. That is why it is like that there is not much of a supervisory mechanism for students in education.*" (I6). The same teacher noted the lack of reading materials in schools, except for textbooks, especially for students who have difficulties with reading: "*For example, regarding the availability of the materials, educational materials, I mean... For example, some other materials other than the materials we use in classrooms may be designed. I mean, different materials, reading materials, may be developed for children who have difficulty in reading and writing. These materials may then submitted to schools. Because not every*

child can learn using only a printed material, a textbook. Some of them need different visual and auditory stimuli. Such materials may be designed. There are the problems present in the educational environment." (I6)

Drawing attention to physical conditions and financial shortcomings of schools, a teacher stated that: "*The buildings are inadequate; we need more buildings and lack a chess room as well. My kid's going to a private school. It has a marbles field, a climbing wall, a painting workshop, and a music room. What does my kid have that these children do not? S/he is just financially lacking. I feel sad when I witness such cases.*" (I7) and expressed regret that this may lead to inequalities of opportunity in education.

Yet another teacher mentioned the quality and up-to-dateness of books, which are extracurricular reading materials, in school libraries and articulated that: "*School libraries should be equipped with advanced books with a novel perspective. With the books dating back to 1995-2000, we cannot teach children the love of reading and the habit of reading. We need to transform our libraries.*" (I1) and emphasized that if the quality of books in school libraries is not improved and contemporary books are not offered to children, some problems may be experienced in developing the reading habit and the love of reading among children.

Another concern was about the types of the books teachers prefer in reading instruction: "*The greatest mistake is that teachers feel the obligation to perform their reading instruction using educational books and thus prevent children from reading funny books.*" (P34), who expressed that teachers should be competent in choosing quality children's books. Another teacher self-critically remarked on the importance of teachers' attitudes towards reading and being role models in this regard: "*Most teachers don't take the time to read books because they are just worried about their income and to make ends meet or merely out of laziness, like me. It is not sincere for a teacher who does not read books to encourage children to read books, and children can spot insincerity from a mile away. Further, activities such as reading sessions in schools are either not carried out at all, or when they are performed, randomly selected and unreviewed books are used just to pass the time.*" (P32) and thus clearly believed that the reading activities carried out in schools and the quality of the books preferred in these activities are not sufficient.

Quantitative Findings

This section presents findings on the modeling with Artificial Neural Networks (ANN). Overall, two different models were developed for each title created for research purposes, forecast and classification. These models were created through the MATLAB software. In this regard, the findings on forecast modeling are presented first and the findings on classification modeling are offered later on.

Forecast Modeling

The ANN model, which consists of 3 layers: input, hidden and output layers, was trained using the "LecenbergMarquard" (trainlm) optimization algorithm. After the hidden layer, "Hyperbolictangent sigmoid" (tansig) was used as the activation function. The number of neurons used in the hidden layer was 5 in all forecast models. The default training parameters were utilized for the entire ANN architecture created. The stopping criterion is satisfied when the performance of the control set carries out at least 6 cycles. 70% of the data set was used as a train set; 15% was as a validation set and the remaining 15% was as a test set. These data were randomly selected by the system during each training. MSE (Min-squarederror) was the performance indicator based in the evaluation of the models. The findings of the forecast models created by the regression analysis method are presented under the following headings.

Forecast modeling of the shortcomings caused by educational practices that underlie the reading problems experienced by the students. Table 2 demonstrates the difficulty values of the items designed based on the answers given by the teachers. The most common three answers of the teachers

are, respectively, as follows: “Not allocating enough time for extracurricular reading”, “Efforts to keep up with the curriculum and achievements” and “Crowded classrooms.”

Table 2. Difficulty levels of the shortcomings caused by educational practices that underlie the reading problems experienced by the students

Shortcomings Caused by Educational Practices	Difficulty Values of Items
Not allocating enough time for extracurricular reading	.644
Efforts to keep up with the curriculum and achievements	.598
Crowded classrooms	.471
The design of the curriculum failing to recognize individual differences	.466
Texts in the textbooks too advanced for students	.431
Failure to provide encouraging reading environments	.420
Attaching great emphasis and importance to evaluation in the form of tests	.420
Exam-oriented teaching	.391
Lack of practices that encourage reading	.374
Hasty approach to reading instruction	.345
No chance of repeating the grade	.339
Early school starting age	.328
Competitive approach towards reading instruction among teachers	.287
The mandatory implementation of only a single method in reading instruction	.282
Teachers with no reading habits	.270
Changes in teaching staff (timed/untimely)	.259
Teachers' failure to adequately support students with reading problems	.253
Lack of technology and materials in schools	.236
Lack of library	.230
Poor physical infrastructure of schools	.224
Uniformity of textbooks	.207
Lack of up-to-date and qualified books in school libraries	.195
Changes in primary literacy instruction	.184
Lack of regional curriculum applications	.184
Reading activities not being valued at the school level	.184
Lack of a mechanism to monitor reading progress	.178
Teachers' preference for books or reading materials that are not appropriate for the grade level	.155
Teachers' lack of interest in reading	.149
In-class competition/competitive climate	.144
Italic-cursive writing application	.132
Achievements in the Turkish language course being mostly grammatically focused	.126
Teachers' lack of professional competence	.126
Multi-grade classroom teaching practices	.109
Lack of consensus on writing method	.103
Activities outside the teaching program	.046

First the difficulty values for each of the items and then the total difficulty values for each teacher regarding the shortcomings caused by educational practices that underlie the problems that students experience in reading were calculated. High numerical values of the items indicate that the difficulty levels of the items are high and that these items pose a high risk in terms of the shortcomings caused by educational practices. Based on all the data obtained, it was found that the total difficulty values ranged from the highest, 7.781 to the lowest, .437.

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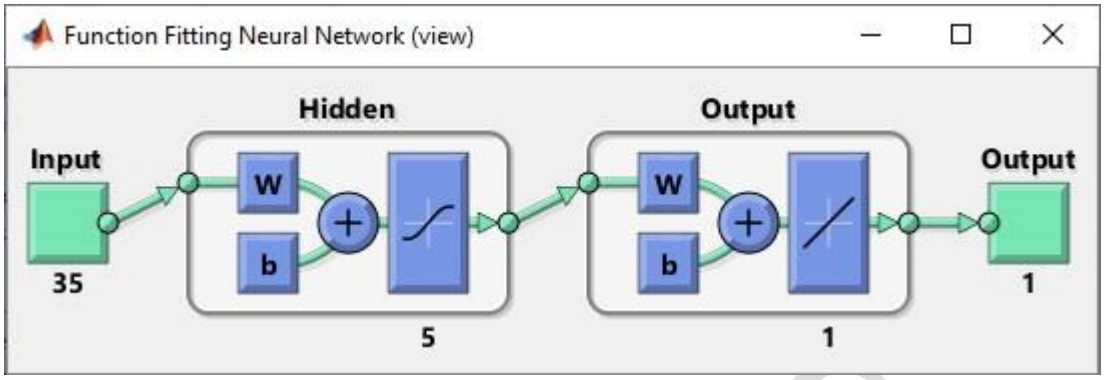

Figure 1. The ANN architecture created based on forecast for shortcomings caused by educational practices that underlie the reading problems experienced by the students

As seen in Figure 1, the students were included as input variable in the architecture with 35 items on the shortcomings caused by educational practices that underlie the problems that students experience in reading; and five neurons were used in the hidden layer and a single output value was obtained.

Figure 2 is a regression graph of the model created for the shortcomings caused by educational practices that underlie the reading problems experienced by the students. As seen from Figure 2, the model estimates the specified individual factors with full accuracy.

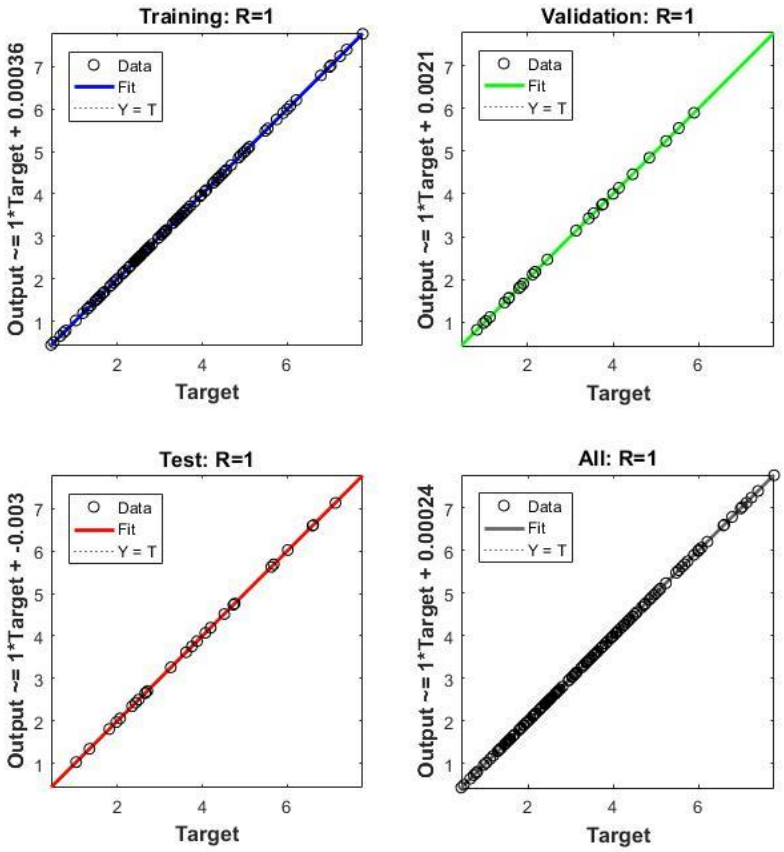

Figure 2. Regression Graph of the forecast model of the shortcomings caused by educational practices that underlie the reading problems experienced by the students

The developed model predicts the shortcomings caused by educational practices that underlie the problems that students experience in reading with 100% accuracy both in the educational set, in the control set and in the test set.

The error graph (Figure 3) of the model developed for the shortcomings caused by educational practices that underlie the problems that students experience in reading, clearly shows that the error rate is very close to zero. Based on these results, it seems that the developed model has a fairy low error rate.

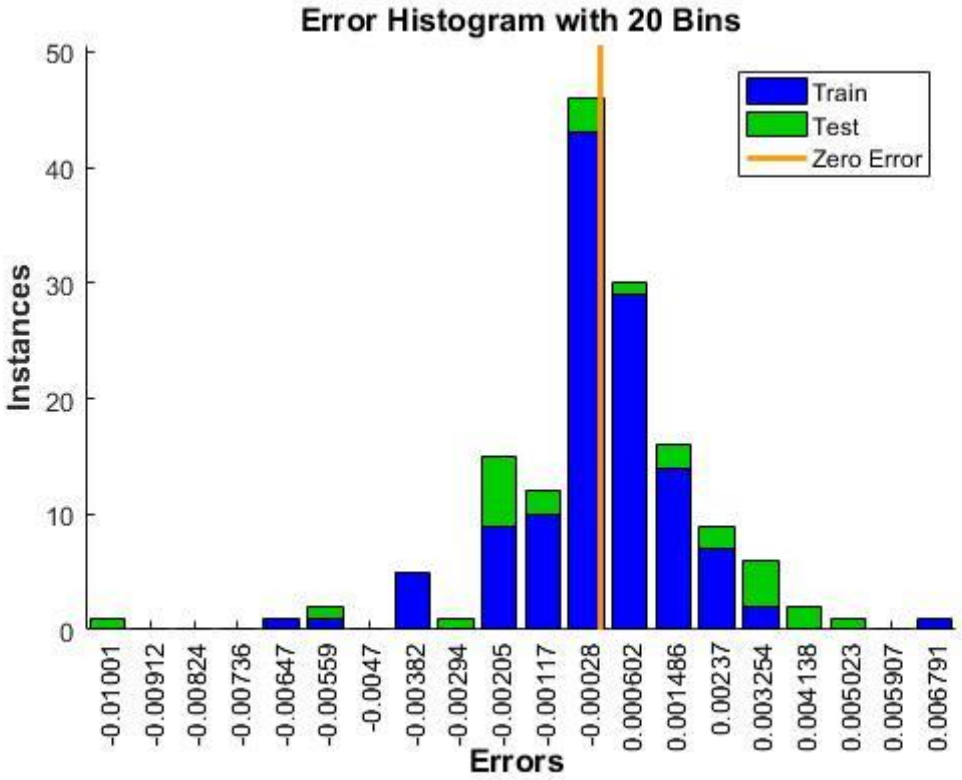

Figure 3. Error histogram of the forecast model of the shortcomings caused by educational practices that underlie the reading problems experienced by the students

The error value ranging between "-0.01001" and "+0.006791" indicates that the targeted prediction model has a very low error rate.

Figure 4 shows the performance graph of the model. As per the stopping criterion set in this architecture, the training stage was terminated at 173 cycles.

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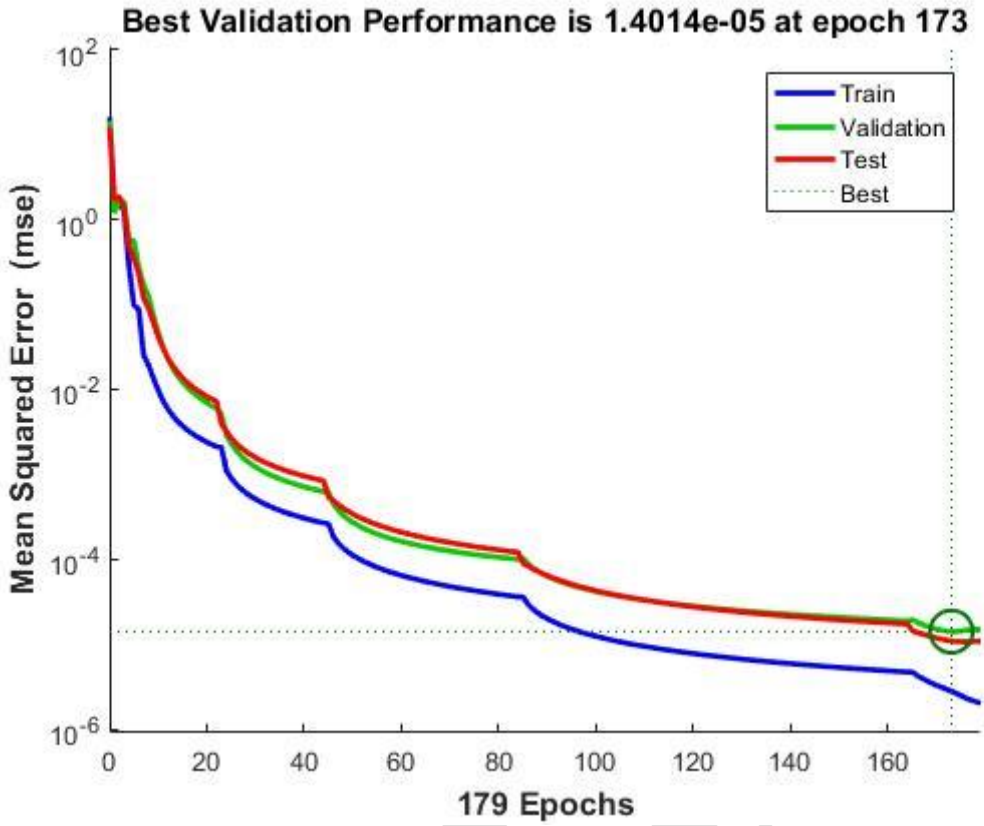

Figure 4. Performance graph of the forecast model of the shortcomings caused by educational practices that underlie the reading problems experienced by the students

Classification Modeling

This model intends to classify the difficulty levels of the reading problems identified and of the factors causing the reading problems, and to determine the relative effects of the items on the modeling for each model developed. The relative effects of the items on output values were determined by *Garson's Algorithm* proposed by (Ibrahim, 2013) David Garson.

The ANN model designed on the basis of classification was trained with the (traingdx) optimization algorithm, "*Gradient descent with momentum and adaptive learning rate back propagation*." As an activation function in the hidden layer "*Hyperbolictangent sigmoid*" (tansig) was used. The number of neurons used in the hidden layer varied for each model to develop the best training model. The default training parameters, besides the number of neurons, were used in the entire ANN architecture created. The stopping criterion in the training stage was 6 cycles when the performance of the control set did not improve. 70% of the data set was used as a train set; 15% was as a validation set and the remaining 15% was as a test set. These data were randomly selected by the system during each training. *Crossentropy*was used as a performance indicator in the evaluation of models. The findings of the classification modeling developed are presented under the following headings.

Classification modeling of the shortcomings caused by educational practices that underlie the reading problems experienced by the students. Figure 5 indicates the ANN architecture created for the classification model that is intended to be developed. Figure 5 shows that the students were included as input variable in the architecture with 35 items on the shortcomings caused by educational practices that underlie the problems experienced by the students in reading; and 10 neurons were used in the hidden layer and two different classification values as low difficulty level and high difficulty level were obtained.

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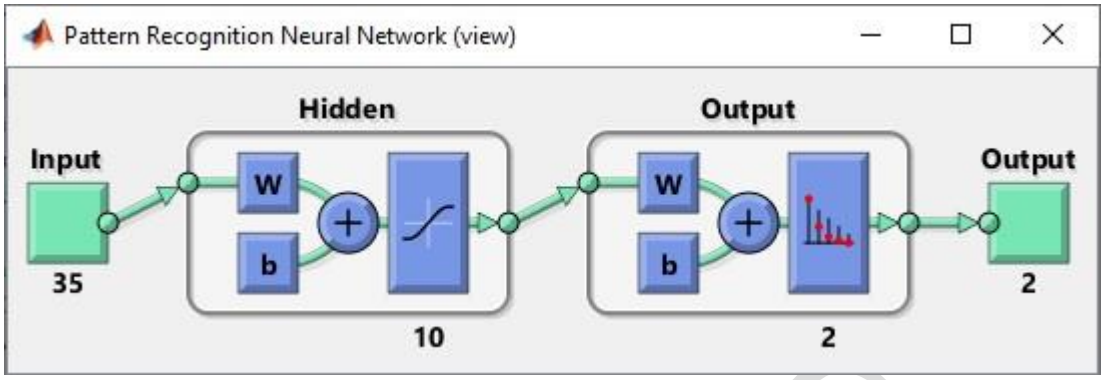

Figure 5. The ANN architecture created based on classification for shortcomings caused by educational practices that underlie the reading problems experienced by the students

Figure 6 presents the classification graph for the developed model. Figure 6 demonstrates that the developed model predicts the items with the low and high difficulty levels with 100% accuracy in both the control set and the test set and the training set.

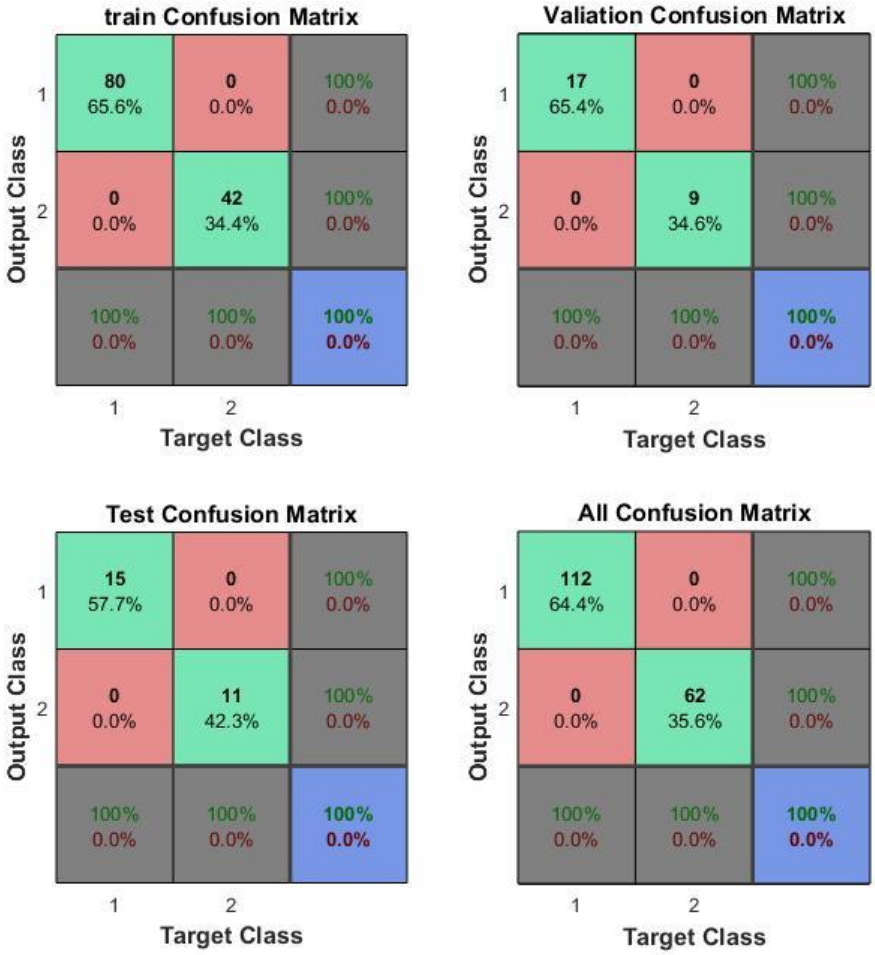

Figure 6. Classification graph, confusion matrix of the model of the shortcomings caused by educational practices that underlie the reading problems experienced by the students

Figure 7 demonstrates the performance graph of the model. The architecture designed was terminated at 165 cycles. There was no improvement following this threshold in the control set data.

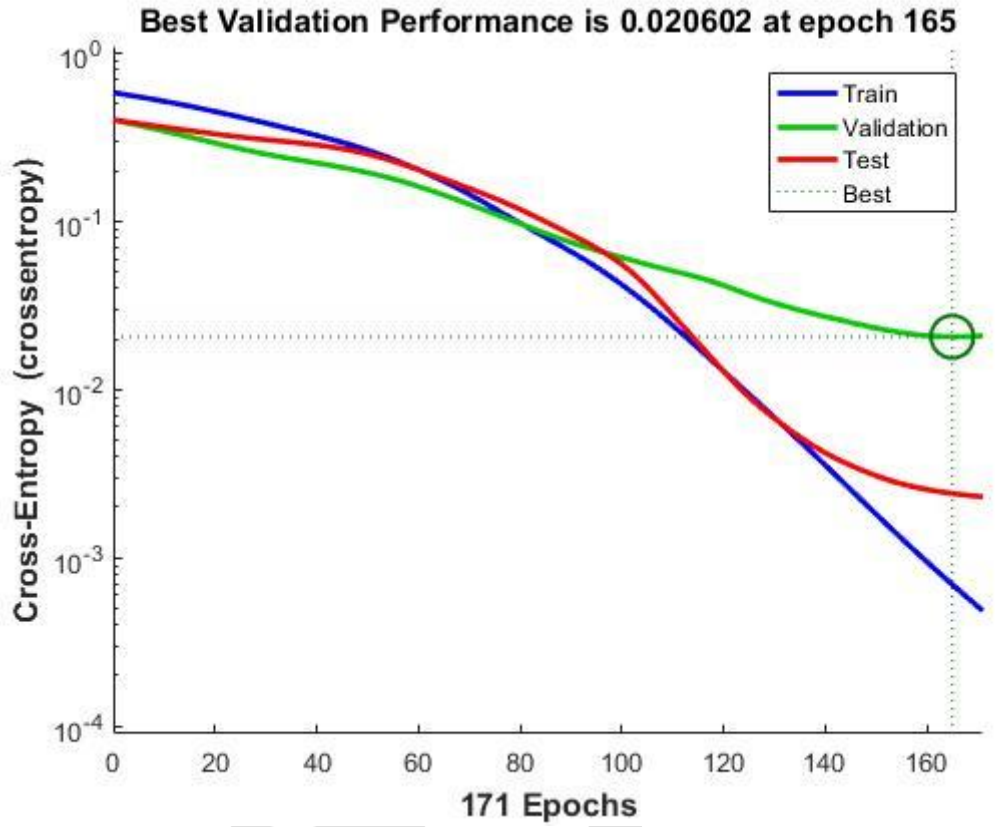

Figure 7. Performance graph of the classification model of the shortcomings caused by educational practices that underlie the reading problems experienced by the students

Table 3 shows the relative effects of the output variables of the items in the model developed for the shortcomings caused by educational practices that underlie the reading problems experienced by the students. As evident in Table 3, the first three items with the most impact on the output variables are, respectively, "Not allocating enough time for extracurricular reading", "The mandatory implementation of only a single method in reading instruction", and "Efforts to keep up with the curriculum and achievements."

Table 3. The impact weights of the shortcomings caused by educational practices that underlie the reading problems experienced by the students on the classification model

Shortcomings Caused by Educational Practices	Percentage
Not allocating enough time for extracurricular reading	4.61%
The mandatory implementation of only a single method in reading instruction	4.60%
Efforts to keep up with the curriculum and achievements	4.43%
The design of the curriculum failing to recognize individual differences	4.43%
Changes in primary literacy instruction	4.29%
Achievements in the Turkish language course being mostly grammatically focused	3.88%
Italic-cursive writing application	3.84%
Activities outside the teaching program	3.61%
No chance of repeating the grade	3.40%
Crowded classrooms	3.37%
Lack of regional curriculum applications	3.03%
Teachers with no reading habits	3.00%
Early school starting age	2.94%
Texts in the textbooks too advanced for students	2.89%

Table 3 (Continued). The impact weights of the shortcomings caused by educational practices that underlie the reading problems experienced by the students on the classification model

Shortcomings Caused by Educational Practices	Percentage
Lack of practices that encourage reading	2.83%
Exam-oriented teaching	2.82%
Lack of a mechanism to monitor reading progress	2.82%
Attaching great emphasis and importance to evaluation in the form of tests	2.66%
Failure to provide encouraging reading environments	2.63%
Lack of up-to-date and qualified books in school libraries	2.62%
In-class competition/competitive climate	2.56%
Lack of technology and materials in schools	2.54%
Multi-grade classroom teaching practices	2.52%
Changes in teaching staff (timed/untimely)	2.43%
Reading activities not being valued at the school level	2.26%
Lack of consensus on writing method	2.22%
Poor physical infrastructure of schools	2.21%
Lack of library	2.18%
Hasty approach to reading instruction	2.06%
Competitive approach towards reading instruction among teachers	1.98%
Teachers' lack of professional competence	1.96%
Teachers' lack of interest in reading	1.96%
Teachers' preference for books or reading materials that are not appropriate for the grade level	1.72%
Uniformity of textbooks	1.50%
Teachers' failure to adequately support students with reading problems	1.17%
Total	**100%**

DISCUSSION, CONCLUSION, and SUGGESTIONS

It is important to follow students' reading progress, to predict current reading problems and future reading problems, and to design appropriate methods and techniques for preventive programs (Görgün & Melekoğlu, 2022; Morris, & Gill, 2023; Spear-Swerling, 2013). To prevent them, it is further significant to determine the reasons for the problems experienced by students who do not have a physical or mental problem that will prevent them from reading, but still have problems in reading. In this way, the identification of the students who have problems in reading helps preventive work that involves creating level groups when needed and determining the reading risk maps of the students.

This study identifies the factors of non-cognitive shortcomings caused by educational practices that underlie the reading problems of students, and develops a preventive model with Artificial Neural Networks. This new model helps determine possible reading problems that students may experience due to the shortcomings caused by educational practices. The goal here is to implement preventive programs aimed at eliminating these reasons. Thanks to this model, which investigates the reasons of the reading problems, the schools where the students receive education are evaluated, and suggestions to overcome the factors that affect the students will guide the relevant authorities.

Given that the number of students with reading difficulties receiving support education through special educational practices or remedial programs can be reduced by up to 70% with early identification and prevention programs, (Lyon et al., 2001) it seems that preventive activities can be much more effective in minimizing the number of students who have not or could not be identified. In this regard, this study focuses on the students who have not been diagnosed with a reading disability or do not have any learning disability, but still have problems in reading. A total of 231 classroom teachers participated in this study. Considering that there are an average of 21 students per classroom in Turkey (MEB, 2018a), this study indirectly obtained data on approximately 4,851 primary school students.

The research findings yield that the academic achievements of students are closely related to a well-designed curriculum, and it is known that many countries have systems that monitor, evaluate

curriculum practices and track student success (Hooper et al., 2016). From this standpoint, the items such as "The design of the curriculum failing to recognize individual differences", "The mandatory implementation of only a single method in reading instruction", "Changes in primary literacy instruction" and "Lack of regional curriculum applications" are directly related to the curriculum. "Lack of a mechanism for monitoring reading progress" is considered a weakness of the Turkish language course curriculum.

An education system is only as good as its teachers (UNESCO, 2013); therefore, the improvement of reading skills of students and the elimination of reading problems that have been experienced or are likely to be experienced is closely related to the professional experience of teachers. In the qualitative part of this study, the teachers personally mentioned "Teachers' lack of professional competence", which was then marked by 12% of the teachers in the quantitative part; this simply means that some of the teachers who participated in this study were self-critical in this regard. In fact, this finding is further supported by other research. A relevant study argues that classroom teachers need in-service training on literacy instruction, which also may help preventing incorrect practices that might be performed in the future (Aydın & Kartal, 2017).

It is believed that school facilities and physical facilities, as well as the qualifications of teachers, have an impact on student achievement, and consequently on their reading progress. These include proper school facilities with well-trained teachers, adequate classroom space and other advanced school facilities (Cheryan, Ziegler, Plaut, & Meltzoff, 2014; Kapoor, Kumar, Meena, Kumar, A., Alam, Balam, & Ghosh, 2021; Schneider, 2002). The scope and quality of the school resources, materials and human resources are critical to a quality education and also in a strong relationship with students' reading and math achievements (Lee & Zuze, 2011; Yang, & Lee, 2022). From this perspective, the items "Poor physical infrastructure of schools" and "Lack of technology and materials in schools" are closely associated with the reading skills of the students. As for the effects on student achievement, comparing school facilities and teacher qualifications, it is evident that teacher qualifications have a much greater effect than inter-school variable factors (Hattie, 2009; Manning, Wong, Fleming, & Garvis, 2019).

Another addition to the school facilities should be classroom libraries or school libraries. When it comes to reading skills and reading problems, libraries become more significant. It is known that there is a solid relationship between reading success and the use of school libraries (Clark, 2010; Stewart, 2018). Therefore, "Lack of library", "Lack of up-to-date and qualified books in school libraries" and "Failure to provide encouraging reading environments" to children at schools directly or indirectly cause children to have reading problems. Classroom libraries, like school libraries, which can be established within the bounds of possibility, also contribute to the reading motivation of students. Also, classroom libraries may encourage children's positive attitude towards reading. Indeed, it is reported that classroom libraries can help improve reading habits and reading attitudes among children (MacKay, Young, Munòz, & Motzkus, 2020; Omigie, & Idiedo, 2019; Young & Moss, 2006).

It is believed that teachers, like school libraries and classroom libraries, also motivate students to read. To increase student motivation for reading, it is important that teachers read as well (Cremin, Mottram, Collins, Powell, & Safford, 2009; Merga, & Ledger, 2019); research show that children who are more motivated to read, especially at an early age, will become better readers in the future (Lewis & Samuels, 2003; Nevo, & Vaknin-Nusbaum, 2020; Wigfield, Gladstone, & Turci, 2016; Wigfield, Guthrie, Tonks, & Perencevich, 2004). For this reason, "Teachers' lack of interest in reading" and "Teachers with no reading habits" are just some of the issues that will prevent students from reading. This also determines the quality of the books that teachers will choose in reading activities. Teachers' selection of books that are not of interest to students may have a negative impact on students' attitudes towards reading. The reading material and technology used by teachers in reading instruction underlie students' reading experiences at school (Hooper et al., 2016). For this reason, "Teachers' preference

for books or reading materials that are not appropriate for the grade level" may adversely affect the reading experiences of students in the educational process.

Research indicate that the cooperation between teachers enhances the learning experience of students (Ainley, & Carstens, 2018; Goddard, Goddard, & Tschannen-Moran, 2007; Hargreaves, 2019; Vangrieken, Dochy, Raes, & Kyndt, 2015). Here, it is important to note that teachers who adopt "Competitive approach towards reading instruction among teachers" negatively affect the learning progress of students knowingly or unknowingly.

It is stated that if well managed, multi-grade classroom teaching practices provide students with the opportunity to develop individually in the subjects they are talented and interested in (Köksal, 2005). However, considering that not all classroom teachers have sufficient knowledge and equipment about multi-grade classroom teaching practices (Köksal, 2005) "Multi-grade classroom teaching practices" are of critical importance in developing reading skills.

The model developed in this study will hopefully allow predicting and classifying the causes of possible reading problems that students may experience through the criteria specified by evaluating the educational practices that students benefit from.

Limitations and Suggestions

This research is limited to the third grade primary school teachers working in the province of Eskişehir in the 2019-2020 academic year.

Through the items identified in the qualitative part of this study as well as the checklist with these items applied in the quantitative part, forecast and classification models have been developed via artificial neural networks. It is notable that the full accuracy and near-zero error rates of the developed models ensures that the validity, inclusivity and reliability of the data obtained as well as the predictability of the opinions of the teachers on the shortcomings caused by educational practices that underlie reading problems are high.

According to the results of the research, the following suggestions can be made for practitioners and educational researchers:

Reading risk maps of the students may be formed both on a city-by-city and country-by-country basis through the models developed under this current research, and this might facilitate implementing preventive programs quickly.

This study, identifying the reading problems experienced by the students, offers an artificial intelligence model that will help creating classes by level for students with similar reading problems based on the difficulty levels of the reading levels experienced by the students. In this way, specific measures and interventions aimed at eliminating reading problems may be implemented.

To find educational practices that have an impact on reading, the schools where children study may be screened and a "risk map of educational practices that have an impact on reading" can be created through the model developed.

Another effective approach in this regard would be to design a curriculum that recognizes the wishes and needs of the students as well as considers the environmental conditions. Extracurricular reading in schools may be promoted, and teachers may be encouraged to take more initiative in choosing reading materials and using selected reading materials in lessons.

It should be mandatory to establish libraries in all schools and to equip them with qualified children's books. Classroom libraries need to be mandatory, within the bounds of possibility, and this may directly support the development of students' reading skills.

To allow for better reading and learning, the necessary legal regulations may be enforced to abandon classroom teaching practices or to perform teaching in separate classrooms in schools with adequate classrooms and teachers regardless of the number of students.

In elementary schools, which are considered critical in the acquisition of reading skills, “Reading specialists” should be staffed to monitor the reading progress of students; these specialists should be only asked to deal with reading problems and progress.

Interesting reading activities can be organized in schools to engage children's interest in reading. It is necessary to carry out frequent collaborative and interactive book reading sessions, such as reading aloud and recounting what you are reading, in schools.

Activities can be designed to involve parents in educational practices. Thus, school and family cooperation can be achieved.

The attitudes and competencies of their teachers, who children consider as role models, towards reading are critical. The relevant ministry may carry out practices to improve these attitudes and competencies. In order to contribute to teachers' access to books, financial support for the purchase of books may be given every year. Teachers may be provided with an unlimited and smooth access to local and foreign academic resources that will contribute to their professional development.

Educational practices and the causes of reading problems based on the opinions of students and parents in future research may investigate. Thus, the views of all stakeholders who affect reading can be revealed with their own perspectives and experiences.

Ethics and Conflict of Interest

Before the applications were carried out, the participants were informed about the research’s purpose and scope, and it was declared that there was no ethical violation. Therefore, the ethical committee approval was obtained for this research from Bursa Uludağ University Scientific Research Ethics Committee with the decision numbered 2019/10 dated 29 November 2019. All rules required by research ethics were complied with while conducting this study. And also the authors declare that there has no conflict of interest between them. The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article. This study is complied from the master’s thesis titled as “Modelling reasons for reading problems experienced by third graders through artificial intelligence method” which was conducted at the Institute of Education Sciences of Bursa Uludag University in 2020 by the supervision of second author.

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THE CONNECTION OF MATHEMATICS WITH REAL-LIFE SITUATIONS: PRESERVICE ELEMENTARY MATHEMATICS TEACHERS' PERCEPTIONS OF CREATING AND EVALUATING STORY PROBLEMS

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Abstract

This study aimed to determine the perceptions of preservice elementary mathematics teachers about creating and evaluating real-life connections in story problems. The study was conducted according to the case design. The study group consists of 35 preservice teachers taking Mathematical Connection Teaching course. Study instruction was used as a data collection tool. While analyzing the data, content analysis and the codes of similar studies were used. According to the findings, real-life problem preferences of the teacher candidates are generally about numbers and operations learning domain at the seventh-grade level. Preservice teachers' aim while creating story problems is to show students how to use them in real-life and to create awareness. The preservice teachers mostly paid attention to the suitability of the student and grade level while creating problems. While preservice teachers' real-life associations were predominantly in the form of examining accurate data, only one study met the evaluation criteria. Most preservice teachers thought that the story problems could be associated with real-life situations. Consequently, it was determined that the preservice teachers found the reflection of real-life situations in the story problems useful for students, and the mathematics subjects can be associated with real-life situations.

Keywords: Evaluation perception, preservice teacher, real-life connection, story problem.

INTRODUCTION

In a changing and constantly renewing world, instead of taking the information as it is, internalizing it by processing and transferring it to daily life situations has become the primary purpose. In line with this purpose, in the perspective of the curricula of many countries, raising individuals who can understand the concepts and use these concepts in their daily lives by evaluating knowledge, skills, and behavior as a whole has taken its place among the main objectives of the curricula (Eurydice, 2012; Ministry of National Education [MoNE], 2018; National Council of Teachers of Mathematics [NCTM], 2014; National Research Council [NRC], 2011). For this reason, reaching the correct knowledge, understanding this knowledge, producing new and different types of knowledge, interpreting the produced knowledge, attributing meaning to the knowledge, adapting the acquired knowledge to daily life situations, and using it effectively are the roles attributed to individuals by today's information societies. Undoubtedly, one of the most effective ways of internalizing the knowledge reached is associating them with real-life situations (Kösece, 2020). Especially knowing that the information learned in the school and classroom environment has an equivalent in daily life makes it easier for the learner to internalize the information and use it when needed. Thus, today's education systems focus on teaching students how to reach information instead of transferring the existing information (MoNE, 2018; NCTM, 2000). The most important reason for this is that

individuals who can produce solutions for daily life problems, transfer the acquired knowledge to daily life situations, and make sense of them by turning them into skills are needed more than ever (Arthur et al., 2018; Bukova Güzel et al., 2018; Chapman, 2012; English & Watters, 2004; MoNE, 2018; Mutlu & Akgün, 2016; NCTM, 2000; Özgen, 2013a).

Mathematics is one of the most critical disciplines contributing to a better understanding of the world. Mathematics lessons are not only about the theoretical information used within the classes but also an important field of study that provides practical solutions to the problems encountered in daily life and helps them cope with the issues (NCTM, 2014). In this respect, raising individuals equipped with mathematical knowledge and skills and allowing them to produce solutions to the problems they encounter in their real lives are among the elementary goals of mathematics education (MoNE, 2018). Freudenthal (1991) stated that exploring mathematics and using it effectively is necessary to associate mathematics with daily life and materialize abstract concepts and turn them into reality. Mathematical knowledge has arisen from real-life situations. Therefore, inferences, assumptions, and applications of mathematical knowledge are intertwined with real-life situations (Eli, 2009; Gainsburg, 2008; Kösece, 2000; Winn, 1993). NCTM (2000) emphasized the connection of mathematics with daily life by stating that "students should learn mathematics by understanding it and actively constructing new knowledge from experiences and previous knowledge" (p.2). In particular, the associations established in the teachings for conceptual knowledge facilitate learning other concepts and provide valuable contributions to the development of mathematical phenomena (Skemp, 1976). At the same time, finding concepts in the mathematics lesson meaningful and having a positive attitude toward this discipline can be achieved by correlating them with daily life (Gainsburg, 2008).

Enabling individuals to use the information they acquired in real-life is among the critical outputs of mathematics teaching. Because students' ability to associate the information they learn with events in daily life is closely related to how much they can make sense of the knowledge they have acquired and how permanent the data is. Subjects and contents that are trying to teach to students in many curriculums are devoted to being associated with daily life. As long as students can associate the information, they learn with the events encountered in everyday life, the functionality of education increases and learning environments centered on individuals can be enabled. Therefore, in the process, the knowledge that students gain through education becomes permanent to the extent that it can be associated with events in daily life (Özmen, 2003). Thus, when the relationship of mathematics, both within and with other fields, is evaluated, it has been determined that it will lead to more permanent learning in children (NCTM, 2000). Therefore, the ability to associate has especially been emphasized in mathematics learning and teaching (Bingölbali & Coşkun, 2016).

Individuals must understand the nature of mathematics and be aware of its relationship with daily life to give meaning to everyday life situations. It is known that teaching by establishing a connection between life and mathematics increases students' interest and motivation contributes to their development of positive attitudes toward the lesson and facilitates their conceptual understanding (Akkuş, 2008; Arthur et al., 2017; Bingölbali & Coşkun, 2016; De Bock et al., 2003; Doruk & Umay, 2011; García-García & Dolores-Flores, 2021; Lee, 2012; Mosvold, 2008; Özgeldi & Osmanoğlu, 2017; Özgen, 2013b; Papadakis et al., 2017). However, the fact that the achievements of the students in our country are not at the desired level in international scale exams such as TIMSS (Trends in International Mathematics and Science Study) and PISA (Program for International Student Assessment), which measure the ability to integrate learned knowledge and skills into daily life, shows that the importance of mathematics in everyday life is not taken into account (MoNE, 2019; OECD, 2019). The findings of the studies in the literature also show that students have problems adapting mathematics to daily life, difficulty establishing relationships between concepts, and do not know where and how to use the information they have learned (Akar, 2020; Altay et al., 2017; Baki et al., 2009; Çavuş-Erdem et al., 2021; Doruk & Umay, 2011; Mosvold, 2008; Özgen, 2013b; Yiğit Koyunkaya et al., 2018). Considering the need to understand and use mathematics, which is increasing exponentially with each passing day, the existence of a relationship between mathematics and real-life situations becomes essential. Therefore, within the scope of the study, daily life stories

that encourage learning mathematics in its nature were included, and it was tried to determine the connections of preservice teachers between real-life situations and mathematics.

Theoretical Framework

Many institutions and organizations emphasize the importance of mathematical association, and reports and scientific research are published in this field. Especially in recent times, with the increasing interest in mathematical association ability, several changes in the definitions of mathematical association abilities draw attention. For example, mental webs structured like a spider web (Hiebert & Carpenter, 1992), schema groups associated with mental webs (Eli, 2009), large-scale ideas and processes (Coxford, 1995; Skemp, 1976), analogies (Gainsburg, 2008), knots of concepts (Ma, 1999), experiences (Marshall, 1995; Romberg & Kaput, 1999), connections with the external world (Mosvold, 2008) are some of them. Association ability is being approached within the context of the relationship between mathematical concepts and the relationship of mathematics with the natural world and other disciplines (Bingölbali & Coşkun, 2016; Van de Walle et al., 2013). In the related literature, association ability is generally grouped under four headings. These are associations between real-life situations, different disciplines, concepts, and representations (Bingölbali & Coşkun, 2016; Doruk & Umay, 2011). When we look at the relationship of mathematics with daily life, we find two dimensions. One is to be aware of the relationship between mathematics and daily life, and the other is to use these relationships to solve real-life problems (Özgen, 2013a). The content and objectives of national/international standards or curricula focus on improving students' ability to make connections throughout their education life, and efforts are made to increase the permanence of the teaching and the efficiency of the process (MoNE, 2018; NCTM, 2000; NRC, 2011). It has been shown in the primary and priority skills group because it makes valuable contributions to the development of mathematics (NCTM, 2000). There are also some axioms expected from individuals in the mathematical association process, which are meticulously focused on. According to NCTM (2000), mathematical association abilities expected from students: (i) recognizing and using relationships between mathematical ideas, (ii) understanding mathematical ideas' relation with one another, and how these relationships can build new ideas and bring them into a consistent whole, (iii) identifying and applying mathematics in disciplines other than mathematics. Based on the general framework of international organizations, the association of mathematics with daily life was emphasized by making an explanation as "developing and applying mathematical thinking to solve a series of problems encountered in daily life" under the title of mathematical competence in our country's middle school mathematics curriculum (MoNE, 2018, p. 5). The primary purpose of these steps is to facilitate understanding by establishing connections between mathematics and the real world, embodying the abstract discipline of mathematics, and contributing to its perception as accurate (Umay, 2007).

When the relevant literature was examined, it was determined in the study conducted by Altay et al. (2017) with eighth-grade students that the ability to relate mathematics to real-life situations was insufficient and that most students could only associate mathematics with numbers and shapes in real-life situations. The study by Lee (2012) examined how preservice teachers used connection skills in their own story problems. As a result of the research, it was determined that most of the problems created by preservice teachers were mainly related to calculations, time, and money contexts. The study conducted by Coşkun (2013) aimed to determine the association abilities of mathematics and classroom teachers in classroom practices and the types of connections they prefer. In the study, while teachers mainly included the association between concepts and real-life situations in their classroom practices, they gave less place to the association between different demonstrations. It has been observed that they rarely give place to association with other disciplines. It has been observed that they rarely provide association with other disciplines. Karakoç and Alacacı (2015) examined the views of 16 high school mathematics teachers and eight academicians on real-life connection examples in mathematics teaching and the advantages and disadvantages of using these examples in the classroom. At the end of the research, it was determined that mathematics teachers and academicians could provide meaningful examples of real-life connections for almost all high school

mathematics subjects. For example, using computer software and algorithms to teach logic in a real-life context is a practical example. In the study carried out by Akkuş (2008) with preservice elementary mathematics teachers, mathematical concepts and real-life connection levels of preservice teachers were examined. As a result of the research, it was determined that the preservice teachers had a sufficient level of connection skills, and the student's skills increased by the year they studied. In the study conducted by Özgeldi and Osmanoğlu (2017), it was determined that preservice teachers could make associations openly with real-life association studies, comprehend the relationships between mathematics and real- life, and could realize the benefits of associations for students. In the study conducted by Didiş-Kabar (2018), many of the preservice teachers expressed the context of "shopping" as the daily life context in which mathematics is used, and the subjects of "ratio-proportion" and "angle" as the mathematics topics that they may encounter in daily life.

Education priorities include giving meaning to real-life events and helping individuals overcome real-life difficulties. The discipline of mathematics, which intertwines with real-life situations, also contains information that makes life easier at every moment. Therefore, the bridge between mathematics and real-life situations should be built firmly. For this reason, it is essential to focus on scientific studies that focus on the ability to make connections. However, a limited number of studies deal with the ability to make connections in mathematics education in Turkey (Ece, 2021). However, considering the increasing importance of understanding mathematics and using it in real-life in the 21st-century technology era, it is evident that more studies are needed in this direction. It is hoped that the study will contribute to the importance of awareness between mathematics and daily life and create a resource for the related field.

Purpose of the Research

The study aims to determine the perceptions of elementary school mathematics preservice teachers about creating and evaluating real-life connections in story problems. Accordingly, answers to the following sub-problems were sought:

- What are the grade levels, learning area, sub-learning area, and learning outcome(s) preferred by preservice teachers while creating real-life story problems?
- What are the relationships between preservice teachers' real-life story problems and the outcome(s), the points to be considered while creating a story problem, and the real-life equivalents of story problems?
- What are the preservice teachers' views on the relationship between story problems and real-life situations, on real-life association contexts, the level of meeting the evaluation criteria, and the association of all mathematics topics with real-life situations?

METHOD

Research Model

The research was designed in the case study model since it was aimed to examine the perceptions of elementary school mathematics teacher candidates in creating and evaluating story problems. The case study method is used to explore the situations of an event, training, activity, and one or more participants in detail (Creswell, 2018). In this context, the processes of developing the research questions, developing the sub-problems of the research, determining the analysis unit, determining the situation to be studied, choosing the individuals to participate in the research, collecting the data, and associating it with the sub-problems, analyzing and interpreting the data, and reporting the case study were taken into consideration (Yıldırım & Şimşek, 2018). The research conveyed the existing situation, and categories and codes were used to analyze the data. The answers of the participants were examined thoroughly and supported by descriptive statistics.

The Study Group

The study group of the research consists of 35 students who participated in the Mathematical Connection Teaching course at the undergraduate level in the spring semester of the 2021-2022 academic year. 57% (20) of the participants were female, and 43% (15) were male. The study group

was determined according to the non-random sampling method. Among the reasons for choosing this way are that the sample to be applied is studying in the mathematics education department of the university where the researcher is working, the ease of access to the sample, and the ease of time and labor. Hence, the appropriate sampling method; the sample is chosen from easily accessible and functional units due to limitations in terms of time, money, and labor (Büyüköztürk et al., 2018).

The Data Collection Tool

The study instruction developed by the researchers was used as a data collection tool. In creating the content of the study instruction, the opinions of the assessment, evaluation, and field experts were also taken. The relevant literature was first scanned in preparing the study guide, and the data tools and processes of studies conducted in a similar direction were carefully read (Gainsburg, 2008; Lee, 2012; Özgeldi & Osmanoğlu, 2017). In addition to the points that the participants should pay attention to, there are three headings that the participants should answer in the study guide, which was prepared with the support of the literature. The first title includes the grade level, learning area, sub-learning area, learning outcome(s), and purpose of the story problem. The second title considers some points while creating the relationship between the story problem, the outcome, and their real-life equivalent. The third title includes the relationship between the story problem and real-life situations, real-life association contexts, meeting the evaluation criteria, and the preservice teachers' views on associating all mathematics subjects with real-life situations. The names of the participants were kept confidential, and the study instruction was coded as P_1, P_2, P_3…P_{35}. Additionally, to avoid bias, the answers given by the participants were given codes and reported in the findings section.

Analysis of the Data

Descriptive analysis was used in this study. In this type of analysis, the data obtained are summarized and interpreted according to predetermined themes (Yıldırım & Şimşek, 2018). Accordingly, the answers given by each participant within the scope of the study directive were examined in the context of real-life associations. The codes determined by Gainsburg (2008) and Lee (2012) were used to develop the evaluation codes to analyze the obtained data. Furthermore, the answers of the preservice teachers were analyzed according to the learning areas, sub-learning areas, learning outcomes, terms, and concepts in the Mathematics Curriculum. In this direction, the participants' aims while creating the story problems were analyzed by Özgeldi and Osmanoğlu (2017) with the help of the codes developed according to the relevant literature (Table 1).

Table 1. Purpose codes for real-life associations (Özgeldi & Osmanoğlu, 2017, p.445)

Purposes of story problems
To attract the students' attention and motivate them
Since the context (examples given) is suitable for students
Since the context is useful
To show/raise awareness of how these concepts are used in students' lives (real lives)
To enable students to understand mathematics better, easily, and permanently by making connections with real-life situations

At the other stage, the analysis of the relationship between the story problem and the outcome(s) was discussed under six headings. These titles were determined based on the answers of the preservice teachers. Accordingly, the data, primary elements, terms, and concepts of the story problem, requiring knowledge, skills, and attitudes, being goal-oriented, and its relation with previous outcomes were considered. The codes regarding the relationship between the story problem and the outcome are presented below (Table 2).

Content analysis of the preservice teachers' answers to the issues they paid attention to while creating the story problems was made. The codes determined as a result of this analysis were used. Some sample codes are as follows: Outcome, simplicity, originality, interdisciplinary unity, suitability for student and grade level, age, language, and expression. Similarly, the content analysis of the answers to the equivalent of the story problem of the preservice teachers within real-life situations was made, and the codes determined as a result of the analysis were used. Some sample codes are as follows: The

importance of sports and healthy nutrition, energy sources, traffic rules, food waste, recycling, blood donation and games of chance, etc.

Table 2. Information on the relationship between the story problem and the outcome

The relationship between the story problem and the outcome
The story problem data is following the outcome
The main elements of the story problem are oriented toward the learning outcome
The story problem includes the terms and concepts of the outcome
The story problem requires knowledge, skills, and attitudes
The story problem is goal-oriented
The story problem also includes previous outcomes

In the last stage, content analysis was carried out on the preservice teachers' responses regarding the relationship between the story problems and real-life situations. The information obtained as a result of the analysis was evaluated according to the codes of real-life association types developed by Gainsburg (2008). Information on the code list suggested by Gainsburg (2008) is presented below (Table 3).

Table 3. Codes for real-life associations (Gainsburg, 2008, p. 200)

Real-life association types	Examples
Simple analogies	Associating negative numbers with sub-zero temperatures
Classical problems	Trains departing from the same station
Analysis of real data	Finding the average height of classmates
Discussing mathematics in society	Distortion of statistical results to guide public perception
Practical demonstrations of mathematical concepts	Models of regular objects
Mathematical modeling of real events	Writing a formula for the temperature to express an approximate function for a particular day of the year

In the other step, examples of associating the story problems created by the preservice teachers with real-life situations were examined. At this stage, the contexts determined by Gainsburg (2008) and researchers were used while determining the real-life association contexts in the participants' responses. Examples are saving, chemistry, love, encryption, waste, production, charity, sports, games, medicine, nature, and the environment. On the other hand, the story problems written by the preservice teachers were analyzed according to the evaluation criteria suggested by Lee (2012) and added by the researchers. The story problems written in the real-life situations were evaluated according to six criteria. These criteria are as follows:

- Problem instructions are clearly stated,
- Appropriate in terms of language and expression,
- Suitable for grade level,
- Have a suitable difficulty level,
- Include high-level thinking skills,
- Multiple representations are used (p. 437).

In the last stage of the research data analysis, the preservice teachers' views on associating the story problems with the mathematics subjects were examined by content analysis. The opinions of the participants were discussed under four headings. These titles are all relatable, almost all relatable, some relatable and unrelatable. On the other hand, the data were organized after the participants' answers, and the codes that supported the literature were determined. The learning areas, sub-learning areas, learning outcome(s), objectives, relationships with the outcome(s), the points they pay attention to, their counterparts, relationships, contexts (examples), and opinions were determined as frequency and percentage in real-life associations of the participants. Then, the statements of the preservice teachers for each research question in the study instructions were examined. These expressions were used to profoundly interpret the findings on how the groups made real-life associations. To increase the reliability of the study, all the answers of the participants were coded independently by the researchers. Then, the first coding was examined and determined what parts of it had disagreements.

The compliance percentage of the coding made individually by two researchers was determined as 92%. The parts where there was disagreement were discussed again, and a consensus was reached.

RESULTS

In this part of the research, the findings obtained from the answers to the real-life associations of preservice teachers are included. The findings are presented under three headings. The first title contains information about the persistent story problems [learning area, sub-learning area, learning outcome(s)] and general purposes of story problems. The second title includes the relationship between the story problem outcomes, the points to be considered while creating the story problems, and the real-life counterparts of the story problems. Finally, in the third title, teachers' views on the relationship with real-life situations, real-life association contexts, meeting evaluation criteria and associating all mathematics subjects. In this direction, information about the story problems written by the preservice teachers on their real-life situations is presented below (Table 4).

Table 4. Information on the determined story problems

Grade lLevel	Learning area	Sub-learning area	Learning outcome	Number of outcomes	*f* (%)
5	Numbers and operations	Percentages	M.5.1.6.2	1	3 (7.1)
	Geometry and measuring	Length and time measuring	M.5.2.3.3	2	2 (4.8)
	Data processing	Data collection and evaluation	M.5.3.1.1	1	1 (2.4)
6	Numbers and operations	Multipliers and products	M.6.1.2.4	1	
		Integer	M.6.1.4.2	1	3 (7.1)
		Ratio	M. 6.1.7.2	1	
	Geometry and measuring	Area calculating	M.6.3.2.4	1	2 (4.8)
			M.6.3.2.5	1	
	Data processing	Data analysis	M.6.4.1.1	1	2 (4.8)
			M.6.4.2.3	1	
7	Numbers and operations	Ratio and proportion	M.7.1.4.2	3	15 (35.6)
			M.7.1.4.4	2	
			M.7.1.4.7	4	
		Percentages	M.7.1.5.1	3	
			M.7.1.5.4	3	
	Algebra	Algebraic expressions	M.7.2.1.1	1	3 (7.1)
			M.7.2.1.2	1	
			M.7.2.1.3	1	
	Data processing	Data analysis	M.7.4.1.3	1	2 (4.8)
			M.7.4.1.1	1	
8	Numbers and operations	Exponential expressions	M.8.1.2.1	1	4 (9.5)
			M.8.1.2.4	1	
			M.8.1.2.5	2	
	Algebra	Linear equation	M.8.2.2.1	1	2 (4.8)
		Inequalities	M.8.2.3.1	1	
	Geometry and measuring	Transformation geometry	M.8.3.1.4	1	2 (4.8)
		Triangles	M.8.3.2.3	1	
	Probability	Probability of simple events	M.8.5.1.2	1	1 (2.4)

Note. In some studies, more than one outcome was preferred. The outcome explanations are presented in Appendix-1.

When Table 4 is examined, it is seen that preservice teachers create mostly story problems at the seventh-grade level (35.6%) in the field of learning numbers and operations. This is followed by the eighth-grade numbers and operations learning area (9.5%), the fifth-grade numbers and operations learning area (7.1%), the sixth-grade numbers and operations learning area (7.1%), and the seventh-grade algebra learning area (7.1%). Fifth-grade geometry and measurement learning area (4.8%), sixth-grade data processing learning area (4.8%), seventh-grade data processing learning area (4.8%), eighth-grade algebra learning area (4.8%), and geometry learning area (4.8%) have more than one story problem with content. The findings from the general objectives of the story problems written by the preservice teachers following their real-life situations are presented below (Table 5).

Table 5. General purposes of story problems (Özgeldi & Osmanoğlu, 2017)

Purposes of story problems	*f* (%)
To attract the students' attention and motivate them	8 (11.9)
Since the context (examples given) is suitable for students	8 (11.9)
Since the context is useful	6 (8.9)
To show/raise awareness of how these concepts are used in students' lives (real lives)	24 (35.9)
To enable students to understand mathematics better, easily, and permanently by making connections with real-life situations	21 (31.4)

Note. Some studies have more than one purpose.

When Table 5 is examined, it is seen that while preservice teachers create story problems suitable for real-life situations, they mainly aim to show how concepts are used in students' real lives and to raise awareness (35.9%). Similarly, among the answers of the preservice teachers, it was frequently stated that associating with real-life situations would enable the student to understand mathematics better, easily, and permanently (31.4%). Attracting students' attention/motivating them (11.9%), appropriate contexts for students (11.9%), and usefulness of context (8.9%) are other purposes. The findings from the relationship between the story problems the preservice teachers wrote following their real-life situations and the outcome(s) are presented below (Table 6).

Table 6. The relationship between the story problems and the outcome

The relationship between the story problem and the outcome	*f* (%)
The story problem data is following the outcome	6 (17.1)
The main elements of the story problem are oriented toward the learning outcome	7 (20.0)
The story problem includes the terms and concepts of the outcome	10 (28.6)
The story problem requires knowledge, skills, and attitudes	5 (14.3)
The story problem is goal-oriented	5 (14.3)
The story problem also includes previous outcomes	2 (5.7)

When Table 6 is examined, it is seen that preservice teachers pay the most attention to the fact that the outcome includes terms and concepts (28.6%) while creating a story problem suitable for real-life situations. Furthermore, the fact that the main elements of the story problem are oriented towards the outcome (20%), that their data are suitable for the outcome (17.1%), that they contain knowledge, skills, and attitudes (14.3%), that they are goal-oriented (14.3%) and that they include previous outcomes (5.7%) are the other relationships that the participants establish between the story problem and outcome(s). The findings obtained regarding the issues that preservice teachers pay attention to when writing story problems suitable for real-life situations are presented below (Table 7).

Table 7. Considerations while creating story problems

Considerations	*f* (%)	Considerations	*f* (%)
Suitability for student/grade level	27 (20.6)	Interdisciplinary collaboration	6 (4.5)
Connection with daily life	15 (11.5)	Awareness	5 (3.8)
Outcome	14 (10.7)	Age	4 (3.1)
Language and expression	12 (9.2)	Usability	4 (3.1)
Accuracy of data/information	10 (7.6)	Curriculum	3 (2.3)
Student interest, curiosity, participation, attention	10 (7.6)	Root Values	3 (2.3)
Originality	7 (5.4)	Gaining experience	3 (2.3)
Readiness level	6 (4.5)	Simplicity	2 (1.5)

When Table 7 is examined, it is seen that preservice teachers mostly pay attention to the suitability for student/grade level (20.6%) while creating story problems suitable for real-life situations. Connection with daily life (11.5%), outcome (10.7%), language and expression (9.2%), student interest, curiosity, participation, attention (7.6%), accuracy of data/information (7.6%), originality (5.4%), readiness level (4.5%) and interdisciplinary collaboration (4.5%) are among other considerations. The findings regarding the real-life responses to the preservice teachers' story problems are presented below (Table 8).

Table 8. Correspondences of story problems in real-life

Examples of real-life	*f* (%)	Examples of real-life	*f* (%)	Examples of real-life	*f* (%)
Traffic rules	4 (11.5)	Energy resources	1 (2.8)	Mother's love	1 (2.8)
Recycling	3 (8.6)	Holiday ceremonies	1 (2.8)	Stem cell transplant	1 (2.8)
Food waste	2 (5.7)	Patient analysis report	1 (2.8)	Planet	1 (2.8)
Menu/Beverage contents	2 (5.7)	Blood donation	1 (2.8)	Honey production	1 (2.8)
Agricultural/Animal production	2 (5.7)	Recruitment process	1 (2.8)	Games of fortune	1 (2.8)
Navigation	2 (5.7)	Holiday	1 (2.8)	Cryptography	1 (2.8)
The importance of sleep and rest	1 (2.8)	Advertising	1 (2.8)	Pandemic	1 (2.8)
National exam	1 (2.8)	Acids and bases	1 (2.8)	Weather	1 (2.8)
Importance of sports and healthy eating	1 (2.8)	Forest fires	1 (2.8)		

When Table 8 is examined, it is seen that preservice teachers mainly deal with traffic rules (11.5%), recycling (8.6%), food waste (5.7%), menu/beverage contents (5.7%), agricultural/animal production (5.7%) and navigation (5.7%) in the real-life equivalents of story problems. In addition, problems with subject contents such as the importance of sleep and rest, national exams, the importance of sports and healthy nutrition, energy sources, holiday ceremonies, patient analysis report, blood donation, recruitment process, and holidays were used. To explain the real-life equivalents of the problems posed by the preservice teachers in more detail, the participant's story problem, which includes the cryptography (encryption) example, is as follows:

> *Cryptography or encryption is all the methods used to convert readable information into a form unwanted people cannot understand. For example, two people who want to communicate send emails to each other. These emails go through many computers, and we don't know if anyone else has read them except the person who should be reading it…In this encryption system, the internet provider determines two prime numbers. As a result of multiplying these prime numbers, a vast number emerges… the numbers for encryption are 100-200 digits. First, create a password for yourself. Use three natural numbers for your password, and let the password of each natural number be composed of the product of two prime numbers…(P_{32}).*
>
> *According to the Highways Traffic Law, there are rules to be followed to prevent traffic accidents and ensure traffic flow and order quickly and safely. If these rules are not followed, serious problems such as traffic accidents may occur… The speed limit on highways varies from vehicle to vehicle. What do you think is the speed limit for cars in the city? (City speed limit is 50 km/h)… Speeding fines in 2022 are acceptable for exceeding the speed limit by 10-30%: 427 TL. Fine for exceeding the speed limit by 30-50%: 888 TL. Fine for exceeding the speed limit by more than 50%: 1823 TL. If paid within 15 days from the date of notification of the fine, a 25% discount will be applied… For example, the notice stated that my father was fine for driving 70 km in the city. I'll pay the fine tomorrow. How much should I pay?...(P_{28}).*

Under the example codes above, the participant's associated daily life problems with encryption and traffic rules. Participant P_{32} associated the prime factors of natural numbers with encryption and tried to determine the elements and their multiples. Participant P_{28} solves the problems related to the correct and inverse ratio and establishes a relationship between the diversity associated with the proper and inverse ratio and traffic fines based on the outcome. The findings obtained from the real-life associations of preservice teachers' story problems are presented below (Table 9).

Table 9. Real-life associations of story problems (Gainsburg, 2008, p. 200)

Types of real-life associations	*f* (%)
Simple analogies	5 (14.3)
Classic problems	10 (28.6)
Examination of actual data	6 (17.1)
Discussion of mathematics in society	11 (31.5)
Mathematical modeling of real events	2 (5.7)
Applied representations for mathematics concepts	1 (2.8)

When Table 9 is examined, preservice teachers generally discussed real-life associations in terms of discussing mathematics in society (31.5%) and classical problems (28.6%). In addition, the

examination of actual data (17.1%), simple analogies (14.3%), mathematical modeling of real events (5.7%), and realistic representations for mathematics concepts (2.8%) are other associations that preservice teachers discuss. To explain the real-life associations of the problems posed by preservice teachers in more detail, the sample story problem under the code of discussing mathematics in society is as follows:

> *According to the Ministry of Environment and Urbanization data, 1.836.000 tons of packaging waste were collected in our country in 2020. 7.000.000 kWh of energy saving was achieved in 1 year with the accumulated waste. The release of 323 million tons of greenhouse gases into nature was prevented. A contribution of 1.836.000 TL was made to the economy as recycling. Do you collect recyclable waste in your home and dispose of it in the recycling bin? If your family does not separate recyclable waste, do you give information about this? How many kWh of energy is saved with 38.556.000 packaging paper, and how many tons of greenhouse gas emissions are prevented? As a result of the recycling of 1 ton of packaging paper, how much TL contribution was made to the economy? (P_{30}).*

In the sample coding given above, the participant (P_{30}) used mathematical operations to emphasize the importance of recycling for societies. Furthermore, based on the concept of family, the smallest whole in society, the contribution of recyclable wastes that concern society to the country's economy was also discussed about greenhouse gas emissions.

Table 10. Real-life contexts of story problems (Gainsburg, 2008, p. 204)

Contexts	***f* (%)**	**Contexts**	***f* (%)**
Statistical data	6 (17.1)	Production	1 (2.8)
Transport vehicles	5 (14.3)	Chemistry	1 (2.8)
Nature/environment	3 (8.6)	Savings	1 (2.8)
Medicine	3 (8.6)	Entertainment	1 (2.8)
Waste	2 (5.7)	Love	1 (2.8)
Sports/games	2 (5.7)	Encryption	1 (2.8)
Shopping	1 (2.8)	Ceremonies	1 (2.8)
Map/plan/land measurement	1 (2.8)	Benevolence	1 (2.8)
Physics/astronomy	1 (2.8)	Exterior and interior design/architecture	1 (2.8)
Personal habits of students	1 (2.8)	Setting a price	1 (2.8)

When Table 10 is examined, real-life association contexts of preservice teachers are mostly composed of statistical data (17.1%). This is followed by transport vehicles (14.3%), nature/environment (8.6%), medicine (8.6%), waste (5.7%), and sports/games (5.7%), respectively. In addition, shopping, maps/plans/terrain, physics/astronomy, personal habits, production, chemistry, saving, entertainment, love, cryptography, ceremonies, benevolence, exterior and interior design/architecture, and price determination are among the real-life associations of preservice teachers. To explain the real-life correlation contexts of the problems posed by preservice teachers in more detail, the sample story problem under statistical data code is as follows:

> *The following information is included in the budget booklet of the Ministry of Agriculture and Forestry for the year 2022: 821 million people in the world face hunger, but more than 670 million adults and 140 million young people also face obesity problems. Food waste is mostly experienced in fresh fruits and vegetables followed by fast food and bread. 4.9 million pieces of bread are wasted every day in Turkey... 50% of the vegetables produced are wasted. A total of 18.8 million foods go to waste every year... In addition, 4.2 tons of food and 2000 liters of beverages are wasted per year in the service sector...(A_7).*

> *According to Google's advertising policy, whatever you do in a week, you will find sites, news, and advertisements about it… While the best-selling number in women's shoes was number 38 with 27%, it was followed by number 37 with 26%. While the best-selling number in men's shoes is number 42 with 25%, it is followed by number 41 with 21%. While 13 out of every 100 women buy heels, 4 out of every 50 men prefer classic shoes... (A_{14}).*

In the sample coding given above, the participant (P_7) created research questions that required data collection and associated daily life data with mathematics. Similarly, the participant (P_{14}) created a

research question based on the data of a corporate company and associated a situation frequently encountered in daily life with mathematics. The findings obtained regarding the evaluation criteria of the story problems written by the preservice teachers following the real-life situations are presented below (Table 11).

Table 11. Evaluation criteria of story problems

Number of criteria	**1**	**2**	**3**	**4**	**5**	**6**	***f* (%)**
Number of participants	4 (11.4)	5 (14.3)	7 (20.0)	7 (20.0)	11 (31.5)	1 (2.8)	35 (100)

When Table 11 is examined, 11.4% of the story problems of preservice teachers' real-life associations meet all one, 14.3% two, 20% three, 20% four, 31.5% five, and 2.8% six criteria. A detailed explanation of the story problems written by the preservice teachers following the real-life situation according to the evaluation criteria is as follows on the following example story problem:

> *A full, half, quarter?*
> *Known for his research on games of chance, Prof. Dr. Erkan Işığıçok gives striking information about the New Year's draw of the National Lottery. Since the draw was made over 10 million numbers, he said there is a 1 in 10 million chance that a purchased ticket will win the jackpot. He noted that in the last 27 years, the windfall has gone up for 2 full tickets, 5 half tickets, and 20 quarter tickets. He said there's an 85% chance that the bonus will go up to a quarter this year. There are full, half, and quarter ticket applications on the 10 million different numbers of the National Lottery tickets. When the jackpot comes to the full ticket, the entire jackpot is one person, while 2 people share half tickets and 4 people share quarter tickets… 85% of the ticket numbers are printed as a quarter, 10 half, and 5% as full tickets… Do you believe the National Lottery will be yours? Have you ever bought a ticket? Which ticket is less likely to receive a bonus, according to the report? What could this be about? Which ticket has a better chance of winning the National Lottery? In the news, the odds of getting a bonus on a ticket are higher on a quarter ticket, how is that possible? What can be done to increase the likelihood of the National Lottery? (P_{25}).*

In the sample coding given above, the participant (P_{25}) clearly stated the problem situation and the instruction and explained its content. Although its language and expression were appropriate, the class level was also considered. The participant who has taken the level of eighth grade and the subject of likelihood as a learning area and the possibility of simple events as a sub-learning area has associated the game of chance with mathematics and created the story problem at the appropriate difficulty level. At the same time, the participant included questions containing high-level thinking skills and associated the possibility of simple events with mathematics as a daily life situation by using tables. Therefore, the evaluation criteria determined for the quality of the participant story problems have all been met. Findings obtained from preservice teachers' views on associating real-life problems with all mathematics subjects are presented below (Table 12).

Table 12. Opinions on the association of story problems with mathematics subjects

Codes	***f* (%)**
All can be associated	19 (54.3)
Almost all of them can be associated	7 (20.0)
Some may be associated with	5 (14.3)
Cannot be associated	4 (11.4)

When Table 12 is examined, 54.3% of the preservice teachers think that real-life problems can be associated with all mathematics subjects, 20% of them think that almost all of them can be associated, 14.3% of them think that some of them can be associated and 11.4% of them think that they cannot be associated. Some preservice teachers' views on the association of all mathematics subjects with mathematics are as follows:

> *They can be related because all the subjects in mathematics are used in real-life and in different disciplines (physics, chemistry, biology, geography, engineering, etc.). Therefore, all mathematics subjects can be associated with concrete story problems (P_6).*

The story problem can be written with mathematics subjects, but may not be compatible with real-life. The data may not reflect real-life. For example, while calculating the volume in mathematics, some things can be neglected by numerical calculations (gaps between sand grains) (P_1).

DISCUSSION, CONCLUSION, and SUGGESTIONS

The study aimed to determine the perceptions of elementary school mathematics preservice teachers about creating and evaluating real-life connections in story problems. According to the research's first finding, most preservice teachers created real-life story problems with numbers and transactions learning area content at the seventh-grade level. Within this learning area, the ratio-proportional sub-learning area comes to the fore. One of the crucial details in the story problems written by preservice teachers is that the learning area of numbers and operations is included in all grade levels. At the grade level, the seventh graders were preferred the most. This was followed by the eighth, sixth, and fifth graders. On the other hand, story problems with the content of sub-learning areas of exponential expressions with percentages were also preferred more by preservice teachers. The results of similar studies conducted in the literature state that the samples given from daily life are generally related to numbers and transactions (Baki et al., 2009; Didiş-Kabar, 2018). Accordingly, it is thought that they reflect the situations that individuals frequently need to use in daily life on their story problems. Therefore, the contexts related to numbers and operations are dominant in preservice teachers' perceptions about the use of mathematics in daily life. In addition, the fact that subjects such as ratio-proportion, percentages, and exponential expressions are preferred more indicates that the perceptions of mathematics preservice teachers are limited to certain subjects. Although the participants were free to choose whatever they wanted while determining the story problems, they tended to create more story problems on specific topics. The reason for this may be the effect of preservice teachers' mathematics knowledge on problems. However, the fact that teachers limited the relationship of mathematics with real-life situations to topics such as numbers and calculations may have affected the participants' preferences (Baki et al., 2009). Because teachers often get help from numbers and operations in embodying and making mathematics understandable. It is expected that preservice teachers trained with this understanding will turn to similar examples.

Another study finding was obtained from the objectives determined by the preservice teachers while creating story problems suitable for real-life situations. Accordingly, preservice teachers aimed to show how the concepts they determined while writing story problems suitable for real-life situations are used in students' lives and to raise awareness about this issue. This finding is consistent with the statements in the literature that daily life problems should be emphasized to support meaningful learning as well as overlapping with similar study results (Akkuş, 2008; Baki et al., 2009; Karakoç & Alacacı, 2015; Lee, 2012; Özgeldi & Osmanoğlu, 2017). In addition, enabling the student to understand mathematics better, more accessible, and permanently by associating it with real-life is another goal adopted by preservice teachers. Like the preservice teachers who participated in the studies conducted by Lee (2012) and Yiğit Koyunkaya et al. (2018), the preservice teachers in this study presented different perspectives on the effects of associating with daily life. Preservice teachers stated that by associating with daily life, we could make the student aware of the place of mathematics in our lives and arouse curiosity outcomes of mathematics. In this regard, outcomes Gainsburg (2008) stated that teachers generally chose to motivate students, attract them, and show that mathematics is more understandable when choosing real-life contexts.

Another research finding was obtained from the relationship between story problems and outcomes. Preservice teachers focused on the terms and concepts of the most outcomes in story problems and the least on the connection of the outcome(s) with the previous outcome(s). Other focused points are that the problem data are suitable for the outcome, the main elements of the problem are aimed at the outcome, the problem contains knowledge, skills, and attitudes, and the problem is goal-oriented. Accordingly, teachers observed the outcomes more by using daily life connections. In this respect, it is crucial to focus on practices in the content of undergraduate courses to enrich and diversify the perceptions of preservice teachers in daily life connections (Bukova Güzel et al., 2018; Gainsburg,

2008; Didiş & Kabar, 2018; Karakoç & Alacacı, 2015). Furthermore, Didiş-Kabar (2018) emphasizes the reflections on course achievements in daily life by stating that the learned mathematics knowledge contributes to the problems encountered in daily life in terms of practical solutions and calculation. In this respect, bringing preservice teachers together with a learning environment that allows the development of their multiple mathematical approaches can make valuable contributions to adopting an inquiry-based teaching approach in their future careers (Gainsburg, 2008; Karakoç & Alacacı, 2015).

Another research finding determined what the preservice teachers paid attention to while creating story problems. While creating real-life problems, preservice teachers paid the most attention to the suitability of students and grade level. Overlapping with real-life situations, attainment, language and expression, data accuracy, student interest, curiosity, and authenticity are among the other issues that preservice teachers pay attention to the problem. In this context, preservice teachers are aware of the importance of their daily life status for students and attach importance to the transfer of the learned information to daily life. Therefore, it is essential to elaborate on the teaching knowledge that includes the relationship of mathematics with daily life in teacher training programs and to develop the mental habits of preservice teachers in this regard. Many curricula and scientific studies emphasize the connection of mathematics with daily life and state that daily life problems should be included more in learning environments (Lee, 2012; NCTM, 2014; Özgen, 2013b).

One of the remarkable findings of the research is the real-life correspondence of the story problems created by preservice teachers. Accordingly, traffic rules and recycling content story problems were the most preferred subjects. Food waste, menu/beverage contents, agricultural/animal production, and navigation are other topics in the preservice teachers' story problems. While creating real-life story problems, teachers' preferences for various disciplines such as stem cell transplantation, weather, acids and bases, sports, and the importance of healthy nutrition draw attention. One of the most important reasons for the participants to give examples from different numbers and types of daily life is that mathematics has many reflections on our lives (Bukova Güzel et al., 2018). The situations frequently encountered in daily life are reflected more in the problems. Accordingly, it can be said that the participants are trying to associate mathematical concepts with daily life. Studies indicate that preservice teachers have various knowledge in associating mathematics subjects/concepts with real-life (Arthur et al., 2018; Coşkun, 2013; Gainsburg, 2008; Lee, 2012; Mutlu & Akgün, 2016; Özgen, 2013a; Yiğit Koyunkaya, 2018). Although preservice teachers know this subject, it is evident that studies should focus on increasing their competence.

When the real-life associations of preservice teachers in story problems are examined in the research, the types of associating classical problems with the discussion of mathematics in society draw attention the most. Simple analogies with the examination of accurate data are other topics in preservice teachers' real-life associations with story problems. On the other hand, preservice teachers preferred associating mathematical modeling of actual events with realistic representations of mathematical concepts. This finding also coincides with the results of similar studies in the literature (Gainsburg, 2008; Lee, 2012; Özgeldi & Osmanoğlu, 2017). This finding is thought to be because preservice teachers attribute meaning to them by being influenced by life events. Especially the quality of social events affected the examples given more and preservice teachers gave examples in this direction. In this context, preservice teachers are aware of the effect of real-life contexts on mathematics and act to establish a relationship between mathematics and real-life situations (Gainsburg, 2008; Lee, 2012). On the other hand, preservice teachers preferred it more in stories with classical problem content. This situation is shown to be the excessive use of such problems in textbooks and additional resources (Gainsburg, 2008). In addition, the learning environments in the education life, the content of the course materials, and the outputs of the curriculum may have caused preservice teachers to turn to more classical problems. Therefore, we should train preservice teachers to create learning experiences that allow questioning and developing high-level thinking skills and monitor their effectiveness.

When the findings related to the real-life association contexts of story problems were examined in the research, statistical data, transportation tools, nature/environment, and medical samples were preferred more by preservice teachers. Apart from these, waste, sports, shopping, map/plan/land measurement, physics/astronomy, personal habits, production, chemistry, saving, entertainment, love, encryption, ceremony, benevolence, exterior and interior design/architecture, and price determination are other contexts preferred by preservice teachers. Context preferences are essential in the permanence of the information students acquire. For this reason, contexts that encourage students to think about using the learned knowledge in daily life should be used more. This way, the transfer of new knowledge and skills acquired by the learners to different situations is facilitated (Winn, 1993). In a similar study by Özgeldi and Osmanoğlu (2017), preservice teachers gave examples for sports/games, shopping/price determination/eating contexts. The study by Lee (2012) determined that money/time-content contexts came to the forefront. Although these differences are expected, the interest and ability of preservice teachers may have affected the types of contexts they exemplify. Individuals perceive mathematics as isolated facts and procedures (NCTM, 2014). Therefore, learning experiences that preservice teachers can experience and realize how the real-life connections of mathematical concepts are established should be created. For this, improving course materials and teacher quality is recommended (Arthur et al., 2017).

One of the noteworthy findings of the research is that only one of the story problems that the preservice teachers wrote in real-life situations meets the evaluation criteria of "problem instructions are clearly stated, appropriate in terms of language and expression, appropriate for the class level, appropriate difficulty level, high-level thinking skills, and multiple representations were used." Nearly one-third of the story problems meet five criteria, while one-fifth meet four, and an outcome one-fifth meets three criteria. In preservice teachers' story problems, the problem instructions were not explicitly stated, and the lack of questions about high-level thinking skills decreased the rate of evaluation criteria. Approximately one-quarter of the story problems created has at least one or two evaluation criteria. In this context, preservice teachers should carefully create evaluations that value establishing and learning daily life connections (Eli, 2009). Increasing the number of courses, such as associating with mathematics teaching, is essential. This will help the new generation of teachers use mathematical association with a more professional approach to teaching practices (Akar, 2020). It is known that preservice teachers have problems reflecting their associative skills and thoughts about daily life to verbal problems (Çavuş Erdem et al., 2021; Gainsburg, 2008; Lee, 2012; Özgen, 2013a; Yiğit Koyunkaya, 2018). Therefore, preservice teachers should be taught how to transform their thoughts about daily life following the problems. However, it should not be forgotten that it is essential not to use situations with many real-life relationships in the lesson but to ensure that students are active in the processes (Mosvold, 2008).

The last finding of the study was obtained from the views on associating the story problems written in real-life situations with mathematics subjects. Accordingly, three-quarters of the preservice teachers stated that story problems could be associated with mathematics subjects. On the other hand, a quarter of the preservice teachers stated that some subjects could or could not be associated. This finding is in line with the study conducted by Özgeldi and Osmanoğlu (2017) on the use of preservice teachers' real-life stories. In the study of Didiş-Kabar (2018), most preservice teachers stated that using daily life problems (situations) in mathematics lessons would benefit the students. In the study by Yiğit Koyunkaya et al. (2018), most preservice teachers argued that associating it with daily life effectively teaches mathematics and its necessity. Similarly, in the study by Karakoç and Alacacı (2015), teachers and academicians stated that real-world connections could improve students' motivation, interests, and attitudes, as well as their problem-solving skills and conceptual learning. Accordingly, it can be said that preservice teachers are aware of the connections of mathematics with real-life situations and understand its importance. However, the limited amount of information in the relevant literature and sourcebooks increases the incompetence of preservice teachers in this regard. In this context, increasing awareness of the design and use of course contents in curricula based on associations is

crucial. Especially in this regard, it may be beneficial to increase practice-oriented undergraduate courses, conduct training, and develop association-oriented resources.

Limitations

One of the most important limitations of the study is that only the study instructions were used as the data collection tool. Another limitation is that the study was conducted with 35 volunteer preservice teachers who took the Mathematical Connection Teaching course. The real-life contexts discussed in this study consist of preservice teachers' perspectives. When prospective teachers are assigned as teachers, there may be changes in their thoughts and views. The fact that preservice mathematics teachers were given a certain amount of time to determine their perceptions of creating and evaluating real-life connections in story problems may also affect their thoughts.

Suggestions

The course contents can be rearranged during the preservice teacher training process so that preservice teachers can realize the importance of real-life associations earlier and have a more in-depth idea about these associations. Learning activities, workshops, and seminars can be organized to make preservice mathematics teachers and preservice teachers in other branches aware of the importance of associating with real-life. The teachers can evaluate the types of associations revealed by the preservice teachers in the studies, and their opinions on their use in the lessons can be obtained. In addition, longitudinal studies can be done to understand the effects of real-life associations better. Finally, elective courses at the undergraduate level can be included for effectively using real-life contexts. A similar study can also be done in the form of group work.

Ethics and Conflict of Interest

The ethical permission of this study was obtained from the Research Ethics Committee of Nevşehir Hacı Bektaş Veli University (date 27.04.2022, number 128/05); it was decided that the research is following the human research ethics committee directive. The authors declare that they have no potential conflict of interest.

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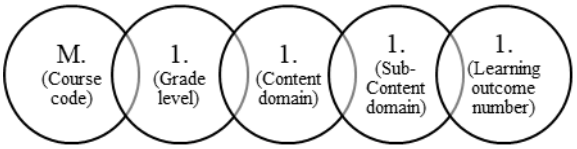
Appendix-1: Preferred Learning Outcomes by Preservice Teachers



M.5.1.6.2: Associates a percentage expression with a fraction and decimal notation representing the same magnitude, converting these notations to each other.
M.5.2.3.3: Recognizes time measurement units, convert them to each other, and solves related problems.
M.5.3.1.1: Creates research questions that require data collection.
M.6.1.2.4: Determines the prime factors of natural numbers.
M.6.1.4.2: Compares and ranks integers.
M. 6.1.7.2: In cases where a whole is divided into two parts, it determines the ratio of two parts to each other or each part to the whole, and in case of problems, it finds the other when one of the ratios is given.
M.6.3.2.4. Recognizes land measurement units and associates them with standard area measurement units.
M.6.3.2.5. Solves the problems related to the field.
M.6.4.1.1: Creates research questions that require comparing two data groups and obtaining appropriate data.
M.6.4.2.3: It uses the arithmetic mean and span to compare and interpret the two groups' data.
M.7.1.4.2: When one of the two multiplicities is given a ratio, it finds the other.
M.7.1.4.4: It refers to the relationship between two directly proportional multiplicities.
M.7.1.4.7: Solves problems related to correcting an inverse ratio.
M.7.1.5.1: Finds the amount corresponding to a specified percentage of a plurality, and a certain percentage finds the whole of the given multiplicity.
M.7.1.5.4: Solves problems related to percentage.
M.7.2.1.1: Performs addition and subtraction operations with algebraic expressions.
M.7.2.1.2: Multiplies an algebraic expression by a natural number.
M.7.2.1.3: Expresses the rule of number patterns in letters and finds the desired term of the pattern whose rule is expressed in letters.
M.7.4.1.3: Creates and interprets the circle graph for a data group.
M.7.4.1.1: Creates and interprets the line graph of the data.
M.8.1.2.1: Calculates the integer strengths of integers.
M.8.1.2.4: It refers to a given number using different integer forces of 10.
M.8.1.2.5: Expresses and compares large and minimal numbers with scientific representation.
M.8.2.2.1: Solves equations with a first-order unknown.
M.8.2.3.1: Write mathematical sentences suitable for everyday life situations involving inequality with a first-degree unknown.
M.8.3.1.4: Draw a triangle whose dimensions are given by a sufficient number of elements.
M.8.3.2.3: It creates the image of polygons due to translation and reflections.
M.8.5.1.2: Distinguishes and gives examples of events with more, "equal" or "less" probability.

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PRE-SERVICE PRIMARY TEACHERS' TPACK IMPROVEMENT THROUGH LISTENING ACTIVITIES: DESIGN, OBSERVE AND EVALUATE

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Abstract

Pre-service teachers are mostly trained with traditional methods in their institutions and as a result, they do not become competent in technology integration in education. To successfully integrate technology in education, it is necessary for teachers to have knowledge of the content and the pedagogical techniques to teach this content with technology (TPACK). The purpose of this study was to contribute to pre-service primary school teachers' TPACK. For this purpose, the content was selected as listening, the most ignored skill taught in language education. In a qualitative framework, a case study approach was utilized. Eight pre-service primary teachers were selected with convenience sampling from a public university in Turkey. For eight weeks, the pre-service teachers learned block-based visual programming and designed visual and audio listening texts in pairs. Their projects were undertaken with fourth grade students, and they observed the students' interactions with these projects. Upon the completion of this process, a semi-structured interview form, prepared by the researchers, was used to gather the pre-service teachers' views. Results showed that they increased their technological pedagogical content knowledge in the TPACK framework. They also developed a better sense of entertaining, active, and individual learning environments.

Keywords: TPACK, design-based activities, listening, pre-service primary teachers, teacher education

INTRODUCTION

Technology has become an indispensable component in the education field. As the implementers of technology in education, teachers' beliefs, attitudes, goals, will, and knowledge in technology are highly related with successful technology integration (Chen, Looi & Chen, 2009; Sang, Valcke, Van Braak & Tondeur, 2010; Vitanova, Atanasova-Pachemska, Iliev & Pachemska, 2015; Farjon, Smits & Voogt, 2019). However, when teachers' knowledge, attitudes, motivation, and skills towards technology are not at an adequate level, technology integration may not be successfully ensured (Malinina, 2015). Teachers' lack of training and skills impedes their effective use of technology (Alghasab, Alfadley & Aladwani, 2020). Their capability to use technology positively affects their technology integration (Instefjord & Munthe, 2017). Teachers' confidence with technology helps both their teaching and their students' learning (Lehiste, 2015). Before starting their professions as teachers, pre-service teachers need to receive training in technology at teacher education institutions. However, teacher education institutions do not take the advantage of technology and are inactive in this regard (Grudin, 2018), and teacher educators struggle with successful technology integration (Voogt & McKenney, 2017). Pre-service teachers need role models for technology use such as teacher educators (Tondeur, Scherer, Siddiq & Baran, 2020) and need training on technology to be included in their instruction (Instefjord & Munthe, 2017).

The International Society for Technology in Education (ISTE) (2008) standards recommend that teachers "design, develop and evaluate authentic learning experiences and assessments incorporating contemporary tools and resources to maximize content learning in context" (p. 1). Pre-service teachers' designing of technology-integrated lessons and educational instruments improves their level of technology competence along with their beliefs in technology in education (Lee & Lee, 2014; Chien, Chang, Yeh & Chang, 2012; Munday, Windham & Stamper, 1991). Teachers' self-efficacy has a positive impact on their technology integration in classrooms (Koh, 2011). Teachers' evaluation of technology-based learning environments (Kim, Xie & Cheng, 2017) requires them to have high technology self-efficacy.

Teachers who believe in the benefits of technology for students' learning are confident about their technology skills. These teachers are also the ones with the highest technological pedagogical content knowledge (TPACK) (Saubern, Urbach, Koehler & Philips, 2020). Moreover, teachers' TPACK affects their technology integration in education (Raygan & Moradkhani, 2020). TPACK necessitates teachers to have content knowledge, and pedagogical techniques to teach this content with technology's possibilities (Mishra & Koehler, 2006). TPACK does not consider content, pedagogy, and technology separately, but rather, interactions among these three components are necessary (Koehler & Mishra, 2009). Technology is used to design, implement, and evaluate instruction in the TPACK framework (Niess, 2011). Thus, teachers' knowledge improvement in technology is required to meet this necessity, and it can be gained in higher education institutions while they are in their pre-service years. Pre-service teachers who receive support in their teacher training institutions have strong self-efficacy, attitude and TPACK (Tondeur, Scherer, Siddiq & Baran, 2017). Yet pre-service teachers mostly fall behind in technology-related areas (Valtonen et al., 2017). For this reason, teacher education programs must educate student teachers for technology-integrated teaching environments (Zinger, Tate & Warschauer, 2018). Hereby, the need for successful implementation of technological practices can be fulfilled.

It is required for pre-service teachers to combine different knowledge types in their future profession (Ekmekçi, 2018), such as content, pedagogy, and technology (TPACK). The current study was conducted to contribute to pre-service primary teachers' TPACK. To achieve this goal, we selected *listening*, which is the most ignored language skill taught (Emiroğlu & Pinar, 2013; Tuzel & Keles, 2013; Sejdiu, 2017). To the best of our knowledge, only a small number of studies have worked on the listening subject in the TPACK framework. Designing technology-based learning activities, collaboratively working with peers, applying their knowledge in real classroom settings, having field experiences, and receiving continuous feedback have been suggested for improving pre-service teachers' TPACK (Dawson, 2007; Tondeur, Scherer, Siddiq & Baran, 2020). In this study, these recommendations were put into practice in the listening subject.

Based on the related literature, the research question is "What do pre-service primary teachers' designing, observing, and evaluating of TPACK activities tell us about their TPACK improvement?"

LITERATURE REVIEW

Technological pedagogical content knowledge (TPACK)

Teacher's' knowledge should include the following: "Content knowledge, general pedagogical knowledge, curriculum knowledge, pedagogical content knowledge, knowledge of learners and their characteristics, knowledge of educational contexts, and knowledge of educational ends, purposes, and values, and their philosophical and historical grounds" (Shulman (1987, p.8). From this list, Shulman (1987) underlined pedagogical content knowledge (PCK), in which content and pedagogy are combined to understand the arrangement of special topics and issues for learners with various interests and potentials, and are presented for instruction. PCK includes classroom management and organization and their combinations of teachers' knowledge, and it differentiates expert teachers from novice teachers. Teaching does not simply enhance students' understanding but it includes teachers having pedagogical content knowledge, the combination of knowing what to teach and how to teach (Shulman, 1987). Mishra and Koehler (2006) have added another component, technological knowledge, to Shulman's pedagogical content knowledge framework, in which technology has been coming to the

forefront. They included the technology component in the pedagogical content knowledge in their framework. The three components of TPACK are content, pedagogy and technology (Koehler, Mishra & Cain, 2013). Teachers' TPACK is formed based on the interactions among these three components. Specifically, teachers' technological pedagogical knowledge (TPK), pedagogical content knowledge (PCK), technological content knowledge (TCK), and TPACK are argued to be equally important.

TPACK has become an important model to understand whether teachers use technology successfully in teaching content supported with pedagogy (Sofyan et al., 2023). Saubern, Urbach, Koehler and Philips (2020) determined five levels of TPACK proficiencies for teachers. Teachers with the lowest level of TPACK proficiency have little or no confidence that they have the skill to assist students' learning with technology. Teachers with the middle level of TPACK proficiency are very confident that they have the skill to teach content by using technology. Teachers with the highest level of TPACK proficiency are extremely confident that their skills are enough to support students' deep learning by using technology. Teachers at this level believe that technology is extremely useful. As a result, teachers with the highest level of TPACK proficiency believe more in supporting students' deep learning by using technology than any other group of teachers.

Several strategies exist to improve pre-service teachers' TPACK (Tondeur, Scherer, Siddiq & Baran, 2020). First, teacher educators should be a role model in their classes. Second, pre-service teachers should discuss the roles, advantages and disadvantages of technology use. Third, they should design learning materials with technology to learn technology integration. Fourth, they should work together with their peers to create technology-based materials. Fifth, they need to apply their TPACK in a classroom environment. Finally, they need to be provided with continuous feedback on their understanding of TPACK. Using the strategies above, the present study provided a learning environment to improve pre-service teachers' TPACK. This aim was put into practice by having pre-service teachers design technology-based language materials in collaboration with their peers, trial these materials in classroom settings, and receive feedback during the whole process.

Hypermedia, multimedia, and communication media have been shown to be useful for teaching a language. However, language pedagogy combined with technology (Hoopingarner, 2009) and teachers' competency in creating such technology (Derewianka, 2003) are necessary. Audio-visual aids help students to effectively acquire language-related skills (Mathew & Alidmat, 2013). Moreover, such aids can be beneficial for both teachers' teaching and learners' learning of language-related skills (Al Mamun, 2014; Asadi & Berimani, 2015). Animated learning activities including audio-visual aids can be an alternative for teaching language skills. Some research even indicates that when teachers design animated activities for teaching, their attitude towards technology improves (Erümit, 2020). Thus, pre-service primary teachers in this study designed animated learning environments to improve their technology attitudes. They used static and animated visuals, which were representative of the listening texts, and story characters with audio-visual aids to design their stories. They specifically used a block-based visual programming language to create their listening activities.

Elementary school teachers, who rated themselves on their level of TPACK, had lower self-efficacy in terms of selecting and making use of appropriate technology to teach their content than secondary school teachers. Their self-evaluation for technological content knowledge (TCK) had the lowest score (Lehiste, 2015). In this respect, an improvement is needed especially in their pre-service education years. Pre-service teachers must develop both their TPACK and the pedagogical reasoning behind using technology in education (Voogt et al., 2018). In this sense, to strengthen their pedagogical views on technology integration, they should witness teachers using technology in classrooms. Classroom experiences are helpful specifically for pre-service teachers to gain familiarity in terms of the connections among technology, pedagogy, and content. Pre-service teachers can plan and implement technology-based courses with the support of these experiences (Mouza & Karchmer-Klein, 2013). Pre-service teachers' participation in technologically enriched classroom experiences while taking an educational technology course may increase their awareness of technology use in educational settings (Lux & Lux, 2015). Teachers' classroom experiences affect their educational beliefs and knowledge,

and vice versa (Levin & Wadmany, 2006). Improvement in beliefs and knowledge in technology is highly related to technology integration (Chen, Looi & Chen, 2009; Sang, Valcke, Van Braak & Tondeur, 2010; Munawar & Nasreen, 2022), which brings about pedagogical change in classrooms (Heath, 2017).

In language teaching, very limited amount of research in TPACK has been found in the literature. These studies focus on foreign language teaching (Aisyah, Setiawan & Munir, 2021; Baser, Kopcha & Ozden, 2016; Erten, 2022) or oral communication skills in second language teaching (Debbagh & Jones, 2018). Pre-service teachers receive training in creating technology-based language learning environments, such as augmented reality, to improve their TPACK (Belda-Medina & Calvo-Ferrer, 2022) in these studies. Native language teaching in a TPACK framework for pre-service teachers (Cheng, 2017) is very limited. In this study we selected language as the content in the TPACK framework. As one of the language skills, listening skill is important (Hoopingarner, 2009), yet teaching of listening skill is mostly ignored (Sejdiu, 2017; Tuzel & Keles, 2013). To the best of our knowledge, only a small number of studies looked at English language teachers' level of TPACK in teaching listening skills, and these found that teachers' level of TPACK was very low (Alnajjar & Al-Jamal, 2019; Rustanto, Nur & Mitriana, 2020). In these studies, teachers were either observed in their classrooms on TPACK or given surveys to obtain a better understanding about their TPACK level. None of these studies trained teachers or pre-service teachers to improve their TPACK in listening content. As a result, it is necessary to conduct studies training pre-service teachers to improve their TPACK by taking listening as the content.

This study aimed to advance pre-service primary teachers' TPACK in language teaching. We specifically wanted to fulfill this purpose with the technological instruments they created to give them a sense of ownership of the learning environment. In this regard, they learned about designing pre-, while- and post-listening activities based on the fourth-grade level within the scope of content knowledge. They designed these activities with technology to gain technological knowledge. While designing these technological materials, they focused on how students learn within the scope of pedagogical knowledge. As a result, all the three components of TPACK (i.e., technology, pedagogy, and content) were combined. During this process, they received continuous feedback from the researchers. Their technological materials were then trialed with fourth grade students in their classrooms. The research question in this study was "What do pre-service primary teachers' designing, observing, and evaluating of TPACK activities tell us about their TPACK improvement?"

METHOD

Research model

In colleges of education, student teachers receive training in their content areas. During this education, they are mostly trained with traditional methods. Although pre-service teachers' educators should be role models in technology use (Tondeur, Scherer, Siddiq & Baran, 2020), teacher educators already struggle with productive technology use and technology integration (Voogt & McKenney, 2017). Instructors mostly use technology to continue their traditional teaching methods, rather than using technology as a replacement for traditional teaching tools or supporting existing practices (Cuban, 2001). This situation might be a result of the educators' lack of knowledge or attitudes towards the use of technology. Even if pre-service teachers may feel comfortable with technological tools, they are not capable of successfully integrating technology in education (Martin, 2018). Accordingly, student teachers are unaware of the effect of technology in education.

We observed that in their classroom presentations and assignments during their education in college, pre-service teachers rarely or unsuccessfully take advantage of technology. For this reason, we wanted to provide the pre-service teachers with a learning environment to develop technology-based listening materials and witness students' learning with technology in classroom environments. With this purpose, a case study approach was utilized in this study. A case study describes and investigates a system and focuses on a case, program, or fact in detail (Merriam, 2009). It is based on real events, takes a phenomenon into account, and presents a variety of perspectives. According to Merriam (2009), a theoretical framework must be placed in qualitative research and be the basis of all studies, although

many claim the opposite. In this respect, we took the TPACK framework into account when designing our study. Using a case study approach, we trained pre-service primary teachers to improve their TPACK.

Procedure

The pre-service teachers received training utilizing the TPACK framework throughout an eight-week study period. In the TPACK framework, in the scope of content knowledge they first learned how to teach fourth grade students' listening skill, which is one of the language skills. This training was completed in a Language Teaching course. They learned how to design pre-, while- and post-listening activities in the fourth-grade level. In the scope of pedagogy content of the TPACK framework, they learned how students learn with the most appropriate strategies. In the scope of technology content, they learned how to design technology-based listening materials with the use of visuals, sounds and animated objects to support students' learning. This whole training period was completed concurrently to better support pre-service teachers' TPACK. They designed technology-based listening texts, which were then undertaken with students. Upon the completion of the training period, fourth grade students completed these listening activities in an individual learning environment, where pre-service teachers observed the students' learning activity. The researchers also observed the learning experiences of the pre-service teachers. Their views were then gathered with open-ended interview questions. The study procedure can be summarized as below:

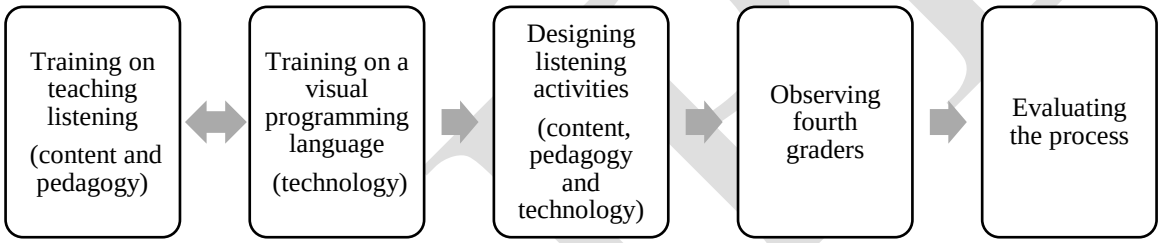

Figure 1. The procedure of the study

Participants

The pre-service teachers (n = 8) were in their third year at the Department of Primary Education in a public university. We used convenience sampling to select the participants attending the university where the research was conducted. The participants were selected on a volunteer basis. The pre-service teachers took the Turkish Language Teaching course for the very first time. Accordingly, learning how to teach listening using appropriate pedagogical methods was a very new concept for them. Also, they received training in designing technological materials for the first time. As a result, their TPACK level was expected to be very low. Their names are not disclosed in the study. They are instead named PTs (an abbreviation of pre-service teachers). Their demographic information is as follows:

Table 1. Demographic information of the participants

Variables	Categories	n	%
Gender	Female	3	37.5%
	Male	5	62.5%
GPA	2.00 – 2.49	-	-
	2.50 – 2.99	4	50%
	3.00 – 3.49	4	50%
	3.50 – 4.00	-	-
Perceived technology confidence level	Very poor	-	-
	Poor	-	-
	Neither poor nor good	4	50%
	Good	4	50%
	Very good	-	-

Training

The training and designing of the projects were completed in eight weeks. During this eight-week period, the pre-service teachers took the Language Teaching course from one of the researchers who is an expert in language teaching. In this course, they learned how to teach listening skills to primary school students along with pedagogical methods. To help them design their technology-based listening materials, the pre-service teachers were taught block-based visual programming by one of the researchers who is an expert in programming and instructional technology. In the eight-week long training process, the pre-service teachers learned the basics of the programming language and completed small homework assignments based on what was covered in each class. They then built their technology-based listening activities with visual block-based programming for fourth grade students. The listening texts were chosen from a textbook prepared by the Ministry of National Education (MNE, 2015). During their creation of the digital listening material, we provided help and feedback on their projects. Upon the completion of their projects, the projects were checked and edited for content, workability and appropriateness issues and then trialed with fourth grade students.

Materials

Technology-based listening materials

The pre-service teachers designed listening activities with a visual block-based programming language. For this, they created pre-, while- and post-listening activities including static and animated visuals illustrating the listening texts. The while-listening activities included not only animated and static pictures but also pre-service teachers' voice recordings of the texts. An animated character asked text-related questions and an answer button was provided for students to respond to these questions in the pre- and post-listening activities. In these activities, by considering its positive outcomes for learning (Hattie & Timperley, 2007; Pérez-Segura, Sánchez Ruiz, González-Calero & Cózar-Gutiérrez, 2020; Wisniewski, Zierer & Hattie, 2020), each listening activity included individual feedback for students.

Interview form

The researchers prepared a semi-structured interview form to gather the pre-service teachers' views about the process. This form included items related to participants' demographic information and open-ended interview questions revealing their views about the process: Their genders, ages, GPAs etc., their experiences with designing listening activities, the implementation of the activities, their evaluation of the projects, and their future project plans. Before administering this form to participants, the views of two experts in the field of language and instructional technology were obtained on the questions used in the form. Based on the views of the experts, the form was given its final shape.

Data analysis

The findings from the interview questions were analyzed with descriptive analysis. For this, two individual coders created codes, categories, and themes. The themes were grouped under "training in coding", "implementation", and "evaluation and future projects". We calculated the inter-rater reliability between coders with the formula suggested by Miles and Huberman (1994): "Number of Agreements / (Number of Agreements + Disagreements)". The reliability score was .85.

RESULTS

The pre-service teachers designed their own technology-based listening materials for fourth grade students in this study. They were trained on campus with block-based visual programming to create their listening materials, which were administered to the students. The aim was to enhance the TPACK of pre-service teachers and give them a better understanding of how technology is used in classrooms. In the TPACK framework, they were trained in content, pedagogy, and technology in this study. Initially, they learned about teaching listening skills consisting of pre-, while- and post-listening activities. For these activities, they learned about pre-listening activities (e.g., guessing the content of a text from the visuals), while-listening activities (e.g., predicting the remaining events of a listening text after pausing at some parts) and post-listening activities (e.g., answering text-related questions). Then, they learned how fourth grade students learn with effective teaching strategies (e.g., drawing students'

attention to learning activities for educational purposes). Finally, they learned about designing technology-based listening activities to improve their technological knowledge (e.g., computer programming, selecting, creating, and using static and animated visuals, and adding sounds). As a result, they combined their skills within this framework to create their technology-based listening activities. These activities were then trialed with fourth grade students. In classroom settings, the pre-service teachers observed the students interacting with the listening materials. At the end of the process, we interviewed the pre-service teachers. The results are summarized in the following tables.

Theme 1: Training in Coding

Table 2. Pre-service teachers' positive and negative thoughts about the coding training

THEME: TRAINING IN CODING		
1st Category	**Codes**	**PT#**
	Entertaining learning	PT3, PT6, PT7, PT8
	Technology-age appropriateness	PT1, PT8
	Technology competency	PT2, PT5
	Concretization	PT4, PT6
Positive	Being active	PT1
Thoughts	Practical/Creative thinking skills	PT2
	Easily applicable	PT8
	Experience	PT3
	Feedback	PT7
	Motivation	PT7
	No negative thoughts	PT3, PT5, PT8
	Must be improved	PT1
Negative	Coding error	PT2
Thoughts	May take teachers' role	PT4
	Technological issues	PT6
	Time-consuming	PT7

Some of the pre-service teachers' positive thoughts about the training in coding were entertaining learning, technology-age appropriateness, increasing technology competence, and concretization. Based on this, some of the quotes from the interviews were as follows:

> PT1: Coding is a must for technology-age children. It is helpful for those whose aim is to produce knowledge, to be more active.
>
> PT2: Thanks to the coding training, I learned how to use computers better. Most importantly, I gained new skills in practical and creative thinking.
>
> PT4: It is a new and interactive way to reflect the imagination in a virtual world.
>
> PT7: It was very good that the students obtained feedback by directly interacting with the listening texts. The best part of it was that they were entertained and they learned.

Their negative thoughts about the training in coding were that it must be improved, coding errors were difficult to handle, and it decreased the value of professional worth. However, three pre-service teachers thought that there was no negative side to this training. Based on this, some of the quotes from the interviews were as follows:

> PT1: It is necessary to improve block-based visual programming and make better use of it.
>
> PT2: We struggled with having coding errors at the very beginning.
>
> PT6: I think it will be a problem if we don't have enough computers when we apply it to our students.
>
> PT8: I have no negative thoughts. Everything I acquired from the coding training was very effective and good.

Table 3. Pre-service teachers' thoughts about individual and professional contributions

THEME: TRAINING IN CODING		
2nd Category	**Codes**	**PT#**
Individual Contributions	Develops creativity	PT4, PT8
	Coding skills qualification	PT3
	Learnt to be patient	PT5
	Increasing technology use skills	PT6
Professional Contributions	Entertaining education	PT5, PT6, PT7, PT8
	Coloring my professional life	PT1, PT8
	Computer-based learning	PT1
	Getting to know students	PT2
	Individual teaching	PT4

The pre-service teachers' thoughts about the individual and professional contributions of the training were that it develops creativity, supports entertaining education, helps in getting to know students and improves coding skills. Based on this, some of the quotes from the interviews were as follows:

> PT3: The training has especially contributed a lot to my profession. I can share this knowledge with the people around and design good activities with my students. This knowledge may give me the opportunity to implement much better-quality education.
>
> PT4: Coding is a field where I can entertain myself and develop my creativity. Professionally, it can effectively support my students' individual learning.
>
> PT5: I think it contributed a lot both individually and professionally. We learned a lot from the coding training. First, we worked very hard and learned how to be patient. We can make our learning activities entertaining thanks to the training we received.
>
> PT6: Thanks to the training, I can teach classes in an entertaining way. Individually, I have started taking advantage of technology better.

Theme 2: Implementation

Table 4. Pre-service teachers' feelings during implementation

THEME: IMPLEMENTATION		
3rd Category	**Codes**	**PT#**
Feelings during implementation	Happiness	(PT2, PT3, PT4, PT5, PT6)
	Excitement	(PT4, PT5, PT6, PT8)
	Sense of professional worth	(PT1, PT7)
	It feels great	(PT1)
	Tiring	(PT3)
	Proud	(PT4)

We asked the pre-service teachers what they felt when their projects were put into practice. Most of them said they were happy and excited. Some of their comments were as follows:

> PT1: It was a great feeling for me. I realized that what I was doing was very precious after receiving positive comments from the students. I hope I'll experience similar feelings when I become a teacher.
>
> PT3: It was a long and tiring process to prepare the projects. However, after seeing that the students completed the tasks with joy, we became happy.
>
> PT5: We were very excited when the students completed our projects because we had worked very hard. Seeing the students' excitement and happiness made us happy.

Table 5. Pre-service teachers' thoughts about the benefits of the implementation for students

THEME: IMPLEMENTATION		
4th Category	**Codes**	**PT#**
Benefits	Active learning	PT1, PT2, PT4
	Individual learning	PT1, PT7, PT8
	Better comprehension	PT2, PT5, PT8
	Learning with technology	PT3, PT4, PT6
	Enjoying the activities	PT3, PT5, PT6
	Contributing to the imagination	PT3
	Out of routine	PT6
	Permanent learning	PT7

The pre-service teachers observed students during the implementation process of their projects. According to their comments, the benefits of this practice were as follows:

> PT2: It is definitely a very useful activity because students become more active and comprehend the listening texts better.
>
> PT6: I certainly think that it is beneficial for students. It provides students with an out-of-routine learning activity. Students enjoy the activities in an untraditional learning environment. Moreover, we will be engaging with technology more and I think this is important.
>
> PT7: I think that the students learned willingly in an individual learning environment. Since they interacted with technology in an interactive learning process, learning can be permanent.
>
> PT8: I think it is useful for students. Because they answer questions from what they have listened to individually, it will increase their learning and success levels.

Table 6. Pre-service teachers' thoughts about the most impressive experience during the implementation

THEME: IMPLEMENTATION		
5th Category	**Codes**	**PT#**
The most impressive experience	Students' excitement/happiness	PT3, PT6, PT7, PT8
	Students' admiration	PT2, PT6
	Students' wish to recomplete the activities	PT2, PT8
	Students not familiar with computers	PT4
	Students' interest in technology	PT5
	Figure, music, and speech synchronization	PT1

The impressions of the pre-service teachers during the implementation process were students' excitement and happiness, how they admired the listening materials, their "Can I do it again?" questions, and a student with autism who also benefited from this learning environment. Based on this, some of the comments were as follows:

> PT1: Block-based visual programming provides visual, music and speech work together. It impressed me that all these things worked mutually for the students' learning.
>
> PT8: I observed that the students enjoyed it and became excited when working on our projects, responded to the questions carefully, and were willing to recomplete the activities.

Theme 3: Evaluation and Future Projects

We asked the pre-service teachers which one of the projects other than theirs was the most effective and why. Our reason for this was to learn how they would evaluate a good project under the same conditions as for those who are the creators of a technology-based teaching environment.

Table 7. Peers' project evaluation

THEME: EVALUATION AND FUTURE PROJECTS		
6th Category	**Codes**	**PT#**
Peers' project evaluation	Visuals	PT2, PT6, PT8
	Animations	PT2, PT3
	Reflecting the text into coding	PT4, PT5
	Entertaining	PT6
	Extensive activity	PT8
	Concretization	PT1
	Gamification	PT2

Their comments were as follows:

> PT2: It was rich in terms of visuals and animations. The exercises were prepared in a game format.
>
> PT4: Everything was in detail. The text was very well reflected in the block-based visual programming.
>
> PT6: It was completed visually well and effectively. The exercises were entertaining.
>
> PT8: The visuals and the exercises were quite extensive and effective.

Table 8. Prospective projects

THEME: EVALUATION AND FUTURE PROJECTS		
7th Category	**Codes**	**PT#**
Prospective projects	Text exercises	PT3, PT4, PT5
	Supporting practical thinking	PT2, PT4
	Supporting active learning	PT2
	Game activities	PT3
	Arousing curiosity for learning	PT1
	Increasing reading speed	PT4
	Difficult subjects	PT7
	Supporting permanent learning	PT8

We asked the pre-service teachers what type of technology-based teaching activities they would create in the future. Some of the quotes from the interviews were as follows:

> PT3: I will design activities based on students' interests. I think students will learn more with games. For this reason, I can develop game activities. Additionally, text exercises can be designed so that students may become more active.
>
> PT5: I think we can design almost all the texts with this programming tool. I can especially design entertaining and instructive text exercises.
>
> PT7: I can design difficult and challenging subjects.

DISCUSSION, CONCLUSION and SUGGESTIONS

Adding the technology component to Shulman's (1987) pedagogical content knowledge (PCK) framework, Mishra and Koehler (2006) suggested teachers' TPACK including the interacting knowledge of pedagogy, content and technology. What to teach and how to teach in combination with technology are at the core of the TPACK framework. Tondeur, Scherer, Siddiq and Baran (2020) recommended strategies to support teachers' TPACK: Having a role model for using technology, discussing the pros and cons of technology, designing technology-based instruments, having peers' support, applying TPACK in real settings, and receiving continual feedback. Using most of these strategies, this study has attempted to increase pre-service primary teachers' level of TPACK. They learned the listening subject, pedagogical methods to teach this content, and integrating technology with content and pedagogy. They designed technology-based listening instruments for students. They

received feedback during this process. Their projects were trialed with fourth grade students in their classrooms, and they reflected on their experiences and observations regarding the process.

Based on our observations, pre-service teachers' ability in selecting visuals, searching for lesson plans, preparing presentations, and combining technology-based resources is mostly at a very low level in general. This situation might be a result of having a mostly traditional education and technologically low-skilled teacher educators. That is because teacher educators mostly lack technology knowledge and their attitudes towards technology integration is not at an adequate level (Martin, 2018). In the TPACK framework, teacher educators' technology knowledge is lower than their content and pedagogical knowledge (Sutrisno et al., 2023). Yet teacher educators with a high level of technological competency induce pre-service teachers to have more self-efficacy to expand students' learning (Nelson & Voithofer, 2022). Thus, pre-service teachers' technology skills will be increased with the help of their teacher educators in their institutions so that they know how to use technology resources effectively for educational purposes. Additionally, they will be able to design technology-based educational instruments, as mentioned in the literature (e.g., Chien, Chang, Yeh & Chang, 2012; Lee & Lee, 2014; Tondeur, Scherer, Siddiq and Baran, 2020). In the present study, pre-service primary teachers' comments about designing technology-based learning instruments shed light on whether designing such materials and observing students' interactions with these materials will be beneficial for their technology skills. The five levels of TPACK for teachers proposed by Saubern, Urbach, Koehler and Philips (2020) range from not being confident to being extremely confident to support students' learning with technology. The pre-service teachers' confidence in technology increased in the sense that they believed that their technology competencies, technology use skills, coding skills and belief in technology-based learning increased. Accordingly, based on the related literature, we can claim that pre-service teachers' TPACK level can be improved in the same way as in the present study.

Audio-visual supports are helpful for students' learning and teachers' teaching of language skills (Mathew & Aidmat, 2013; Al Mamun, 2014). While designing their technology-based listening materials, the pre-service teachers used static and animated visuals, and audio. For them, in a non-traditional learning atmosphere, such technological elements worked together to support student learning in an entertaining way. An effective technology-based listening material must include static and animated visuals. This is promising, since the pre-service teachers recognized the benefits of technological features in terms of learning support. This result is consistent with Erümit's (2020) study revealing that when teachers design animated activities for teaching, their attitude towards technology improves. Using these elements supports students to effectively gain language-related skills. In conclusion, pre-service teachers can recognize the effective elements of technology-based listening materials such as animation and visuals by being involved in classroom settings, where their projects are implemented. Thus, their technological knowledge (TK) within the TPACK framework can be supported with the process used in the present study.

The interviews revealed that this environment promotes active, permanent, and individual learning. It is out-of-routine, helps better comprehension and contributes to the imagination. The pre-service teachers were mostly impressed by students' high interest in the technology-based listening materials they created. The pre-service teachers' reactions are consistent with our observation. The fourth grade students paid full attention to the listening activities presented each week. They wanted to continue even more activities and asked whether they would complete similar activities. Being involved in the whole process helped the pre-service teachers get to know the students better and learn how to support students' learning before even starting their professions. As recommended by some studies in the literature (e.g., see Voogt et al., 2018), the pre-service primary teachers recognized the pedagogical benefits of the use of technology in classrooms. In addition, they learned how technology could be used to focus on students' level and interest. As a result, we can claim that such an action supports pre-service teachers' pedagogical knowledge (PK) and technological pedagogical knowledge (TPK) within the TPACK framework.

In the related literature it was stated that relying on readily available materials could be detrimental for pre-service teachers' creative thinking skills (Agyei & Voogt, 2015). Mishra and Koehler (2006) advocate that teachers must accommodate themselves to new technologies and not only take advantage of available tools. In the present study, the pre-service teachers used a block-based visual programming language to create their own listening materials. Mostly such learning platforms are easy to learn for all ages with their user-friendly interfaces (Hu, Chen & Su, 2021). The pre-service teachers believed that designing learning materials with coding improved their practical and creative thinking skills. As a result, we can claim that pre-service teachers' creating their own teaching materials can be supportive for their creative thinking skills rather than using available technological tools. Teacher education programs should use such learning platforms and design activities for pre-service teachers to support their thinking skills.

Will is the strongest predictor of technology integration among the *will*, *experience*, *skill*, and *tool* elements (Farjon, Smits and Voogt, 2019). The pre-service primary teachers had the will to create and incorporate technology in their future classrooms. They had the intention of creating activities supporting practical thinking skills, improving students' reading speeds, supporting active and permanent learning, teaching specifically difficult subjects, and using games. These examples show their willingness to incorporate technology in their future classrooms. Moreover, they felt professional worth by implementing technology-based listening activities for students. This process taught them a teaching method which they believed would color their professional lives in the future. They gained confidence and developed positive feelings for technology. Teachers' attitude toward technology is a crucial element in improving their TPACK (Yulisman, Widodo, Riandi and Nurina, 2019). Teachers' technology integration can be predicted from their TPACK and attitudes (Raygan & Moradkhani, 2020). As a result, we can claim that the pre-service teachers' TPACK improved.

The ISTE (2008) standards recommend that teachers "design, develop and evaluate authentic learning experiences and assessments incorporating contemporary tools" (p.1) so that they can increase the level of learning in context. Additionally, it is essential for teachers to evaluate technology-based resources to decide what suits their classes best (Kim, Xie & Cheng, 2017). In this study, the pre-service primary teachers designed, developed, and evaluated students' use of technology-based projects in an actual learning environment. They regarded the good projects as the ones having good visuals and animations, being in a game format, having audio-visual synchronization, and successfully reflecting texts into technology-based learning. They commented on these features as the ones improving students' active learning, interaction with the learning environment and willingness to learn. As a result, we may conclude that the pre-service teachers reached the stage of evaluating technology in education.

In sum, the pre-service teachers designed, developed, and evaluated their own technology-based listening materials. For this, they learned coding with a blocked-based visual programming tool. They then observed the students, who completed the listening materials they had designed. In conclusion, they believed that they increased their technology use skills (TK), developed awareness of how students learn (PK), learned how to teach pre-, while- and post-listening activities (CK), and acquired a sense of professional worth. They confirmed that designing such a learning environment was easy and that they could develop new projects in the future. More importantly, they believed that students' willingness to learn can be increased with such a learning environment. Their confidence in teaching in the TPACK framework increased. Thus, we may conclude that their technology pedagogy content knowledge (TPACK) increased. As consistent with Santos and Castro's (2021) study, the pre-service teachers developed their knowledge in the content of TPACK.

Finally, the following can be implied from the study:

- Pre-service teachers' confidence in technology may be increased and their TPACK may be improved by designing, observing, and evaluating technology-based learning environments.
- Teacher educators may consider providing pre-service teachers with the experience of applying technology in real classroom settings.

- Digital materials designed by pre-service teachers should be given feedback in terms of pedagogy, content, and technology in the TPACK framework so that they can familiarize themselves with the elements necessary to support learning.

Recommendations for Researchers

Students' learning of language skills that enable them to understand what they listen to and read, and to express themselves orally or in writing prepares them for life and affects their success in other courses. Considering primary school students are mostly digital learners, it is important to present language skills to students with technology-related materials. Teachers are the implementers of technology, and they need to be well prepared in technology-related skills. This study was about designing, developing, and evaluating technological materials for the listening skill in the TPACK framework for pre-service teachers. However, it is the subject of research to investigate whether such an action has a similar effect on other language skills. For this reason, it may be suggested to researchers to conduct other studies in TPACK to support pre-service teachers in designing, developing and evaluating their own language-related and technology-based materials.

Recommendations for Practitioners

We suggest similar actions for teacher educators. To be able to integrate technology into their future classrooms, pre-service teachers need assistance with technology-related skill development. Specifically, their intentions to integrate technology can be improved by having them witness the use of technology in classrooms. In the present study, we suggested such an action and observed positive results. Teaching technology as isolated facts does not help teacher candidates. Pre-service teachers must receive support in their TPACK for a successful technology integration before beginning their careers.

Limitations

This study was limited to the data gathered from eight pre-service primary school teachers, the listening skill, and an eight week-long training process.

Ethics and Conflicts of Interest

Research approval was obtained from the ethics committee of Kafkas University Ethics Commission dated 20.10.2021 and numbered 23. Participation in the study was completely voluntary. There is no conflict of interest to declare among the authors. The authors acted in accordance with the ethical rules. No funding was received for conducting the study.

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A MODERN PROBLEM FACED BY PRIMARY SCHOOL STUDENTS IN DISADVANTAGED REGIONS: THE TEACHER INFLUENCER

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Abstract

Some young and inexperienced teachers working in rural and disadvantaged areas in the city center of Turkey have the habit of constantly producing digital content and sharing virtual videos in classrooms/schools. Thus, the students become the material of virtual trade. The process of becoming a teacher influencer and its effects on the students were examined in detail. The research had a phenomenology design as one of the qualitative methods. The data were collected from the teachers of various teaching areas (n=201). According to the findings, the majority of the teachers participating in the research thought that being a teacher influencer, and teacher influencers caused damage to the students and violated children's rights.

Keywords: Disadvantages regions, primary schools, teacher influencers, social media.

INTRODUCTION

The internet plays a crucial role in the change and development of teachers who have been seen as craftsmen of the spirit (Topçu, 2016) since the past. In this change, social networks such as digital platforms, online courses, and social media (Facebook, Instagram, Twitter) used for effective teaching are an important, influential and helpful part of teaching processes (Ajjan & Harsthone, 2008; Marcelo & Marcelo, 2021). Significantly, the integration of smartphones into our lives and the diversity of social media platforms are attractive to many teachers. These developments are undoubtedly a good opportunity for effective teaching. Similar ideas are found in the research conducted by Menteşe (2013). Moreover, Erçetin and Menteşe (2013) emphasized the importance of teachers using social media in a positive, controlled, wise, and constructive way for the new generation of students called 'digital natives'. However, the level of benefiting from them may get out of control over time. Undoubtedly, some teachers can be swept away in this cycle. Erişir and Erişir (2018) also emphasized this lack of control in teachers. Thus, teachers find themselves in an unauthorized and uncontrolled sharing of videos/photos (Küçükali & Serçemeli, 2019; Serin, 2019). On the other hand, the intermediary role of social media in making people famous in a short time and its ability to reach the masses sabotage this positive purpose and unconsciously feed this uncontrollability (Shelton et al., 2020). This situation is considered worrisome as Carpenter and Harvey (2019) stated. In this process, some teachers are attempting to turn this aspect of social media into an opportunity to become popular, as Serin (2019) puts it. Popularity here is essentially an effort to become an influencer. This role of social media providing students with digital content, information, projects, and many other activities, especially via smartphones, is succumbing to the ambition of becoming famous, popular, and an influencer over time. These determinations are also found in the results of the research conducted by Shelton et al. (2020). As a result, students are forgotten due to 'techno-neglect' towards students (Goodwin, 2018) in those who are immersed in digital devices. So, students turn into a tool rather than a goal. In other words, classroom environments and students used to create digital content on social media are now turning into springboards for teachers to become popular influencers. In this situation, the teacher asserts themselves more (Shelton et al., 2020). Along with digitalized teachers, students are treated as extras

and decoration tools. Thus, as Selwyn (2010) states, teachers tend to use social media uncomfortably. Therefore, this process needs to be explained and discussed comprehensively.

Teacher Influencer

Popularity is a concept we frequently hear with the spread of social media. The idea of social media influencers (SMIs) in the literature section (Carpenter et al., 2022) meets this popularity. In this context, people become social media influencers on the way to create an audience and become famous by constantly sharing their experiences and various ideas on social media (Audrezet et al., 2018). These issues brought by sharing every moment, informing every moment, creating a virtual fan base, and seeking solace in that world are also expressed by Sayar and Yalaz (2019). In this context, they consider social media as "tribal narcissism". In other words, being an influencer essentially includes narcissism, more precisely, digital narcissism (Kittinaraporn, 2018). Narcissism, on the other hand, is a personality-related illness according to the DSM-IV criteria published by the American Psychiatric Association (APA) (Hopwood et al., 2012). However, this does not mean that being a social media influencer is wholly exposed to such a generalization. However, the masses who are afraid of missing the developments on the way to becoming an influencer (fear of missing out) feel a constant need to share without letting go of their smartphones for a moment (Kardaş, 2020). This is becoming an addiction and disease. Even being without a phone is defined as a particular problem (nomophobia) (Goodwin, 2018; Sayar & Yalaz, 2019). However, as it is understood in the research conducted by Brooks et al., (2021), individuals become social media influencers after being rated with a fine reputation as a result of their performance and the capital they have accumulated. After all, this is a virtual career (Altun, 2019).

Like many other groups, some teachers are starting to look for a place in this network, that is, in the process of becoming a social media influencer. It can be said that the concept of ‘education influencer' (Carpenter et al., 2022; Marcelo & Marcelo, 2021) is close to this situation of teachers. Teachers in this context take part in this network by constantly sharing pictures and videos of students (Temel & Davulcu, 2021). Dobrilă (2021) also points out that teachers do not know their practical and correct use (Den Beem et al, 2020) by drawing attention to these posts and stating that this violates children's rights and privacy (American Board, 2016) and its risks. The violation created by this uncontrolled sharing (Erisir & Erişir, 2018; Keith & Steinberg, 2017), which makes a digital identity unaware of the students, eventually turns into the problem of being a teacher influencer, addiction (Picture 1). Shelton et al. (2020) also point out that this contradicts traditional teaching, which considers students’ benefit.

Similarly, Warnick et al. (2016) draw attention to this issue, emphasizing that the effects on individuals/students turn into profit motives, confirming this situation. In addition, as a result of this trade, by providing material and aid support to schools (Carpenter et al., 2020), this situation is almost legitimized. In this trade, the more students and place content served, the higher they will be on their way to becoming influencers (likes, followers). In the research conducted by Cino and Vandini (2020), this situation is evaluated as creepy and it is stated that the teacher should be busy with teaching, not with likes and followers. As the purpose is not to teach, it is inevitable for the student to be used in the trade of becoming famous. Trying to be an influencer that almost commercializes schools (Saldaña et al., 2021) makes students become a part of virtual commerce. In other words, this trade emerges as an inevitable result of the problem of being a teacher influencer. Carpenter et al. (2022) state that followers are seen as customers by the influencers, which almost confirms this trade.

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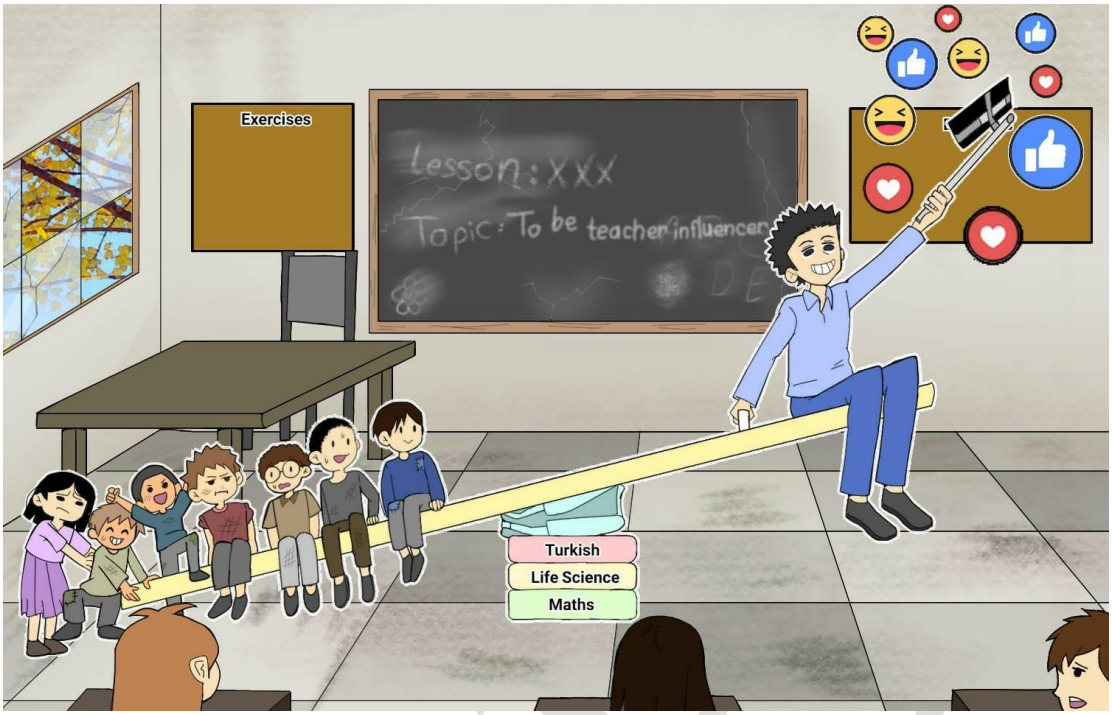

Picture 1. The photo taken by the teacher who wants to be an influencer during the lesson (Source: The picture was designed by the researcher, inspired by the Instagram shares of the influencers. It is representative).

The main purpose of an influencer teacher is to be famous (Küçükali & Serçemeli, 2019), to create an audience, to receive advertisements, and to increase the number of likes and followers. Schmidt (2020) pointed out that trying to get likes is an illness. On the other hand, Carpenter et al. (2022) emphasize that the primary goal of teacher influencers is to become popular on social media platforms and to make money using this popularity (Serin, 2019). These people are considered as micro-celebrity or brand ambassadors (Saldaña et al., 2021), unlike those who are ordinary and famous for activities that require effort in daily life (Senft, 2008). In addition, Selwyn (2019) states that the term edo-famous is used for teachers in this context. Microcelebrities advertise some brands with live broadcasts and organize various raffle contests (Saldaña et al., 2021; Shelton et al., 2020). Thus, a teacher influencer's pedagogical purpose remains in the background. Indeed, Carpenter et al. (2022) also state that teachers move away from being beneficial to their students and professions in this way. They instantly upload photos and videos to social media (Duran & Bayar, 2020). Aslan and Durmuş (2020) also mentioned these in their research. The scary thing is that sometimes students might do the video footage and every activity in the classroom is shared instantly. The student is abused both as a material and as a video shooter. This problem raises the question of 'When does the teacher have his lesson while doing all these?'. Selwyn (2019) states that this takes a lot of time, and this question emerges again. Şad and Demir (2019), on the other hand, expressed the opinions of teachers that the use of social media outside of school/class hours is more effective for students. Therefore, he states that social media can be an effective educational tool (Carpenter et al., 2022). On the other hand, the harms of uncontrolled digitalization (Schmidt, 2020), which are ignored and not restricted due to various excuses, are not subject to sanction, and teachers in this context are considered successful. In fact, from time to time, these teachers are rewarded and invited to various programs. Schroeder et al. (2021), on the other hand, admits that he was inspired by and received support from teacher influencers. However, there are examples from different countries indicating that this situation is serious, and this violation should be avoided (American Board, 2016). In Turkey, there are no sanctions other than an official letter sent by the Ministry of National Education to schools (MEB, 2017).

By issuing a circular letter numbered 2017/12, the Ministry of National Education warned about sharing student pictures/videos and teacher pictures/videos on social media channels such as Facebook, Instagram, Twitter, and Youtube (MEB, 2017). Obeying this rule varies according to the school and the teacher (Schmidt, 2020). It has been emphasized that legal action will be taken against those who share illegally. In the research conducted by Cino and Vandini (2020), the parents confessed their discomfort. They stated that it was a school procedure, and the school did not get their permission. They also said that this situation discomforts even some teachers. Serin (2019), on the other hand, draws attention to the fact that children who are not taken permission may take legal action against pictures, sounds, and images in the long run. It is also underlined that sharing photos/videos without permission will be punished with imprisonment according to articles 136, 137, 138, 139, and 140 of the Turkish Penal Code (TCK, 2004). However, no concrete sanction was encountered regarding this issue. Aw et al., (2020) also attribute the absence of enforcement to the lack of inspections.

On the other hand, teachers have problems using social media for professional or personal purposes. In other words, teachers do not have enough knowledge about using social media (Fox & Bird, 2015; Toker, 2021). Besides, the absence of sanctions encourages teachers' photo/video shooting even during break times. Serin states that most of the video shoots for classroom activities include child abuse (Serin, 2019; Toker, 2021) (Picture 2). These photos, videos, and comments are mentioned everywhere (Shelton et al., 2020) even in teachers' rooms. Over time, similar behaviors begin to emerge in students who follow in teachers' footsteps. Students become so immersed in social media that they forget their responsibilities at school (Duggan et al, 2015; Sakinah Nuraini et al., 2020). Ultimately, before reaching high school, the efforts of many students may turn into becoming social media influencers or YouTubers. The social, economic, and psychological consequences of this situation are worth investigating. Demirtaş (2017) draws attention to the fact that students spend time on social media rather than playing games during breaks.

Picture 2. Some teacher influencers record videos all the time rather than teaching (Source: The picture was designed by the researcher, inspired by the Instagram shares of the influencers. It is representative).

The concept of teacher influencer and studies in this field have not been fully touched upon in the literature in Turkey. However, in the literature, there are studies on the idea of being a popular teacher (Serin, 2019) and positive news titled "teacher influencers" (Ülkar, 2019). Though not directly related to the subject, in the international literature, a limited number of studies on teachers' efforts to become an influencer are found. (Carpenter et al., 2022; Marcelo & Marcelo, 2021; Shelton et al., 2020). These studies are also relatively new. Carpenter et al. (2022) point out that this relationship between social media and teachers was of limited interest to researchers and draw attention to the lack of research on this issue. Another point about the teacher influencers is that these teachers mostly work in certain regions of Turkey. Although these teacher influencers work in village schools in the western regions of Turkey (Ülkar, 2019), this phenomenon is more common in schools, especially in rural and disadvantaged areas in the city centers of Turkey. Teachers in these regions are also relatively younger and inexperienced teachers. It is possible to reach this opinion from the social media posts of teachers who are being an influencer. Cino and Vandini (2020) also stated in their research that young and inexperienced teachers make such posts more often. On the other hand, teachers who are being an influencer, are attracted by social media due to the reflections of the linguistic differences and deficiencies caused by bilingualism in the students in these regions (using words from the first language becomes the subject of dialectal humor), the unique geographical-cultural structure of the region, the low professional seniority of the teachers, the parents' not having enough information about the abuse, the weakness of the relationship among the parents, and the school. The excitement of the students, perhaps for the first time being filmed and photographed, leads them to accept the situation. Toker (2021) draws attention to the fact that disadvantaged groups who have language problems and poor students are abused in this regard.

Mainly primary school students are affected by the teacher influencers. Selwyn (2019) also states that the teacher influencers are seen especially in primary school students. However, it is possible to encounter even the abuse of preschool children. Shelton et al. (2020) state the existence of this phenomenon from kindergarten to 12th grade in this process. Primary school students, whose willpower and questioning skills have not developed enough, think video recordings are part of teaching. The difference between this research from other studies is that: In this research, attention was drawn to the negative consequences of teacher influencer. It aimed to reveal the effect of the uncontrolled and unconscious use of social media by teachers on students. With this awareness, it may become possible for teachers to be more careful in using smartphones and taking videos in the classroom. In addition, sabotage of lessons and neglect of students will be prevented due to frequent video shootings without pedagogical content.

Research Questions

1. What are the views of primary school teachers on teacher influencers?
2. What kind of effects do teacher influencers have on students according to the teachers participating in the research?
3. How does being a teacher influencer relate to children's rights according to the teachers participating in the research?

METHOD

Research Model

In the research, phenomenology design, one of the qualitative research methods, is used. Phenomenology focuses on phenomena that we are aware of in daily life but do not have an in-depth and detailed understanding (Büyüköztürk et al., 2009). The concept of teacher influencer, which is becoming more and more widespread in Turkey with each passing day, is a phenomenon that needs to be examined in depth. The fact that teacher influencers are common in rural, and disadvantaged areas in the city center of Turkey, encourages further investigation of this phenomenon.

Research Group

The research participants are teachers of various teaching areas (n = 201) from the province of Van in eastern Turkey (Table 1). The sample was selected from all districts of Van province. Van is one of the most populated cities in the east part of Turkey. May teachers are appointed to Van. Most of these teachers are young in Van. Namely, the teacher influencer is more common among young and inexperienced teachers. The density of young and inexperienced teachers in Van is an important criterion in this respect. Likewise, it is an important criterion that there are many teacher influencers in social media who work in Van. Therefore, Van was selected for this research. Criterion sampling, one of the purposive sampling methods, is used to select the sample. In criterion sampling, certain criteria were determined based on the purpose of the research; and individuals, events, or situations that meet the specified criteria are included in the research group (Büyüköztürk et al., 2009). In the current research, working as primary school teachers at schools in rural, and disadvantaged areas in the city centers of Turkey was the only criterion. Teacher influencer is mostly seen in primary schools. Therefore, teachers working in primary schools are also another criterion.

Table 1. Descriptive information of the primary school teachers.

Gender	Professional seniority	n	%
Male (90)	0-5 year	66	32.8
Female (111)	6-10 year	60	29.9
	11-15 year	39	19.4
	16-above year	36	17.9

Female teachers represent the majority of teachers participating in the research. The number of teachers with low professional seniority is the highest.

Data Collection

In this research, data were collected using face-to-face in-depth interview forms and online surveys. The reason for choosing this route is the personal requests of the participants for precaution and social distance due to the Covid 19 pandemic. Online surveying, which is used for online surveys, is one of the most frequently used techniques. It can be said that web-based online surveys are useful and effective because they make it possible to reach many people in a short time (Kumar & Naik, 2016). In-depth interviewing makes face-to-face interviews even more valuable by providing the opportunity to ask detailed questions and to elaborate on the answers given in the same way (Kümbetoğlu, 2005). Data were collected through an in-depth interview and online survey technique, and short-answer and open-ended questions were asked to the teachers. In the personal information form included in the form, the participants were asked about their gender, professional seniority, and teaching areas. The participants took part in the research voluntarily. The data collection process was carried out by the researcher himself. No support was received from an assistant researcher in this process. Face-to-face interviews lasted an average of 20 minutes. The data collected through the online survey were collected within 1 week. The opinions of academics working on 'Internet addiction' and 'children at risk' are used while forming the survey questions. After getting the views of three experts, one of the questions was removed, and the above questions were used to collect data. Likewise, the field experts evaluated the questions in terms of language and content. The online questionnaire was piloted on 20 teachers. After all these procedures, the in-depth interview form and online survey technique were finalized.

The original pictures (Picture 1, Picture 2) in the research were designed entirely by the researcher. While the researcher was designing these pictures, he was inspired by tens of thousands of contents shared by teachers. The designed picture is a summary that emerged after looking at the contents of approximately 30 teacher influencers' accounts. Expert opinions were also used to determine to what extent the photographs represent the teacher influencers.

Data Analysis

The data were analysed using content analysis. Content analysis is to gather similar data around certain concepts and themes and to interpret them in an understandable way (Yıldırım & Şimşek, 2008). Based on participants' responses, the themes, categories, and codes were created. To ensure the external reliability of the research, detailed explanations about the purpose of the research, research group, data collection tool, data collection procedures, and data analysis are given. After the data were transferred to the computer, the researcher arranged and cleaned them. Later, the data were shared with an expert who is competent in qualitative research. The data were also coded by an independent expert. The coding of the researcher and the expert was compared. According to Miles and Huberman's (1994) formula [Reliability = Consensus / (consensus+disagreement)] the percentage of consensus between two different encoders was calculated and 96% consensus was found. MaxQDA 2022 qualitative data analysis was used in the coding process of the data about the method and the process followed in the research.

RESULTS

The data were categorized under two titles: the teachers' views about the teacher influencer and the teachers' general opinions.

The Views of Teachers About Teacher Influencers

Table 2 shows the views of the teachers on teacher influencers.

Table 2. The views of teachers about the concept of teacher influencers.

Have you encountered their sharings during class hours?	***n***	**%**
Yes	127	63.2
No	74	36.8
What do you about these sharings?	***n***	**%**
Normal	59	29.4
No Idea	25	12.4
Harmful	117	58.2
In which category do teacher influencers usually fall?	***n***	**%**
Only young, inexperienced, and candidate teachers.	134	66.7
There is no special category.	67	33.3
In which regions do teacher influencers commonly work?	*n*	%
In rural	120	59.7
In city	81	40.3
What are the aims of teacher influencers?	***n***	**%**
to be an influencer	*124*	61.7
to provide students knowledge/skills	*24*	11.9
All	*53*	26.4
Is the concept of teacher influencer a habit/addiction?	***n***	**%**
Yes	140	69.7
No	61	30.3

The findings showed that the majority of the participants (n= 127) emphasized that teacher influencers shared content on social media during class hours. The teachers (n=117) considered that it is objectionable to share content on social media during class hours.

Moreover, the teachers (n=134) stated that the teacher influencers were generally inexperienced candidates and young teachers. The participants (n=120) also agreed that the teacher influencers mostly worked in rural areas. The number of those who say that the teacher influencers are also in the city center is also important (n=81). A significant majority of the participants (n=124) stated that the main purpose of teacher influencers was to be popular or an influencer. Lastly, the participants (n=140) pointed out that the concept of teacher influencer became among some teachers.

The Teachers' Views about the Effects of Teacher Influencers on Students

The effects of teacher influencers on students are presented in Figure 1.

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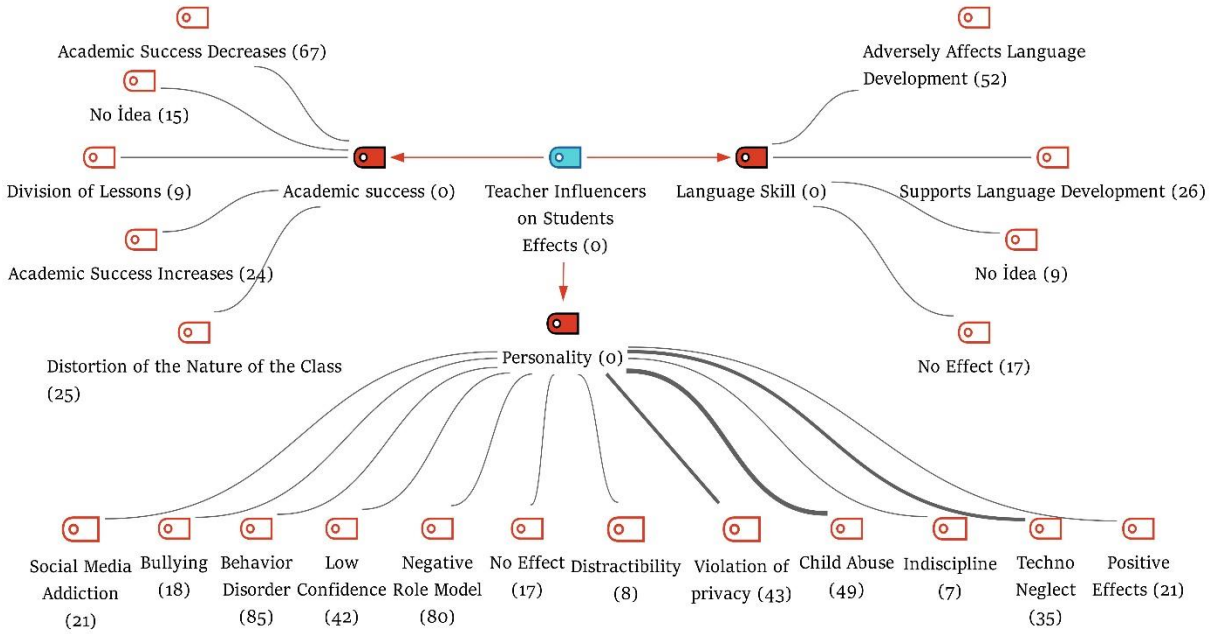

Figure 1. The effects of teacher influencers on students

The effects of teacher influencers on students were categorized as the effects on students' academic life, personality, and language skills. According to participant views, teacher influencers reduced the academic achievement of students (n=67). There are also participants who stated that teacher influencers increased students' academic success (n=24). On the other hand, it should be noted that there are also participants who did not have an opinion on this issue (n=15). Some of the participants' opinions are given below:

> I think that teachers who aim to be an influencer and to get likes will not have any concerns about academic success. Therefore, I believe that teacher influencers will not add anything to students academically (T196).
>
> Academically, the teacher who spends most of his time shooting videos causes children to fall behind. The same teacher tries to save this situation by saying that he or she couldn't catch up with the curriculum (T61).

As the findings revealed, the teacher influencers had various effects on students' language skills. According to some participants, the teacher influencers' sharing, and content preparation processes negatively affected students' language development (n=52). There are also teachers who disagreed with this view (n=26). The views of the participants were as follows:

> There is a strange language used by teachers who try to be an influencer. With the increase in students' long-term interest in social media, the situation that they are exposed to will negatively affect their language skills (T9).
>
> Using children's language differences, dialects, etc. as humor material will negatively affect the correct language use in these children (T20).
>
> The students' language skills can improve, as their ability to express themselves in front of the camera increases (T78).

Teacher influencers also have various effects on students' personalities. The majority of the participants stated that teacher influencers are negative role models for students (n=80). In addition, the teacher influencers indicated that they committed both violations of privacy (n=43) and child abuse (n=49). Thus, students' self-confidence decreased (n=42), and behavioural disorders occurred over time (n=85). Other problems that teacher influencers created in students' personalities are given in Figure 1. Some of the participant comments are below.

> The student, who knows that he/she will be shared in the virtual environment, creates a fake personality that is suitable for the virtual environment, independent of his own personality. This will create identity confusion and self-conflict in the student (T46).
>
> I think that students who are in a funny situation may experience self-confidence problems in the future (T74).

The teachers' Views About the Teacher Influencers and Children's Rights

The teachers' views on teacher influencers and children's rights are given in Figure 2.

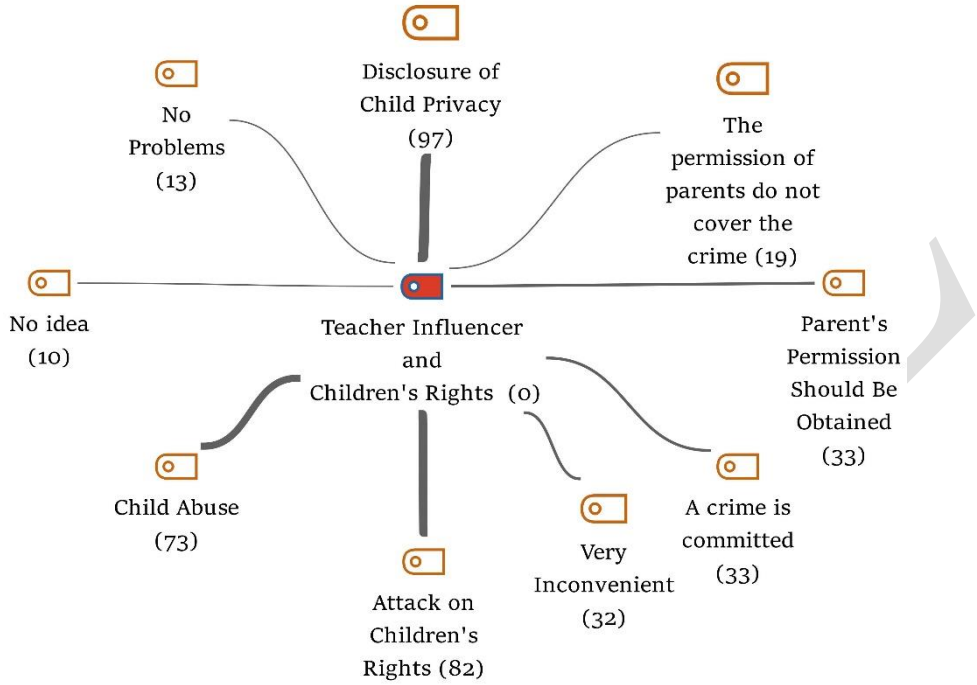

Figure 2. Teacher influencers and children's rights

Almost half of the participants stated teacher influencers violated children's private lives in their social media posts (n=97). In addition, it is emphasized that these were very objectionable posts (n=32) and violated rights (n=82). However, there are also participants who stated that this could not cover up the crime (n=19). Some of the participant comments are below.

> The posts are violations of children's rights regarding the privacy of their private life. Sharing without permission and consent of children and without expressing their feelings and thoughts is a violation of privacy (T46).
>
> Publicly shared social media posts are a crime in terms of violation of children's rights and the prevalence of pedophilia. It causes a violation of privacy (T96).

It can be said that the majority of the opinions are that teacher influencers make posts that attack children's rights and abuse children. The number of teachers who are optimistic about this problem is also limited.

DISCUSSION, CONCLUSION, and SUGGESTIONS

In this research, the concept of teacher influencer, which is becoming more and more widespread in Turkey, has been investigated. The results are striking and interesting. It is worth discussing how consistent the results are with the various research results in the literature. In this context, the results of the research are discussed separately and meticulously.

According to the results, teacher influencers are significantly common (Shelton et al., 2020). In the studies (Carpenter et al., 2022; Duran & Bayar, 2020; Marcelo & Marcelo, 2021; Temel & Davulcu, 2021; Den Beem et al., 2020), it is understood that teachers' classroom shots (photo/video) are shared

on various social media platforms. According to Quintana and de León (2021), platforms such as Instagram are used more intensively (Selwyn, 2019; Shelton et al., 2020). Therefore, the teacher influencers, which have become widespread in Turkey, are also seen in different countries (Higgin, 2017). The 2017/12 directive sent by the Ministry of National Education to schools in Turkey is also proof of the existence and widespreadness of teacher influencers (MEB, 2017). In this sense, it is certain that there is a phenomenon of teaching phenomena in schools in Turkey. In this case, it is necessary to discuss how the phenomenon of teachers manifest themselves in schools and what these teachers do. Undoubtedly, this discussion will also be made under other research problems.

The first discussion about the situation of teacher influencers in schools is that this situation is negative. Another significant finding of the research is that the teacher influencer is very inconvenient for students and teachers. Considering the negative consequences of teacher influencers (Selwyn, 2019), the participants see this situation as objectionable. Information and findings about the inconvenient and worrying dimensions of teacher influencers are also found in different studies (Carpenter & Harvey, 2019; Cino & Vandini, 2020). Moreover, Higgin (2017) states that social media poses risks to student privacy and he reveals the drawbacks. In some studies, there are various reasons that make the teacher influencer inconvenient. Teachers' efforts to bring themselves to the forefront rather than doing activities with students are essential among these reasons (Shelton et al., 2020). Cino and Vandini (2020) describe this situation as 'creepy' because they emphasize that this problem causes many other issues. In this case, it is a fact that the teacher influencer is not so innocent and well-intentioned, contrary to popular belief. At first glance, teachers may appear to be doing activities. However, it is possible to say that they actually use students by putting themselves in the foreground.

According to the research findings, the concept of teacher influencer is mainly seen in candidate, inexperienced, and young teachers. Higgin (2017) states that one out of every ten teachers is only competent and knowledgeable about this subject. In this regard, teachers' inexperience and lack of knowledge are two important reasons why the concept of teacher influencer is experienced more frequently among teachers aged between 20 and 30 (Selwyn, 2019) in this context. As a matter of fact, when the findings and information in different studies are investigated, it is possible to see that this problem is experienced more intensely by candidates and teachers (Cino & Vandini, 2020). Similarly, it should be noted that there are studies stating that teachers do not know that the situation is a crime (Can, 2016; Den Beem et al., 2020). In this sense, the findings of this research are parallel with the literature. Undoubtedly, one of the reasons why the sample was chosen from the province of Van was the majority of candidates, were young and inexperienced teachers. In this discussion part of the research, it is understood that teacher influencer is more common among inexperienced, inexperienced and young teachers. This situation shows the need and necessity of administrative control. In the same way, it is important to explain to the teachers in question about the risks that these posts will cause.

It is concluded that the concept of teacher influencer is more common among teachers in rural areas of Turkey. The fact that the conditions (such as climate, development level andsocioeconomic level) in rural areas of Turkey are worse than those in western provinces is a severe problem for some teachers (Kızıltaş, 2022). At the same time, these problems cause teachers to get bored. According to Young (1999), it is a strong possibility for teachers to turn to the internet and social media to avoid negativities in such a situation. This mental escape also causes various problems, such as social media addiction. In addition, the mother tongue of students in rural areas of Turkey is different from the country's official language. In this respect, students here have problems with the pronunciation of words due to insufficient use of Turkish (Gözüküçük & Kıran, 2018). Teacher influencers also see these disruptions as humor and comedy material and share them. Therefore, teacher influencers are more common in rural areas as there are many linguistic differences in speaking of students in these regions.

According to the research results, the biggest goal of teacher influencers is to be popular. In other words, the pedagogical purpose remains in the background. There is also information in different

studies claiming that for teacher influencers, being popular prevents increasing student benefit and success (Carpenter et al., 2022; Cino & Vandini, 2020; Shelton et al., 2020). The research conducted by Serin (2019) draws attention to the fact that the purpose of teachers' sharing on social media is to gain popularity. Warnick et al. (2016) also draw attention to this problem and emphasize that pedagogical purposes remain in the background. On the other hand, there are also participants who say that the purpose of teacher influencers is to provide students with knowledge and skills (Davis & Yi, 2022). Teachers also present their content, especially on platforms like Teachers Pay Teachers. As the number of followers increases, so do their earnings (Reinstein, 2018). However, according to the teachers who participated in this research, the aim of a teacher influencer is to be a micro-celebrity, not pedagogy. If the aim is not pedagogy, then it is necessary to question the academic level of the classes. Likewise, it is important to discuss how this desire to be famous is reflected in the behavior of students.

According to the results of the research, this situation becomes a habit or addiction as phenomenon teachers frequently share. This habit reaches such an advanced level that there is a constant need to share. This habit, which also stems from digital narcissism, turns into a digital disease. According to Kardaş (2020), the need to constantly share is a reality, a consequence of social media habit and addiction. Likewise, Johnson (2014) draws attention to how such habits are associated with a disease in his research. He states that problems such as narcissism and neuroticism are more common. Kohn (2021) emphasizes that one dimension of narcissism includes arrogance and abuse, which is also pathological. According to Schmidt (2020), the brain begins to release dopamine as the shares increase because there is a constant need to get likes, which makes people happy all the time. In other words, the teacher influencer constantly records, and shares videos can get out of control over time. In such a case, classroom management may also be in the background. More importantly, for teacher influencers, habits can become more advanced over time.

It is also concluded that the teacher influencer has severe effects on students. Within the context of students' personalities, the concept of teacher influencer has negative consequences such as behavioural disorder, bullying, low self-esteem, social media addiction, techno-neglect, child abuse, negative role model, violation of privacy, indiscipline, and attention deficit. The adverse effects of teacher influencers on student personality show a certain level of consistency with various research results (Serin, 2019). Again, according to Serin (2019), the shares of teachers in this context also create psycho-social damage to students' personalities. He emphasizes that students are exposed to comments that offend them, and their psychology is negatively affected. Likewise, Goodwin (2018) states in his research that children want to be like their teacher influencers and fall into digital habits by accessing teacher influencers' recorded posts. In other words, he draws attention to the fact that digital shares make these teachers negative role models for students and claims that these shares are imitated. Umar and Idris (2018) also emphasize the role and importance of the teacher by stating that social media harms students' psychosocial behaviours. Selwyn (2019) states that intense sharing creates questions in people's minds. Therefore, he emphasizes that the primary purpose of this situation can be questioned. The question of whether the aim is to be popular or to be purely pedagogical may arise here. If the objective is to be pedagogical, this situation can be evaluated as abuse. It is emphasized that this problem has negative consequences. Tavşanlı and Akaydın (2017) also state that social media makes the teacher passive, negatively affects the interaction between teacher and student, and causes students to be neglected. At the same time, the findings that these platforms lead students to violence, cause behavioural problems, and act as negative role models are also found in the research of Tavşanlı and Akaydın (2017). It would be appropriate to say that permanent damage has occurred in the personalities of the students due to the phenomenal teachers. The consequences of losing control are very serious. On the other hand, some participants point out that teacher influencers positively affect students' personalities. This is in line with various research results (Gonzalez et al., 2018; Quintana & de León, 2021; Selwyn, 2019).

Another result of the research is that the concept of teacher influencers has positive and negative effects on students' academic and language skills. Goodwin (2018) states that excessive dependence

on digital devices has a negative impact on children's language skills. Accordingly, using digital devices too much causes neglect of the students and reduces interaction between teachers and students. When the interaction decreases, communication is also negatively affected by this situation. Therefore, the necessary prerequisites for developing language skills may not be met by students. On the other hand, according to the research conducted by Tavşanlı and Akaydın (2017), it is concluded that students who have language problems, especially in the disadvantaged region such as Eastern and Southeastern Anatolian Regions of Turkey, learn Turkish better thanks to the videos and cartoons on social media. However, there is no information about the positive effects of teacher influencers on this situation. The concept of teacher influencers has positive and negative effects on students' academic skills (Tavşanlı & Akaydın, 2017; Umar & Idris, 2018). In other words, the teacher influencer's uncontrolled and excessive sharing makes disadvantaged students even more disadvantaged. The academic achievement level of disadvantaged students also decreases. Turkish language skills are also not developing. Because, due to the video shootings, the lessons are not held on a regular basis.

It's also concluded that the concept of teacher influencer leads to different results in terms of children's rights. According to Serin (2019), the fact that the posts are made by the children's own teachers does not change the fact that children's rights, which must be protected according to children's law, are violated. Because teacher influencers' shares often include content that causes child abuse (American Board, 2016). Likewise, Stokes and Simos (2012) draw attention to the fact that teachers lose their jobs due to their neglect and mistakes in using social media. Davis and Yi (2022) show that teachers share videos and pictures of students singing and dancing as if they create a new brand with the students. They emphasize that students are part of this process knowingly or unknowingly. Undoubtedly, these explanations can be presented as concrete evidences of abuse and violation. Thus, as Selywen (2019) states, students become part of their teachers' way of earning money. In other words, children are abused and neglected (Higgin, 2017). It is unknown where the sharing of teacher influencers will lead. It is difficult to predict what these shares will lead to. Children are not told of these risks. Therefore, the rights of children are violated. Their private lives and images are disclosed.

However, the findings of this research pointed out that teacher influencers discredit children by humorously sharing their accents and disadvantages. The agreement on children's rights also emphasizes in Article 19 that states and families should take essential measures on child abuse and violation, and such events and witnesses should be reported to authorities. Moreover, in the Turkish Criminal Code, articles from 135 to 140 mention child abuse. These articles highlight that sharing the personal data of children is a crime and results in a prison sentence. In the Code, Article 137 state that if public officials misconduct using their positions, then the punishment will be aggravated (TCK, 2004). Thus, teacher influencers misconduct as public officials by sharing the personal data of their students. There are also articles in the Constitution of the Republic of Turkey. Article 41 states: "the State shall take measures for the protection of the children against all kinds of abuse and violence."

Lastly, another finding of the research is that permission should be taken from the parents before sharing any content. Higgin (2017) particularly emphasizes the necessity of parents' permission. He also states that if students' names and faces are to be disclosed in the posts, this should be especially stated while taking permission. However, he states that the content should be shared in a way that is not public. He also underlines that school and student locations should not be shared. Selywen (2019) states that the permission documents should be examined before the posts are shared. He states that the posts are worrisome in this sense, as they cause violations of the laws for the protection of children and child privacy. On the other hand, Toker (2021) emphasizes that taking permissions does not make sense if there are abuse and crime in the contents.

Suggestions

Suggestions to the Ministry

Articles 134, 135, 136, 137, and 138 of the Turkish Penal Code on 'child abuse' and privacy (TCK, 2004) can be shared about teacher influencers. It is possible to inform the teachers that these posts

constitute a crime. In addition, the importance of the circular numbered 2017/12 of the Ministry of National Education should be reminded to teachers. The group that violates the directive should be prohibited from filming in classrooms and schools. According to Article 28 of the Civil Servants Law No. 657 in Turkey, teachers cannot work in jobs that generate additional income (DMK, 1965). However, teacher influencers earn money in the process of becoming brand ambassadors and microcelebrities. Teachers should be informed about this. Administrative sanctions should be imposed on teachers who earn money by sharing posts and students as brand ambassadors. To prevent internet addiction in South Korea, internet use of children under 16 is limited by the 'Cinderella' Law from 12 am to 6 am (Nadia Nabila & Quie, 2019). Some laws can also be enacted in Turkey for teacher influencers. With this law, teachers may be restricted from sharing during class hours at school. Teachers can be restricted from shooting and sharing videos during the lesson. 'Cyber security commissions' should be established in schools and national education directorates. These commissions should supervise teacher influencers. Teachers should be given seminars on the issue to increase their awareness of the consequences of this problem. The Ministry of Family and Social Policies of the Republic of Turkey has a unit that monitors parents' shares. This unit is known as the 'Social Media Working Group'. A similar unit should also be established by the Ministry of Education.

Suggestions to the Researchers

Interviews can be made with teacher influencers. Academic success and behavioral status of students can be followed in the classrooms of teacher influencers.

Suggestions to the Teachers

Content sharing that violates children's rights should be avoided. It has been revealed that taking videos during lesson in the classroom causes students to be negative role models. Such behavior should be avoided. It is a fact that companies and organizations that sponsor videos advertise in their aid to schools. Students should not be used for these advertisements.

Limitations

Research data is limited to data collected from only one province. Likewise, it is limited to data collected only from teachers.

Ethics and Conflict of Interest

The author declare that the study has not unethical issues and that research and publication ethics have been considered carefully. The author declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article. The ethical committee approval was obtained for this research from Van Yüzüncüyıl University Scientific Research Ethics Committee with the decision numbered 28.02.2022-7599 dated February 23, 2022.

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