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Message from the Editor,

I am very pleased to inform you that we have published the first issue in 2022. 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 The articles should be original, unpublished, and not in consideration for publication elsewhere at the time of submission to International Online Journal of Primary Education (IOJPE).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): Ghana, Nigeria, Taiwan, Turkey, and United States.

Prof. Dr. Sinan OLKUN

Editor in Chief

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DEVELOPING EQUITABLE ELEMENTARY CLASSROOM PLACEMENT ROUTINES

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Abstract

The annual assignment of elementary students from one classroom to the next is a ubiquitous cycle in schools. Since student class assignment has an effect on students' educational trajectory, understanding how placement procedures impact student equity is an important area of research with benefits for all stakeholders. In this action research project, survey data was collected to examine what student data points teachers found most meaningful as well as what elements participants considered the most effective and the least beneficial components of the previous piloted placement procedures at a central California elementary school. The findings of this research demonstrated that respondents valued intervention data, such as English Language Proficiency Assessments for California (ELPAC) levels or special education (SPED) status, English Language Arts (ELA)/Math achievement data, and behavior data. However, they also expressed hesitancy over certain narrative or subjective information. Respondents also reported that, while multi-grade level cooperation was a valuable component of the placement process, the procedures needed to be more clearly systematized. Findings suggest that by linking placement procedures to existing Multi-Tiered System of Supports (MTSS) structures, the placement process can more effectively address issues of student equity and achievement.

Keywords: Student placement procedures, equity, achievement, multi-tiered systems of support, general systems theory.

INTRODUCTION

According to the federal agency tasked with collecting and analyzing educational data, nearly four million students were expected to begin kindergarten in the Fall of 2020 (U.S. Department of Education, n.d.). During each of the next six years of their school career, the vast majority of these students will be promoted to their next grade level, a process that will annually group and regroup them into cohorts and assign them to (usually) a new teacher. The placement of students into these groups and assigning them to a new teacher is fraught with significant effects on both the short- and long-term trajectory of a student (Bosworth & Li, 2013; Burns & Mason, 1995; Park, St. John, Datnow, & Choi, 2017; Sleenhof, Koopman, Thurlings, & Beijaard, 2019).

This placement process is primarily directed at the school site level, typically with minimal direction from the district. Administrator training programs also rarely address student placement and the formation of classes (Paufler & Amrein-Beardsley, 2014). Not surprisingly, profound variations exist between schools and educators regarding how placement procedures are undertaken (Burns & Mason, 1995). Having a regularly recurring, predictable, and ubiquitous process that has potentially profound effects on a students' achievement without direction from the training institutions or districts presents an essential area for further research.

In this project, the researcher sought to understand who makes decisions about placement procedures and what factors play into their decision-making process. Understanding how the context of decision-

makers (such as local socioeconomics, community demographics, or school size) also affected the way placement decisions are made. While principals often play a defining role, teachers also regularly weigh heavily in the process (Paufler & Amrein-Beardsley, 2014). The conditions set for educators' involvement also contribute to how the conversations and decisions made during the process occur (Sleenhof et al., 2019).

Site conditions also determine how data are collected and utilized to make placement decisions. Data use has substantial implications for equity in many areas of education, and placement procedures are no exception (Datnow & Park, 2018). Data literacy plays a role in determining what student data will be prioritized and interpreted (Mandinach & Gummer, 2016; Park et al., 2017). Mitigating these variances to improve placement results is an important subject in much of the literature. Suggestions for doing so include improving meeting facilitation (Sleenhof et al., 2019), using computer-based applications to limit participant data and micropolitical stresses (Krauss et al., 2013), and regularly training staff to use data with an equity mindset (Mandinach & Gummer, 2016). Reflective practices are also integral to improving this system (Bens, 2012; Buffum et al., 2018; Conzemius & O'Neill, 2014; DuFour, DuFour, Eaker, Many, & Mattos, 2016). Through feedback and direct training, research has demonstrated that capacity building will work to improve equitable data use at the site.

Previous research has shown that optimizing these routines has the potential to improve student achievement (Buffum, Mattos, & Malone, 2018; DuFour et al., 2016; Mandinach & Gummer, 2016; Sleenhof et al., 2019). Refining student placement procedures will lead to improved measures of student achievement and a more strategic allocation of resources. Thus, it behooves all school districts and site-level leaders to reflect on their student placement procedures with an eye on equitable practices.

Purpose of the Study

The purpose of this study was to understand better how issues of equity are linked to classroom placement procedures and how, in turn, such procedures should be improved to encapsulate and promote equitable practices at the school site. While the scope of this project focuses on a single placement cycle at a single suburban elementary school in central California, it is the researcher's intent that understanding the procedures at this location will provide greater insight that can be extrapolated and generalized to similar settings through a tool to guide systematic placement procedures.

Next, this research project intended to better understand what elements of the placement process the teacher and administrator participants considered a benefit, a hindrance, or in need of improvement. While educator opinions on these topics might not indicate any objectively credible point of contention, they nevertheless remain useful in revealing trends in how the process was carried out. This may, in turn, have implications for practice. For example, if multiple participants noted that meetings generally wasted time or meandered, this might imply that the procedures themselves may need to be made more efficient. This subjective information might also indicate problems in the way placement procedures are facilitated. If survey respondents routinely noted issues of favoritism during placement procedures, this may demonstrate problematic micro-political decisions or a lack of transparency which could undermine stakeholder faith in the process at large. All these considerations have implications for equity at the school site and thus need to be discerned for their potential effect on stakeholders.

Review of the Literature

Although millions of elementary students are annually grouped and placed in their next classroom, researchers studying the subject commonly express concern about the procedures, philosophies, and priorities for this ubiquitous and perpetual process (Bosworth & Li, 2013; Burns & Mason, 1995; Kalogrides, Loeb, & Béteille, 2013; Park et al., 2017; Sleenhof et al., 2019). In studying student placement procedures in one southern state, Bosworth and Li (2013) note that little is known about how classroom assignment carries across schools. Likewise, St. John (2014) acknowledges that little research has been done on this context in elementary schools, especially to uncover how student placement procedures relate to stakeholder and school leadership concerns regarding teacher evaluation, student achievement, and educational equity. Still, a small body of literature exists that begins to address

this complex topic from several directions, including the procedures, decision makers, outcomes, and how student data are utilized to move students from one grade to the next.

Further complicating the issue are the wide divergences in how such student placement procedures are carried out. Burns and Mason (1995) found that student assignment procedures vary according to the organizational context of the site, even within the same district, and that these variations have a noticeable effect on stakeholders. These variations present an essential area of study for researchers because the ramifications for stakeholders engaged in the process are significant. Researchers Park et al. (2017) interviewed teachers and school leaders in elementary schools on annual placement routines and also found that such procedures have important implications for equity and access to quality instruction. Similarly, Kalogrides et al. (2013) examined class-assignment patterns using eight years of data from administrative files in the Miami-Dade County Public School district and found systemic inequities in how students were assigned to their teachers specifically noting the positive correlation between teacher experience and student achievement related to placement indicating lower achieving students more likely to be placed with less experienced teachers. Furthermore, Kalogrides et al. (2013) found that in schools led by white administrators with a majority of white teachers on staff, the aforementioned demographic equity gaps are more prominent. While they did not find any specific causation for such disparities in student assignment, they observed that these patterns likely result from the personal biases and assumptions of school leadership, as well as teacher and parental preference (Kalogrides et al., 2013). Unfortunately for students within these school contexts, Kalogrides et al. (2013) observed that structural factors would continue to widen gaps for underserved students as newer teachers tend to have less efficacy than their more experienced peers, while inequitable grouping serves to increase teacher turnover rates.

Based on the above studies, student achievement and demographic data are clearly prioritized when making student classroom placement decisions with potentially devastating results. However, Datnow and Park (2018) note that studies have failed to move beyond those factors. They argue that social justice, equity, and the use of data are integrally bound to one another (Datnow & Park, 2018). Thus, understanding the processes and contexts of student placement decisions in greater detail is important for educational leaders in that it can potentially illuminate areas in which gaps in student achievement and equity may be redressed.

Theoretical Framework

Originally developed to explain biological relationships and metabolic processes, general systems theory was later broadened in scope and applied to fields like business management or education (Sauter, 2017). General systems theory centers on the understanding of a particular process in which input is transformed into a desired output via the relationship between various elements or subsystems contained within the system (Caws, 2015).

This framework is applicable to this research project because the procedures for moving a group of students from one grade to the next similarly involve input (student data), a set of subsystems or elements (data analysis, placement meetings), and a desired output (balanced, heterogeneous classrooms that promote equity). Using general systems theory in this research project will help illuminate the elements and subsystems that effectively lead to the desired outputs, and which of those elements or subsystems inhibit the desired output from occurring. Placement procedures involve a complex set of interactions between educators that require systemic thinking to sort, prioritize, and manage in order to make the optimal placement choices for students.

Lastly, general systems theory acknowledges problems associated with closed systems. Closed systems, defined as those systems that fail to accept input, eventually fall into entropy and collapse (Caws, 2015; Vornberg, 2013). While student data are one input into the system of student placement procedures, in order for placement systems to remain relevant and effective they also need to accept reflective input that is explicitly purposed to improve the elements of the system. Cycles of improvement, driven by participant reflection and input, are integral for maintaining effective educational systems (Buffum et

al., 2018; Conzemius & O'Neill, 2014; DuFour et al., 2016). Therefore, a reflective element must be an integral component of placement procedures in order to provide germane feedback that improves and refines how stakeholders are being served.

Research Questions

This research study aimed to answer the following two questions:

1. How does the process of elementary students' classroom placement relate to issues of educational equity?

2. How can the classroom placement process be improved to promote both equitable instructional practices and improved student achievement?

METHOD

Collecting relevant quantitative and qualitative survey data from participating school educators was critical to this action research study to better under which student data points participating considered most critical to the placement process. With 26 data points per student to consider during the 2020 placement cycle at the research site, the researchers hoped to create a more relevant and focused set of parameters for future placement consideration. Figure 1 provides the 25 data points by category for reference in the order of the referenced student placement procedure.

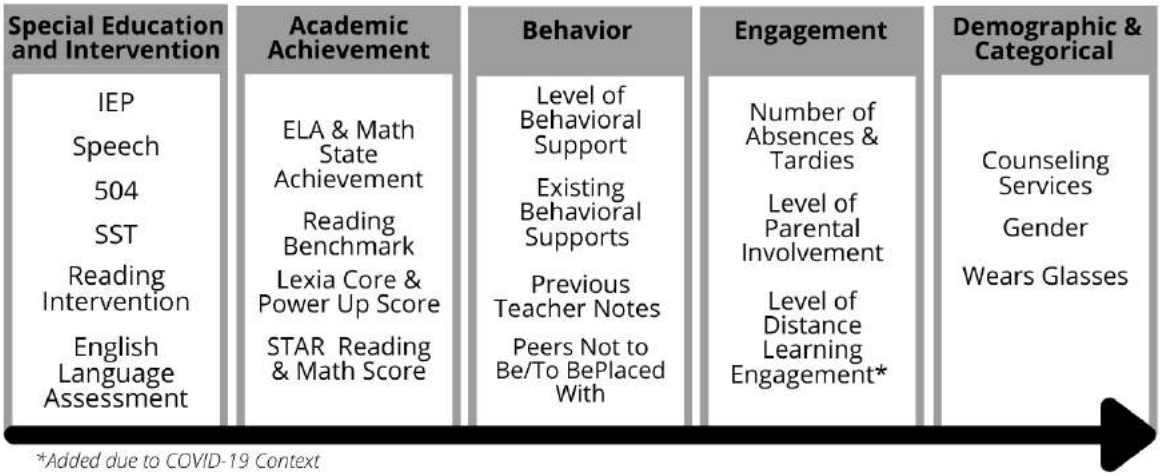

Figure 1. Data points by category in placement procedure order

Research Site Context

The research concerned the 2020 student placement procedures at one public charter school in California's Central Valley. The school is a kindergarten through grade eight public community charter school operating as part and under the authority of one large preschool through high school urban, suburban and rural serving school district. The school has an enrollment of approximately 432 students with nearly 80% considered socioeconomically disadvantaged (SED) and close to 26% classified and English learners., according to publicly available data through the California Department of Education (CDE, n.d.) website. In terms of student race and ethnicity, CDE (n.d.) reports the students at the research school are 79.2% Hispanic, 13.4% White, 3.5% Asian, 1.4% Two or More Races, 1.2% African American, and less than 1% American Indian and Filipino (CDE, n.d.).

Prior to becoming a charter, the school operated as a traditional community-based elementary school until new larger community elementary school campus was opened by the district less than a mile away. In 2017, the research site school was then repurposed as a district community charter with several distinct differences from the district's typical elementary school. First, each classroom after kindergarten is a multi-grade classroom grouping students to learn together as follows: first/second, third/fourth, fifth/sixth, and seventh/eighth. Additionally, the assigned teacher for each respective group

loops with the same students over a 2-year period instead of being assigned a different set of student annually as is common with the traditional model. The charter school also employs a variety of curriculum resources outside of those adopted by the district. According to the charter documents, the school mission is to differentiate itself by focusing on project-based learning, community service, cooperative cross-age learning, a high level of technology integration, 21st-century skills, global education, and a Spanish language program for all kindergarten through eighth-grade students (Unified School District, n.d.).

Survey Instrument

Participant feelings and perceptions on the previous year's student placement cycle procedure were gathered using a 29-item electronic survey. The first set of questions consisted of 26 anchored rating questions asking respondents to consider the usefulness of the respective 26 student data points used in the 2020 placement process. Three open-ended questions aimed at understanding participant teacher perceptions of the 2020 placement process. The questions centered on what teachers felt were most helpful/productive, least helpful/productive, and what aspects of future placement cycles could be improved with explanation.

Participants

Seventeen participants consisting of fifteen teachers and two administrators were purposively sampled according to the following criteria: *participation in the 2020 student placement process at the school site being researched.* All participants still worked at the school site, except for one administrator who worked in the same district at a different school and one teacher who had recently retired but still lived in the immediate area with regular staff contact. Teachers and administrators currently at the site who were not involved in the 2020 student placement process will not be participating in the survey.

Data Collection

Participants were sent an email containing an overview of the study purpose and goals and a link to the survey. The recruitment email also included researcher contact information regarding concerns or questions about the study. The survey included informed consent as the initial question and participants were only able to continue with the survey after assenting to the language in the consent form. Weekly email reminders were sent out over a 4-week period in order to increase participation rates.

Data Analysis

This study relied on descriptive statistical analysis open thematic coding (DePaolo & Wilkinson, 2014) in order to understand the concepts, themes, and patterns that develop through the course of previous placement practices. The anchored rating survey questions were analyzed descriptively using frequency and means in order to broadly understand what student data were most important to educators during the placement cycle, as well as understand how the perceived importance of student data points was distributed amongst teachers. Open ended response data were used to understand what other placement data points might add value to placement process as well as to draw conclusions to inform the placement process revisions. Open ended response data were given inductive codes during the first-stage, open coding process to identify aspects of the placement process that were helpful or not helpful. Next, these codes were refined during the second-stage coding process to generate a broad list of attributes to describe current processes and to guide future placement procedures. From here data were given descriptive themes via open, thematic coding aided by word clouds to assist in identifying potential trends (DePaolo & Wilkinson, 2014). The overall goal of these staged analyses was to understand which aspects of the placement process were perceived to be extraneous hindrances versus those vital to the educators involved for enacting equitable student class placement outcomes.

Validity and Reliability

Regarding qualitative survey data, intercoder reliability (Johnson & Christensen, 2019) will be maintained because a single researcher conducted all analysis during the thematic coding process with code checking for cognitive drift completed by the second researcher. Internal consistency (Johnson & Christensen, 2019) will be further facilitated with the aid of electronically generated word clouds to

identify essential ideas or phrases by frequency of use that the researcher may have otherwise overlooked (DePaolo & Wilkinson, 2014).

Validity for the Quantitative survey data will be addressed first via construct reliability (Johnson & Christensen, 2019) from relevant research literature in order to inform the analysis of the descriptive trends. The anchored rating item validity will be reinforced as each question refers to a distinct student data point used by the participants during the most recent 2020 student classroom placement cycle. The survey also had a high response rate of 88.24%, which increased overall study validity and reliability with strong representativeness of the research context (Fincham, 2008).

RESULTS

The survey results based on the feelings and experiences with the 2020 student classroom placement procedures at one small public community elementary charter school in California's Central Valley highlighted the data points educators found most and least important as well as ways the process could be improved. Respondents often cited intervention statuses, behavior support levels, language arts achievement, and math achievement as primary concerns for placement, while engagement and computer-based assessments were noted as less applicable. Open-ended responses yielded data regarding why specific data points were prioritized over other data points, as well as concerns over how placement meetings were organized in the past. Respondents overwhelmingly valued collaborative environments while simultaneously feeling such meetings were also fraught with biases and micro-political maneuverings that negatively affected fair and equitable placement.

Descriptives

In the first section of the survey, educators were asked to rate how useful they perceived specific student data points during the formation of new classes. Each student data point included in the survey corresponded to a student data point used during the 2019-2020 placement cycle. The educator responses were measured according to a scaled response score of 1 through 5. A score of 1 indicated that the respondent found the data "not useful" during the placement process, whereas a score of 5 indicated a particular student data point was considered "most useful." This survey information was informative for answering the research questions for this case study because it indicated how educators involved in the 2019-2020 placement cycle prioritized specific demographic, academic, intervention, or behavioral student information.

By understanding what information was most critical to educators during the decision-making process, the system for student placement could be streamlined to include only the most useful criteria. Potentially, redundant or overlapping data could be removed in order to simplify the creation of balanced, heterogeneous classes. Furthermore, these survey data are vital because they reflect the current thinking of teachers at the site regarding student equity. By more clearly understanding what student attributes teachers considered most important, the procedures for classroom placement could be modified accordingly to promote equitable practices.

Specifically, the quantitative findings are presented below, through frequencies and means, in the order of greatest perceived applicability and usefulness to those considered less useful in the placement process. The data points are likewise grouped into thematically related categories. Special education status and academic interventions have been grouped together because they represent either specific legally mandated interventions, such as special education status, or site-based initiatives such as enrollment in reading intervention classes. The category of academic achievement data refers to any student data points that indicate their level of standards-based performance. Behavioral data refers to student data points that discuss a student's disciplinary record or classroom conduct. Student engagement refers to any student data points that track a student's attendance or level of commitment to schoolwork. Demographic or categorical data refers to student information that is not attributable to classroom factors, such as gender or enrollment in counseling services.

Special education and academic intervention status

Of the 25 data points used during the placement process, survey respondents tended to rate special education and academic intervention status relatively high. Of the highest survey rankings, five of the seven fell under this category of student data (see Table 1). Student IEP status, determined by their enrollment in SPED services, was the highest-ranked student data point of the 25 in the survey (M = 4.73, SD = .458). While IEP status may indicate the student's receiving of either behavioral or academic SPED services, it was differentiated in the placement process from IEPs related to Speech services. Speech services, while still rated highly by a majority of educators, had a much lower mean and a greater standard deviation than non-speech IEPs (M = 3.80, SD = 1.373). Speech IEPs were ranked 11th of 25 student data points. Student ELPAC score was the second-highest mean score for any student data point (M = 4.53, SD = .516).

Table 1. Frequencies, means, and standard distributions of special education and intervention data point rating responses

Data Point	*f* Score 1	*f* Score 2	*f* Score 3	*f* Score 4	*f* Score 5	Mean	SD
IEP	0	0	0	4	11	4.73	.458
Speech	1	2	3	2	7	3.80	1.373
504	0	0	1	5	9	4.53	.670
SST	0	1	2	5	7	4.20	.941
Reading Intervention	0	0	2	8	4	4.14	.663
ELPAC Level	0	0	0	7	8	4.53	.516

While IEPs are a legal function of the federal government's 1990 Individual with Disabilities Acts, student 504s originate from Section 504 of the Rehabilitation Act of 1973. Student 504s are differentiated from IEPs in terms of what disability they are addressing and whether a student requires accommodations (504) or modifications (IEP) for student success in the learning environment. While IEPs address 13 specific disabilities listed in the IDEA act, 504 plans address any disability that may interfere with a student's learning (Understood for All, n.d.). Student 504 status was the second-highest ranked student data point (M = 4.53, SD = .670), tying with student ELPAC level in order of perceived importance to teachers.

The data point SST referred to whether a student had previously or currently been involved in a Student Study Team. Experiences with SSTs are often a precursory process before SPED status is determined and was likewise reflected in its relatively high ranking (M = 4.20, SD = .941). Student Study Teams can also refer students to other services, like behavioral supports or non-SPED interventions, as warranted by the students' particular needs. The SST status was the sixth most essential student data point as determined by the mean score of the survey answers.

Reading intervention refers to a site-level intervention program wherein students who fall behind in their reading achievement level meet regularly in small groups with a reading specialist. These groups are flexible, although some students may spend most of the year in such groups to get them closer to proficiency. There are no set guidelines or criteria for referring students to reading intervention at the site, although maintaining a small intervention group size sets a cap on the number of students who can attend. Because these services are not legally mandated or controlled by district policy like SPED, SST, or 504 plans, non-academic attributes such as student behavior and work habits are often contributing factors considered before sending a student to reading intervention. A student's involvement in the site-level intervention group ranked seventh on the list of 25 student data points, with most teachers ranking it as a 4 or 5 (M = 4.14, SD = .663).

During the 2019-2020 placement procedures, teachers reported whether a student was classified as an English Learner student by indicating their current ELPAC level. For non-EL students, the response was left blank. Besides the ELPAC's four reporting levels, teachers could also respond if a student had been listed as "fluent" or "reclassified" or "pending." Teachers overwhelmingly reported a student's EL status and ELPAC score to be of considerable importance, with all respondents marking it as a 4 or 5 (M = 4.53, SD =.516).

Academic achievement data

Several data points used in the class formation process were measures of student achievement. These measures varied with regards to their applicability for particular grade levels and their possible level of subjectivity. Student ELA and Math levels were ranked as the ninth and tenth most useful data points (as measured by their score means), with nearly identical distributions of response frequencies and standard deviations (see Table 2).

Table 2. Frequencies, means, and standard distributions of academic achievement data point rating responses

Data Point	*f* Score 1	*f* Score 2	*f* Score 3	*f* Score 4	*f* Score 5	Mean	SD
ELA Level	0	2	3	4	6	3.93	1.100
Math Level	0	2	3	5	5	3.87	1.060
BAS Level	0	3	3	4	5	3.73	1.163
Lexia Core 5 Level	3	2	7	3	0	2.67	1.047
STAR Reading Score	2	3	7	2	0	2.64	.929
STAR Math Score	2	3	7	2	0	2.64	.929
Lexia Power-Up Level	4	2	7	1	0	2.36	1.008

When educators entered these data points into the spreadsheet used to disaggregate the data, there were no guidelines or rubrics presented to align scores across or within grade level spans. These ELA and Math scores used a four-point scale that corresponded to the language and scoring used on the site's standards-based report card. Scores for ELA and Math achievement were 1 for below standard, 2 for standard nearly met, 3 for standard met, and 4 for standard exceeded.

The BAS level refers to Fountas & Pinnell's Benchmark Assessment System. This reading benchmark assessment is only used by the site's kindergarten and first/second grade span teams. It is administered by a teacher at the site three times a year to measure each kindergarten through second-grade student's instructional reading level. Each reading level is given an alphabetic code that corresponds to a Lexile level. The mean score of BAS ranked 12th out of 25 data points according to the mean score on the survey. The distribution and standard deviation for BAS level were similar to Math and ELA achievement scoring. In terms of reading assessments, BAS level ranked far higher than all others.

The STAR Reading and Math assessments were both developed by the Renaissance Learning company. Unlike the BAS reading assessment, the STAR tests are fully online and do not require a human proctor. These assessments themselves take a similar amount of time as the BAS and provide a variety of measures and reports for teachers. For the STAR Reading assessment, teachers can measure students according to various scoring metrics such as their Grade Level Equivalent score, Instructional Reading Level, Lexile level, STAR scales, PARCC score, and percentile ranking. For the site's 2019-2020 placement cycle, teachers reported students' Instructional Reading Level. For the STAR Math assessment, teachers can measure students according to such metrics as their Grade Level Equivalent

scores, PARCC scores, percentile ranking, or Smarter Balance scoring. For the site's 2019-2020 placement cycle, teachers reported students' Grade Level Equivalent scores. Like BAS, each of these STAR tests is given three times a year at the site. According to the survey data, STAR Reading and STAR Math assessments mean scores tied for 20th place (M = 2.64, SD = .929) regarding their perceived usefulness in student placement. STAR math and STAR reading had identical means, standard deviations, and score distributions.

The remaining measures of student academic achievement used during the site's placement cycle is Lexia Core 5 and Lexia PowerUp levels. Lexia is a digital reading instruction platform that consists primarily of independent student practice that is supplemented with program-prescribed teacher reteaching and paper-and-pencil worksheets. Lexia Core 5 is intended to be used by grades one through five, while Lexia PowerUp is intended for grades six through eight. Each student is given a numerical level based on a preliminary digital assessment and their progression through the program. At GLC, Lexia Core 5 is used by grades one through five, Lexia PowerUp is used by grades five through eight, with overlap between programs occurring in the five/six grade span. The mean score for Lexia Core 5's perceived usefulness (M = 2.67, SD = 1.047) rated slightly higher than either STAR assessment (M = 2.64, SD = .929), while Lexia PowerUp (M = 2.36, SD = 1.008) ranked near the bottom of the list. Similar to the STAR assessments, the frequency scores both weighed heavily in the middle, with the most common respondent score being 3 in the case of each Lexia and STAR data point.

Behavioral Data

Student data corresponding to their behavior was generally ranked high as an essential data point for placement by survey respondents, with two exceptions. During the 2019-2020 student placement cycle, Students Level of Behavioral (M = 4.33, SD = 1.047) support mean score was ranked fourth out of 25 student data points with regards to its perceived usefulness to educators (see Table 3).

Table 3. Frequencies, means, and standard distributions of behavioral data point rating responses

Data Point	*f* Score 1	*f* Score 2	*f* Score 3	*f* Score 4	*f* Score 5	Mean	SD
Level of Behavioral Support	0	2	0	4	9	4.33	1.047
Existing Behavioral Supports	0	1	4	3	7	4.07	1.033
Previous Teacher Notes	1	6	2	5	1	2.93	1.163
Peers Not To Be Placed With	0	2	1	3	9	4.27	1.100
Peers to Be Placed With	2	0	9	2	2	3.13	1.125

Teachers were asked to rate students according to a four-tiered ranking system with the categories being model, manageable, constant redirection, and intense support. Despite the lack of any rubric or criteria for such categories, all but two respondents ranked this particular student data point as a 4 or 5.

Teacher notes on existing behavioral supports also ranked relatively high (M = 4.067, SD = 1.033), coming in eighth out of 25 student data points. These teacher notes most often referred to interventions put in place as part of the school's Positive Behavior Intervention and Support system. Such interventions could take the form of checking in with an adult on campus at the start and end of the school day, being given short breaks away from the classroom for emotional cooldown periods, or charts used to set goals and track a student's on-task behavior. In terms of behavioral data, behavioral supports (M= 4.07, SD= 1.033) ranked above previous teacher notes (M= 2.93, SD= 1.163) and peers with whom

the student should be placed (M= 3.13, SD= 1.125), but below the level of behavioral support and peers with whom the student should not be placed (M= 4.27, SD= 1.100).

Juxtaposed to the relative importance of behavioral levels and types of behavioral supports was the relatively low mean score of the perceived usefulness of the previous teacher's notes (M = 2.93, SD =1.163). Teacher notes (M = 2.93, SD =1.163) ranked 17th out of 25 data points. The frequency of answers with these data was split down the middle, with six respondents giving teacher notes a score of 4 or 5 and seven respondents giving teacher notes a score of 1or 2 (two respondents gave it a middle score of 3). Teacher notes varied with regards to length, descriptiveness, and focus. No guidelines or criteria were given during the placement process with regards to how or when such notes should be made.

Teachers involved in the 2019-2020 placement cycle at GLC were also asked to list names of individuals with whom the particular student should be placed, such as to be a support with language needs, and list individuals with whom the student should not be placed with, such as those who might exacerbate negative behaviors or increase the likelihood of conflict. Families would also request that their student be placed with or away from siblings and other family members, a particular concern in a smaller school with multi-grade classrooms. Other than honoring such family requests, there was no rubric or metric for how an individual should be listed. Each category, while somewhat related, resulted in very different responses to the survey. The mean score of listing students with whom the student should be placed with ranked 15th out of 25 data points (M = 3.13, SD =1.125), while listing students that an individual should not be placed with ranked fifth out of 25 data points (M = 4.27, SD =1.100).

Engagement Data

Engagement-related student data refers to four data points used during GLC's 2019-2020 placement process that dealt with how students were engaged in the classroom. While these data points tangentially relate to student behavior, they are variables with contributing factors primarily taking place outside of the boundaries and control of the school. The mean score for all four of these data points ranked in the lower half of the survey (see Table 4). While absences and tardies were objective data sources, student and parental engagement were subjectively assessed by the teacher without any sort of rubric or metric.

Table 4. Frequencies, means, and standard distributions of engagement related data point rating responses

Data Point	*f* Score 1	*f* Score 2	*f* Score 3	*f* Score 4	*f* Score 5	Mean	SD
Number of absences	2	4	2	6	1	3.00	1.254
Number of tardies	5	3	4	3	0	2.22	1.175
Level of parental involvement	1	2	11	0	1	2.87	.834
Level of distance learning engagement	4	4	5	1	1	2.40	1.183

Teachers were asked to numerically note students' absences and tardies, taking these data directly from the school's database. The perceived usefulness of student absences during the placement process was ranked 16th out of 25 data points, the highest-ranking for engagement-related student data (M = 3.00, SD =1.154). The number of student tardies, on the other hand, ranked near the bottom at 24th of 25, with the majority of respondents giving it a score of 1 or 2 (M = 3.13, SD =1.125). While a single teacher ranked absences as "most useful," no teacher did so with tardiness.

The mean score of parental engagement ranked 18th out of 25 student data points on the survey (M = 2.87, SD = .834). During the 2020-2021 formation of classrooms, teachers were asked to rate students' parental involvement on a scale of 1 through 3, with 1 indicating "not involved" and 3 indicating "very

involved." Beyond these descriptors, there was no rubric, discussion, alignment, or metric for how these scores should be applied. Most respondents (n = 11, 73%) rated this a 3 in terms of the data point's perceived usefulness during classroom formation.

Similarly, most respondents (n = 11, 73%) scored distance learning engagement as 1-3 in its perceived usefulness (M = 2.40, SD =1.183). Its mean score ranked 22nd out of 25 student data points, indicating an overall low consideration for the applicability of how students were engaged with distance learning to the process of forming new classrooms. A few months before teachers began the placement process, the Covid-19 pandemic shut down most in-person schooling across the county. GLC's district responded initially by having teachers call students on the phone to check in with them and while students worked asynchronously on printed packets. While the district's plan for distance learning was revised with scheduled, synchronous distance-learning components and internet-based group communication platforms, the earliest stages of the pandemic response had no such components. Teachers were asked to rate their student's level of distance learning engagement as high, medium, or low. No other rubric, metric, or discussions occurred to define what these ratings implied.

Demographic and Categorical Data

These objective student data points did not belong to any other category and were not based on any teacher assessment. However, all three of these data points were used by participants in the placement process at GLC during the 2019-2020 school year. While a student's enrollment in counseling services could be considered a type of intervention, it was placed in this section because the implications for classroom or teacher support vary widely according to the purpose for counseling services. These data points fell to the middle and lowest-ranked mean scores of perceived importance to student placement (see Table 5).

Table 5. Frequencies, means, and standard distributions of demographic and categorical data point rating responses

Data Point	*f* Score 1	*f* Score 2	*f* Score 3	*f* Score 4	*f* Score 5	Mean	SD
Counseling services	1	1	4	5	4	3.67	1.175
Gender	2	0	6	3	4	3.47	1.302
Wears glasses	9	0	4	0	2	2.07	1.487

The mean score for how educators perceived a student's enrollment in counseling services (M= 3.67, SD= 1.175) and their gender (M=3.47, SD= 1.302) ranked 13th and 14th out of 25 student data points. A student's enrollment in counseling services referred specifically to county or school district counseling services, although no specific instructions were given to indicate or differentiate between these cases. Most respondents marked counseling services middle to high, the majority of respondents (n = 13, 86%) scoring it between 3 and 5.

Gender could be considered a preeminent consideration during the balancing of classrooms because the data cards used to form student groups are color-coded accordingly. The mean scores of the survey respondents ranked gender just under counseling status, 14th out of 25 student data points (M = 3.47, SD =1.302). The frequency distribution of gender scoring tends to the center, with most respondents (n = 13, 86%) scoring it 3 or greater.

Whether a student wears glasses or not ranked last of all the student data points used during the 2019-2020 student placement cycle at GLC (M = 2.07, SD =1.486). Most respondents (n = 9, 60%) ranked it as "not useful." The remaining respondents (n = 4, 26%) scored it as a 3 while two outliers marked glasses as "most important."

Open-Ended Responses

The survey also asked respondents to address three open-ended questions to illuminate the context for the anchored scale responses by asking for areas of the placement process that participants felt were most and least helpful and/or productive and areas of improvement. Issues such as the reliability of subjective measures, the organization of placement meetings, the visual aids used during the placement meetings, micropolitical considerations, and the effects of the Covid-19 pandemic were themes that ran throughout the responses to all three open-ended questions after the process of thematic content analysis.

Understanding meeting organization and processes critical for precise placements

The systems and processes for managing the student placement process weighed heavily in many responses to the open-ended survey questions. Several educators, addressing different sections, noted the need for a more precise placement process that was also more efficient. One respondent wrote that a lack of structure made them do "double the work." Several respondents noted that placement meetings often involved irrelevant and needlessly lengthy discussions. The inability to come to decisions during the specified meeting time also caused consternation for many respondents. "It was not as productive when all parties did not understand the process," another respondent wrote. "It seems like we needed a clear step-by-step guide on how to go about building the classes with the data at hand." This confusion led to at least one group completely reshuffling the process mid-meeting because "they could not visualize how the process was supposed to work." Another respondent noted that the meetings "always felt rushed" due to such confusion.

Despite the problems related to meeting organization, respondents overwhelmingly noted that meeting in teams, specifically with the previous year's teachers, was beneficial. Collaboration was mentioned multiple times with regards to what aspects of the placement process proved helpful and productive. Multiple respondents stated things like, "It was helpful being able to discuss students with their previous teachers." Respondents went into further detail on this topic, saying that it was helpful to have the previous teachers present to ask questions, refine placement decisions, and discuss specific student interventions.

Visual aids assist in the process

The ability to visually observe, in real-time, the formation of classrooms was consistently mentioned in various sections of the open-ended survey responses. Clear, color-coded screens that showed the data point counts of each class inspired greater trust that classrooms were balanced between teachers. Respondents wrote comments like "having a color-coded spreadsheet made the process a lot more smooth" and "it was helpful to the grids...so we could see if the classes were balanced academically." Another wrote that "Having instant numbers on varies (sic) data points for students helped to balance classes more efficiently." Compared to having spreadsheet data immediately available, respondents observed that the pink and blue card system was akin to guessing.

Be mindful when considering subjective data and measures

One prevailing theme that ran through the responses was the distrust of some of the subjective data teachers used to place students. Because each grade level span was attempting to create internally heterogeneous, balanced classrooms between teachers, the issue of reliability came to the forefront in multiple survey answers. ELA and Math achievement was specifically mentioned, calling it "a personal criteria" and "the implementation of a person (sic) feelings." This lack of standardization, according to this respondent, "lead (sic) to many inequities." Respondents specifically mentioned that a lack of a grade-level alignment tool for ELA/Math achievement scores means that such data should be taken "with a grain of salt."

Likewise, teacher narrative comments were cited for being potentially skewed, calling them "a little bias." This same respondent suggested that administrators should preview teacher comments

beforehand and coach teachers in eliminating bias language that is "based on emotion." One teacher wrote, "students often behave and/or achieve differently with other teachers or classroom environments. Sometimes one teacher's struggle does not manifest for the next (or vice versa)." This distrust of subjective data and teacher comments, however, did not indicate that teachers were hesitant to discuss students with their prior teachers. Instead, time and again, teachers noted that meeting with the previous teachers was helpful and necessary.

Finally, one respondent was concerned about the accuracy of some computer-based assessments because testing irregularities or skewed scores caused by students who may not have taken the assessment seriously. While few respondents specifically commented on this sort of occurrence, the relatively low rankings of digital tests in the previous section of the survey indicated that this might be a sentiment held by many educators. Another clue to this low ranking may be the different measures used at different grade spans, with one respondent stating that they gave low scores to STAR and PowerUp data points simply because they do not use those assessments in their grade level.

Micro-political decision-making is a barrier to equitable placement

Related to the respondents' concerns regarding biased, skewed, and subjective data were concerns about micro-political decisions that caused potential equity issues. Concerns were raised about making roster changes according to "arbitrary criteria" to accommodate "best fit or past family relationships." According to this respondent, placing students according to past family relationships created a "tracking system...which reduced equity." Likewise, another respondent noted that "the idea that you previously had the family should not be highly considered." They noted that administration should take a leading role in setting the culture and expectations that would curtail this sort of activity.

Multiple respondents noted that off-the-shelf placement software could potentially alleviate equity issues related to the micro-political posturing and biased data. Another respondent noted that such software would also make initial class building and adjustments more efficient. One respondent stated that such software could prevent "teachers favoring their friends", thereby preventing "inequitable class placements." Another answer to this issue provided by respondents would be to have the previous teachers' pre-make balanced classroom assignments and randomly assign them to a teacher. Doing this would likewise serve to eliminate favoritism and prevent teachers from lobbying for or making biased assignments.

Covid-19 pandemic-related concerns impact feelings of trust in the classroom placement process

Distance learning and the Covid-19 pandemic loomed over many of the survey responses. The visual, spreadsheet data system that many respondents reacted positively to was initially conceived to overcome the barriers associated with remote, online meetings. Equity was a concern for those measuring students' distance learning engagement "because all families did not have the same access i.e. tech and internet last year." Lastly, multiple respondents noted their frustration with having much of the placement work undone by the district to accommodate their mandated bifurcated, distance-learning school day schedule. "Due to Covid and all the changes between classes," one respondent wrote, "the hard work we put in felt wasted."

DISCUSSION and CONCLUSION

Open-ended survey data often explained why certain student data points were rated as highly applicable to the student placement process and why some data were regarded as less valuable. For example, student IEP status, ELPAC level, and 504 status, the three most useful student data points, represent what one respondent called "legally binding" designations that require the educator to adjust instruction according to a specific set of parameters to meet student needs. This mirrors findings in the literature in how student data points are prioritized by decision-makers (Datnow & Park, 2018; Paufler & Amrein-Beardsley, 2014). Several other survey respondents wrote that the focus on ELPAC level was a

productive and helpful part of the placement process "because it allows the time to consider what accommodations (even those that are universal) and/or modifications the student needs." The GLC student population consists of 25.9% English Learners, above the California state average of 18.6% (CDE n.d.). The fact that ELPAC status was rated so highly indicates that this substantial population of students is considered critical to the formation of classrooms, and their effect on classroom-level instruction is considered substantial in the eyes of the educators at the research school. This is an encouraging situation regarding student equity. In this case, the data used to group students into the classrooms translated into teacher preparation for meeting their needs.

Data measures were not seen as equally reliable, however. While ELA and Math achievement levels were important for survey respondents, many made note that a lack of site or grade-level scoring alignment caused doubts as to whether such data were valid. Further complicating the measurement of math and ELA achievement are the respondents' views on the various available computer-based assessments. For example, STAR and Lexia levels, while inherently standardized in delivery and scoring, were rated lower than math and ELA level of achievement supplied by teachers with regards to their usefulness. This is due in part to the multiple computer-based measures that differ across grade levels. Mandinach & Gummer (2016) state that educators must understand the context for data during their decision-making process. For many of these standardized assessments, the context of the test simply did not apply to placement processes involving their grade level.

The greatest hindrance in an equity-based student placement process was the meetings themselves. While prioritizing student data points was important, many respondents stated the procedures were ill-defined in intent and process. How placement decisions are facilitated has important ramifications for the ways teachers communicate, advocate, and use information (Park et al., 2017; Paufler & Amrein-Beardsley, 2014; Sleenhof et al., 2019). Therefore, creating and communicating a clear set of steps is critical to ensuring that students can be placed in a classroom situation that is appropriate for their needs. To ensure equitable decision-making, the principal must emphasize asset-based approaches centered around the team's accepted belief that student attributes are not fixed determinations but rather guideposts to drive instruction (Paufler & Amrein-Beardsley, 2014). Such procedures need to encourage orderly participant interaction, something the literature and the survey results support (Paufler & Amrein-Beardsley, 2014). The literature and survey responses also indicate that improved support is needed to create an informed, shared vision for the ways student data are used before the placement of students begins (Mandinach & Gummer, 2016; Park et al., 2017; Sleenhof et al., 2019).

Lastly, such meetings must include a shared visual component that creates a shared understanding of classroom demographics. Survey respondents overwhelmingly stated that a real-time, side-by-side visual representation of classroom populations helped create fair, balanced, and heterogeneous classrooms. Clear, organized, graphically-based data allowed stakeholders to make better-informed decisions with greater confidence (Sleenhof et al., 2019).

Elementary student classroom placement relates to issues of educational equity

The process of assigning elementary students to their next classroom relates to issues of educational equity in two significant ways. First, classroom placement has a significant effect on the trajectory of students' education. Several researchers noted that the deployment of resources and interventions is dependent on classroom placement, including the experience and quality of the teacher being assigned to a given group of students (Bosworth & Li, 2013; Burns & Mason, 1995; Kalogrides et al., 2013; Sleenhof et al., 2019; St. John, 2014). This was similarly reflected in the survey data. Multiple respondents noted concerns that micropolitical decisions had a noticeable effect on where students would be placed, creating a de facto tracking system that potentially overrode the intention of creating balanced, heterogeneous groups.

Second, how data are used during the student placement procedures is tied directly to equity. Multiple researchers noted that the way student data are gathered, prioritized, discussed, and utilized during the

placement process has significant implications for school equity (Datnow & Park, 2018; Kalogrides et al., 2013; Mandinach & Gummer, 2016; Marsh & Farrell, 2015; Park et al., 2017). Survey data gathered in this research project mirrored this assertion as well. Respondents highly rated the importance of student data points that necessitated specific interventions, like SPED or English-Learner status. Survey respondents also noted that the legal and ethical requirements to make appropriate accommodations for students were considered during the placement process. Furthermore, they noted that some data points, while potentially useful, were suspect because teachers within and between grade levels did not similarly calibrate their grading. Several respondents noted that teacher comments had the potential to be biased, and therefore discounted or ignored such student data during their decision-making process.

Improving the classroom placement process to promote equity and student achievement

In order to promote more equitable practices during the placement process, such procedures first need to be transparent, well-developed, and clearly explained to the participants. Researchers noted on several occasions that how placement meetings were organized and carried out affected how students were discussed and how decisions were made (Burns & Mason, 1998; Paufler & Amrein-Beardsley, 2014; Sleenhof et al., 2019). Administrative training and credentialing programs are well-positioned to address this since principals are often central to managing these procedures. Nevertheless, principals currently receive limited training in the formation of classrooms or student placement (Paufler & Amrein-Beardsley, 2014). Multiple respondents in the survey similarly communicated a desire for a transparent, efficient process for student placement that reduced the effects of educator bias and maximized student well-being.

In terms of general systems theory (Sauter, 2017; Vornberg, 2013), the process for moving an elementary student from one class to the next needs to determine what input (student data) is most important to the process and how the subsystems and elements within that process are organized to produce the desired output (balanced, heterogeneous classrooms). School districts are in an excellent position to develop these systems yet have often not done so (Paufler & Amrein-Beardsley, 2014). Therefore, creating a standardized, district-wide placement system that meets the needs of local stakeholders would go a long way towards rectifying potential missteps and preventing bias from interfering with equitable student placement.

With regards to site-level considerations, stakeholders and decision-makers can make several first steps to improve their processes. Before placement begins, educators on the site need to calibrate their grading and achievement data within and between grade levels. Achievement scores rank highly in importance both in the research literature and in this project's survey data. However, concerns about the quality of such data remain. Regular calibration of such data would help to rectify those worries and improve stakeholder confidence. Next, site leadership must promote specific language and attitudes that set a tone for equity during these procedures. Systems that explicitly espouse and engage in asset-based thinking are better equipped to produce holistic decisions that promote inclusivity from all stakeholders (Datnow & Park, 2018; Sleenhof et al., 2019).

Lastly, stakeholders would be well-served by aligning their placement procedures to existing MTSS systems. This would promote a common language between decision-makers and thus help to calibrate and prioritize data. An example of this sort of MTSS alignment could be behavioral data. Behavioral data rate highly in the literature and with this research project's survey respondents regarding its impact on placement decisions (Paufler & Amrein-Beardsley, 2014). Using language and data drawn directly from MTSS behavior systems, such as the placement of students in one of three behavior intervention tiers, would help standardize the way behavior data are addressed and disentangle teacher bias from the discussion. By centering placement procedures in terms of the required interventions necessary for responding to students' needs equitably and effectively, an asset-based approach is reinforced and promoted during the creation of heterogeneous, balanced classrooms. See Table 6 for an overview of a proposed elementary student placement process modeled after Conzemius and O'Neil (2014) and Figure 2 for a decision-making flowchart for the placement meeting process. The process was developed

based on the findings of this study and the literature delineating how such systematic, equity-based placement procedures might be undertaken to further this action research or considered in other similar contexts.

Table 6. Action plan for elementary classroom placement process

Phases	Action Steps	Timeline	Persons Responsible	Leader Considerations
Phase 1 - Before the placement meeting	Calibrate grading within and between grade-level teams	Aug- Dec	Grade Level Teams will meet to define how achievement levels will be measured. Administrators will facilitate meetings and provide in-service teaching as required.	Maintaining cohesion in ELA and Math scoring is important for fomenting confidence in the placement process and for that formation of balanced classes.
	Adjust procedures and review site's guiding principles for placement	Dec-Jan	Administrators will facilitate team meetings to adjust placement protocols using feedback from previous year's feedback.	This step is critical to maintain the continued integrity and applicability of the procedures to current site conditions and stakeholders. The site's guiding principles for placement will be reviewed to ensure relevance.
	Gather documents and data	Feb-Mar	Teacher teams will work together to ensure they have all the necessary student data points easily available and ready.	While not all the necessary year-end data will be finalized, having a common digital storehouse or repository ready for data entry will ease and quicken the following steps.
	Enter appropriate data points into spreadsheet or other visual workspace	Late Mar - Early Apr	Teachers will enter the data for their students.	The nature of this step depends on how the site's teams are sharing information in a visual format that facilitates classroom balance.
Phase 2 - During the placement meeting	Review site's guiding principles for placement	Mid-Apr	Grade level team and meeting facilitator	A brief review of the site's principles regarding placement will serve to remind the team of their purpose with special emphasis focused on student achievement and equity
	Place students receiving special services (SPED, 504, non-speech)		Grade level team and meeting facilitator	Begin placing students with IEPs or 504 plans.
	Place EL Students		Grade level team and meeting facilitator	Maintain a balance of ELPAC levels within classrooms
	Place students on Tier 1 behavior plan		Grade level team and meeting facilitator	During placement, monitor ELA and Math achievement levels in each of the forming classes and adjust as required to maintain balance between groups
	Place students on Tier 2 behavior plan		Grade level team and meeting facilitator	During placement, monitor ELA and Math achievement levels in each of the forming classes and adjust as required to maintain balance between groups.

	Give tentative initial lists to site administrator		Grade level team and meeting facilitator	Site administrator will fine tune class lists to improve balance and heterogeneity, and then move to the next step of placing those students needing Tier 3 behavior supports.
	Place students of Tier 3 behavior plan		Administrator, grade level team and meeting facilitator, along with behavior intervention specialists or other site and district experts as appropriate for context	Students identified as needing Tier 3 behavior supports will need to be strategically placed so as to maintain balance, heterogeneity, with emphasis on student success.
Phase 3 - After the placement meeting	Collect and analyze participant reflection data	Late April	Administrator, meeting facilitator	Use reflection or survey tool to gather teacher feedback on the placement process in order to facilitate the improvement of future placement cycles.
	Assign teachers to classes	June-July	Administrator	This step may need to be adjusted based on Tier 3 student interventions and specific teacher skill sets and/or temperaments to ensure an equitable placement for such students.
	Publish class lists with teacher assignments	Late July-Early Aug	Administrator	Class lists are published for staff and parents.
	Teachers meet to review previous teacher comments	Early Aug	Administrator, Teachers	Before school begins, the Administrator will schedule and plan a series of brief meetings or allocate planning time for teachers to discuss students. Special attention will be given to share effective strategies for Tier 2 and Tier 3 interventions.

Meeting Facilitation Considerations

It may be helpful to have a placement meeting facilitator who can guide the process so the teacher teams can focus on assigning the appropriate student at each step and monitor the balance between the classes being formed in real-time. Teachers should take turns assigning a student to each group to ensure that classes are appropriately heterogeneous and balanced. The facilitator's task will be to update any visual tracking tool or spreadsheet, and ensure the team is abiding by the site's guiding principles.

Students requiring Tier 3 interventions will require special consideration with regards to equitable placements. The administrator may want to match interventions to particular teacher temperaments and skill sets; however, this process is premised on the idea that each teacher should be prepared and able to provide every student with the appropriate interventions. The administrator making final decisions with regards to matching classes and teachers would be advised to consider and prepare appropriate supports for teachers who may need assistance meeting the needs of their Tier 3 students during the school year.

Before the school year begins, it is advisable that teacher teams meet to discuss Tier 2 and Tier 3 intervention students with the previous year's teachers and appropriate specialists. This meeting can be done formally or informally depending on time available and circumstances at the school site. These meetings should focus on discussing effective interventions and strategies for those students, emphasizing asset-based approaches.

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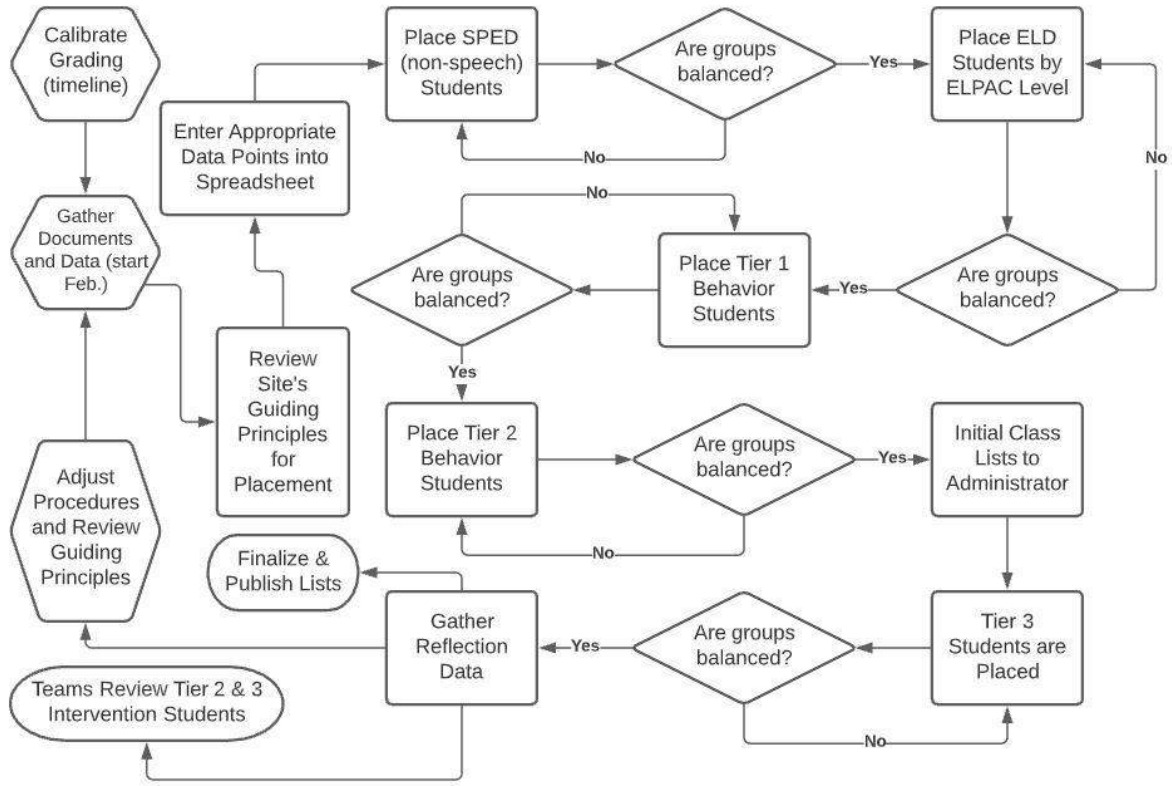

Figure 2. Placement meeting procedure decision-making flowchart

Limits of the Study

Because this research project focused on a single school site case, the study was limited in scope and number of respondents. Future research could be conducted to more comprehensively examine the procedures for student placement procedures across multiple schools within a district. A larger sample size of respondents would also more clearly delineate trends and variations in educator attitudes. Adding demographic data to future surveys would better demonstrate how teachers of lower elementary school students are differentiated in their attitudes and priorities from upper elementary teachers. This could possibly reveal trends within educator demographic groups, including years of experience, socioeconomics, gender, or race.

Finally, future research would do well to investigate how improving placement procedures along the lines presented in this research study correlate to improved student achievement and equity at the school site.

Ethics and Conflict of Interest

We, as the authors of this article, have acted in accordance with ethical rules at all stages of the research, and there is no conflict of interest among the authors.

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EXPLORING SERVICE LEARNING FROM THE PERSPECTIVE OF EARLY CHILDHOOD PRE-SERVICE TEACHER EDUCATION

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Abstract

Service learning has been stressed as an effective pedagogical approach to enhance students' professional skills and citizenship for future development. However, service-learning research concerning early childhood pre-service teacher education has been rarely done. This study explored how undergraduate students in an early childhood pre-service teacher education program experienced in seven different service learning activities and discussed the meanings of their experiences from the perspective of early childhood pre-service teacher education. Participants in the study were 99 undergraduate students of early childcare and education. Their speech reflections, SL (Service learning) reports and verbal presentations during the course and service learning were analyzed qualitatively. The study revealed participants experienced emotion processes. In addition, participants learned professional skills and formed their teacher traits. How to balance the student choice and the goals of the course from SL activity needs to be taken into account.

Keywords: Service-learning, early childcare and education, pre-service teacher.

INTRODUCTION

Service learning(SL), integrating academic learning and community service to increase students' learning experiences, has been advocated as a teaching and learning method (Jones, 2017; Leon et al., 2017; Lovat & Clement, 2016; Pratt & Danyluk, 2017; Tokke, 2017). Studies show SL plays a positive and meaningful role for students to connect academic learning with the real world (Bach, 2016; Kaye, 2010; Myers, 2016; Wilkinson et al., 2012). Furthermore, Research found SL helps students have better attitudes, enhanced communication skills and problem solving skills. Also, students can learn the importance of leadership and collaboration, be aware of citizenship, or prepare career development furtherly from SL (Anderson et al., 2019; Dean, 2000; Edmond & Driskill, 2019; Matheson & Petersen, 2020; Pascualy Cabo et al., 2017; Popovich & Brooks-Hurst, 2019; Rodríguez-Nogueiraa et al., 2020; Vogelgesang & Astin, 2000). However, although what learning outcomes of SL occur has been studied a lot, "How" SL does is less explored in research (Gardner, 2021).

For college education, SL has been applied to college students, especially in academic areas of business, engineering, language learning, and nursing (e.g., Chen, et al., 2018; Dent, et al., 2018; Furness & Paulson, 2018; Liang, et al., 2019). However, SL research in early childhood pre-service teacher education is rare although studies concerning SL has been extensively done in the above areas (Jones, 2017; Pertersen & Petker, 2017). For early childhood education, teacher quality is critically important for educating young children, and SL is considered as a better teaching and learning method to increase the quality (Jones, 2017). Especially, what should be done or how to do to increase teacher quality of

early childhood education through SL has been rarely explored. In the study, as a researcher and course instructor in the academic area of early child care and education for decades, the first researcher who used SL as pedagogy for the first time tried to examine whether or not SL was a pedagogy to increase teacher quality. In addition, the second researcher as a teacher educator for decades was going to examine results from the views of teacher education in order to increase the quality of the study. Hence, this study revealed what university students of early child care and education described their experiences from their SL activities and compared the differences among their SL activities from the perspective of early childhood pre-service teacher education.

Literature Review

Review of SL

SL is defined as pedagogy to increase students' personal growth and civic responsibility through connecting students' academic learning with meaningful community service (Jones, 2017). Scholars (e.g., Chen, et al., 2018; Jacoby, 1996; Strait & Sauer, 2004) usually views SL as an experiential learning paradigm. Flecky (2011) claimed theoretical and pedagogical approaches of SL are needed because SL is not only simply an assignment to a course, but also challenges the educator, learner, and community partners in connecting each other. Hence, in order to integrate SL into teaching, theoretical and pedagogical approaches supporting SL were explored.

From literature research, it was found that Kolb (1984) proposed a four-stage experiential cycle model involving concrete experience, reflective observation, abstract conceptualization, and active experimentation for SL rooted in philosophy of John Dewey and theory of Kurt Lewin. The cycle started with concrete experience, and learners were assigned a task to learn through active involvement at the stage. Next, at the reflective observation stage, what has been done and experienced was reviewed by learners on a personal basis and with teacher's assistance. At the third stage of the cycle, abstract conceptualization, learners formed new ideas or modified existing ideas based on reflective observation. Lastly, learners put their new/modified ideas into practice. Giles and Eyler (1994) provided nine areas (i.e., the continuity of experience, the principle of interaction, inquiry, reflective activity, truly educative projects, concrete and abstract knowledge, the great community, citizenship, and democracy) for theory development and testing based on John Dewey's educational and social philosophy (Dewey, 1990; 1916; 1933; 1938; 1946a; 1946b). For more theoretical and pedagogical approaches of SL, Flecky (2011) stated that SL is also related with critical theory (Freire, 1973; Shor, 1987), feminist pedagogy (Weiler, 1991), pedagogy of engagement (Lowery et al., 2006), the transformational model (Kiely, 2005), and Schön's (1987) reflection in action of students and active coaching by the educator. For early childhood education, Jones (2017) stated SL theory should include Contact Theory (CT) invoked by Erickson and Santmire (2001) and Vygotskian Theory (Vygotsky, 1978). Therefore, the above theories or criteria were taken into account in the study.

Teacher Quality of Early Childhood Education

Regarding teacher quality, Kennedy (2006) stated that teacher quality was related to right combination of personality, values, knowledge and skills, and the condition of classroom. Goldstein and Lake (2000) argued the development of care was viewed as a vital concern of teacher education and the development of conceptions of caring by pre-service teachers should be enhanced. According to a public opinion poll on teacher quality (Hart & Teeter, 2002), designing inspiring learning activities, teacher's enthusiasm and caring attitude were more concerned than a thorough understanding of knowledge content by the public for teacher quality. Also, Cochran-Smith (2003) claimed that teacher quality might have different definitions because of the diverse purposes of schooling in a democratic society.

For early childhood education, teacher quality is critically important and SL is advocated as a better way to enhance teacher quality of early childhood education (Jones, 2017; Patterson et al., 2017). Kaye (2010) stated pre-service teachers could enhance their critical thinking, problem-solving skills, leadership, community engagement, and cooperation for their future roles through SL. The United Nations Educational, Scientific and Cultural Organization (UNESCO, 2006) stressed the initial training and

preparation of teachers were the keys for quality education which leads to good learning outcomes. Therefore, what university students learn from SL activities and how the SL activities related to teacher quality were the objectives that the study would like to explore.

Research Questions

The research objectives are to understand how SL is applied to the university students of early child care and education and to explore how it works on the university students concerning teacher education. Therefore, the research questions were:

Research Question 1: What were the descriptions of the university students in the study to their SL?

Research Question 2: What were the general and different learning outcomes among their SL?

METHOD

Description of the SL Course Design

The SL course was designed by following the above literature. In addition, as the literature also mentioned, SL not only challenges learners, but also educators and community partners. Especially, the educator executing a SL project needs to play multiple roles, such as a service-learning plan organizer, an executor, and a coach/counselor. Furthermore, the researchers argue the actual teaching environment the educator/researcher faces should be also taken into account. Therefore, the course in the study was designed also based on the following three conditions:

1. The objective of the department of early child care and education in the study. Its objective is to equip university students with warm and loving personal traits, with professional care and education knowledge, and with innovative teaching and caring practical skills.
2. Volunteer Service Act (2001/2020). Although SL should not be the same as volunteering, learning and service should be equal and meaningfully connected. In order to improve the quality of SL and ensure the rights of the served persons, according to article 9 of the Act (2001/2020), university students in the study needed to have basic training and special training courses. The courses of the basic training included the connotative meaning of volunteer service, volunteer ethics, the trend of volunteer service, self-understanding and self-affirmation, being a happy volunteer, and the laws and regulations of volunteer service; the courses of the special training, determined by the regulating departments (i.e., the department of early child care and education in the study), consisted of introduction of social welfare, introduction of community partner, the content and practice of volunteer service, social resources for volunteer service, and comprehensive discussion and brainstorming methodology for volunteer service. Therefore, the volunteer training courses were integrated into the course framework of the study and an eight-hour SL task was assigned.
3. Student Choice /Voice. As research results provided by Steinke et al. (2002), it indicated that student choice/voice will be one of predicators for successful SL. Hence, the SL task of the course in the study was discussed and decided by the students after discussing with the first researcher. What SL tasks the university students in the study chose were holding game activities for special children with special needs, cleaning the university neighborhood community, assisting an annual ceremony for special children/adults, helping fundraising activity, cleaning classrooms for an affiliated preschool of university, serving home community, or running a primary school weekend camp.

In short, the service-learning course in the study was a two credit required course designed for university students of the department of early child care and education. The course schedule consists of 12 basic and 12 special volunteer training hours, 8 hours for service-learning task, and 4 hours for service experience sharing presentation. The service-learning task was discussed and decided by students and the course instructor, following the objective of the department, the Volunteer Service Act (2001/2020) and the regulations of community/ university students served.

Participants

Participants in the study were 99 university students of department of early child care and education who took the course. Based on the four stages of SL (i.e., Preparation, Service, Reflection, and Celebration) proposed by Fertman et al. (1996), commonly executed in Taiwan, the participants needed to do an eight-hour SL activity after 12 basic and 12 special volunteer training hours. Then, they wrote their reflection and shared/celebrated their SL experiences. In addition, student choice advocated by Steinke et al. (2002) was adopted in the study. Participants were grouped according to their interests and choices. They chose the SL activities they wanted to do. For SL tasks of the study among the participants, 38 participants chose to hold game activities for children with special needs arranged by the researcher; 29 participants chose community cleanup activities assigned by university student affairs practitioners; 11 participants assisted an annual ceremony for special children/adults of an institution for Intellectual and Developmental Disability; 9 participants helped a foundation for elders to collect receipts for the Taiwan receipt lottery on the street, known as a kind of fundraising activity in Taiwan; 7 participants cleaned the environment for the affiliated preschool of the university; 3 participants served their home community and 2 participants ran a one-day primary school weekend camp with a student volunteer association.

Data Sources

Qualitative analysis was used in the study. For data collection, Krippendorff (1989) suggested written texts and verbal discussions be the sources of data for qualitative analysis. Hence, the participants' written reports and verbal presentations were used for analysis. The data included participants' speech reflections in the course, SL reports, and verbal presentations. It was classified based on the activity they were involved in. Then, each participant's speech reflection, SL report, and verbal presentation were put together and given a case code number. Table 1 shows the case codes. For example, case D01 was the participant listed on the first number for serving game activities for children with special needs.

Table 1. Case code and SL task

Case Code	The Number of Participant	SL Task
A	38	Holding game activities for children with special needs.
B	29	Having community cleanup assigned by university student affairs practitioners.
C	11	Assisting an annual ceremony for special children/adults of an institution for Intellectual and Developmental Disability.
D	9	Collecting receipts for the Taiwan receipt lottery on the street, known as a kind of fundraising activity in Taiwan, for a foundation for elders.
E	7	Cleaning the environment for the affiliated preschool of the university
F	3	Serving their home community
G	2	Assisting a one-day primary school weekend camp with a student volunteer association.

Speech Reflections

Participants wrote their reflections for speeches or classroom activities delivered by the course instructor and five experienced service volunteers during the volunteer basic and special training lessons. These reflections were classified based on the above case code and SL task.

SL reports

At the end of their SL activities, each participant needed to answer three reflective questions for experiential learning based on Kolb's reflective model (1984). The questions were: 1. What? What did I hear/see/contact from the service activity? 2. So what? What did I feel or think during the service activity? What did I learn and what did it mean to me? 3. Now what? How did the experiences in the SL activity change me? What can I do now?

Verbal presentations

By the end of the course, each participant needed to share their service activity experiences to all participants based on activity groups and their written reports. The course instructor asked questions

after their presentations in order to verify their written reports and to obtain the missing parts of the written reports.

Data Analysis

For research analysis, all the data in the study were reviewed repeatedly in order to understand participants' moving images during the course and SL period. Next, the study tried to construct the meanings of the data through coding processes. For the first coding cycle, the initial categories were constructed from a single word or a full paragraph. Then, during the second coding cycle, the initial categories were changed, connected, categorized repeatedly through critical thinking until the researchers felt confident of codes to the data (Saldaña, 2013). The study tried to induct all categories into several common themes, but in vain. The only main theme among all the activities was "emotion process." For others, themes were not appeared until they were conducted based on the SL activity attributes. In other words, the SL activities were categorized into activities with interacting with children and ones without interacting with children. The SL activities with children were Case Code A, C, E, and G; the SL activities without children were Case Code B, D, F (see Table 1).

For research quality, the study used the following criteria advocated by Cuba and Lincoln: credibility, transferability, dependability, confirmability and authenticity (Lincoln & Guba, 1985; Lincoln et al., 2011). The study provided negative/divergent case analyses and member checking by the second researcher for credibility, providing description of 99 participants' feedbacks for transferability, triangulation based on diverse data, and audition by the second researcher for dependability, data recheck and findings audition by both the first researcher and the second researcher for confirmability, and all participants' views through SL presentation by participants for authenticity.

Limitation of the Study

This study tried to explore the participants' experiences during the SL and was therefore constructed based on qualitative data (Creswell, 2012). Quantitative information was tried to be collected and counted in order to increase the reliability at first as Fife (2020) suggested. However, counting was not used in the study after considering pursuing unexpected findings from the participants and was not helpful to gain access to the perspectives of participants (Hannah & Lautsch, 2011). In addition, the participant number of each SL activity was quite different and its quantitative data might not be meaningful due to the lack of reliability and validity for analysis. Hence, this study did not include quantitative information as some studies did to provide statistical data from the perspective of quantitative analysis.

RESULTS

The Descriptions of the undergraduates to their SL

According to the descriptions of the participants, the results showed ten categories were identified, listed based on alphabetical order in Table 2.

Table 2. Descriptive data for the categories

Category	Illustrative Examples
Communication	"I learned how to interact with these adorable angles (special children) and learned how to execute an activity (A16)." "I learned a lot of communication skills from the service learning activity in order to speak appropriately (D01)."
Courage	"I felt they (special children) were very brave. They were trying very hard to have a normal life although they were different form us. So, I told myself I needed to work harder because the barriers I faced were trivial compared to the barriers they faced (A 28)."
Doubt	"I felt it should be sincere to be a volunteer and it is meaningless to be a volunteer just for grades (B06)." "In my mind, it was a hard work to be a volunteer. That was why I was unwilling to do the service learning activity at first (E04)."
Environment protection	"During the sweeping activity, I told myself repeatedly not to throw litters because I "now" learned it was exhausting and hard to sweep streets (B13)."

Table 2 (Continued). Descriptive data for the categories

Category	Illustrative Examples
Empathy	"I will treat them (special children) like normal people, not seeing them as patients or weird people because we all have our own deficits, even for the normal people (A06)." "I learned from the service learning activity that I would donate for fundraising activities because I knew it was difficult (D09)."
Instruction skills	"We had to design activity from multiple perspectives because we did not know special children's ability at first during the preparation period (A08)." "I learned how to manage children when I cleaned the class and watched the teacher teaching children (E02)."
Nervousness	"I was nervous and scared because I did not know how to interact with disabled people (C05)." "I learned I needed to consider those sudden, unexpected occasions when I constructed a teaching activity next time (G02)."
Patience	"I learned that I needed to be more patient to children after the service learning activity (G01)."
Positive life attitude	"Before the service activity, I usually walked away when I saw street sweepers cleaning the streets. Now, I know I need to thank these people for their contributions (B12)." "I felt very happy when children came to me and thank me for cleaning their classroom (E4)." "I learned it was very sweet to finish it with all my efforts (F03)."
Teamwork	"We all worked together to clean the community environment. Although there was a lot of garbage, we finished it very soon through helping each other (B17)."

For further analyses based on the above ten categories, three coding themes were emerged as "emotion process", "professional skills", and "teacher traits." However, "environment protection," occurred only in the community cleanup (Case B), was not included in these themes. The connections among the categories and themes were revealed in Figure 1.

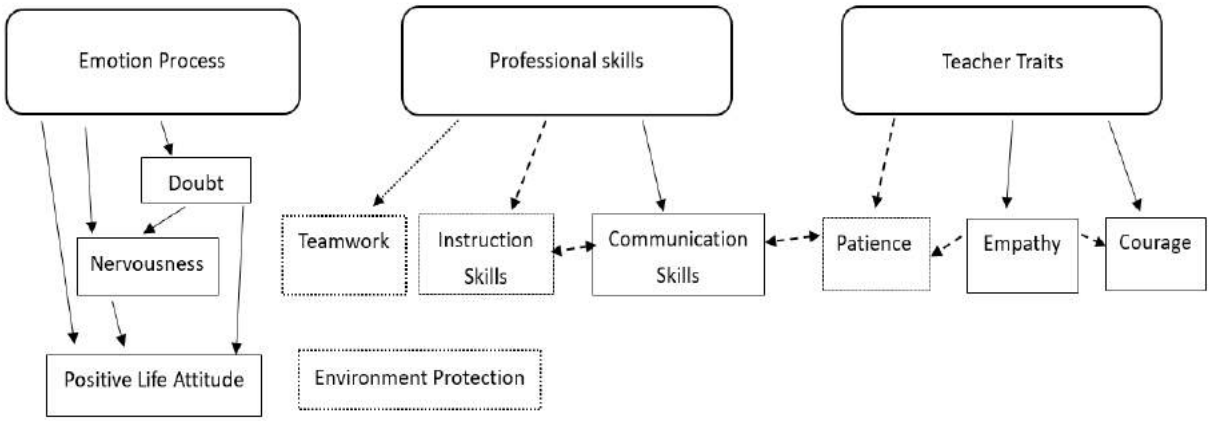

Figure 1. Coding hierarchy

Note:
1. "⎓" presents arrows, categories, or themes occurred in both SL activities with children and ones without children.
2. "- - -" presents arrows or categories occurred in SL activities without children.
3. "....." presents arrows or categories occurred in to SL activities without children.
4. "→" presents one way direction and "←→" presents interactions between two categories.

The general and different outcomes of SL

Among the themes "emotion process," "professional skills," and "teacher traits," it was found categories in the theme of "emotion process" occurred in all SL activities. However, not all categories of "professional skills" and "teacher traits" appeared in all SL activities. The category "environment protection" only occurred in the activity of community cleanup (case code B).

Emotion Process of the Participants

The results showed participants experienced emotion process. Emotions were from their previous experience or cognition and from the interactions with people. In addition, the study showed there had

been four different emotion processes since participants knew they were assigned to participant a SL activity. The four types of emotion process and their examples were described as follows:

Type I Positive life attitude.
The category "positive life attitude" was observed among all the activities. Most participants described they were happy, felt fulfilled, or thanked others for their contributions during or after their SL activity. "From their laugh and happiness, I felt they (special young children) were not different from us. I was happy I was good in health and had a good family" (A02). "I felt happy and helpful, and I would like to join more activities like this" (B16). "It made me feel I was lucky to have my healthy body from my parents and I wanted to thank my parents to let me do anything I liked to do" (C09). Also, it showed that participants who had volunteer experiences before the SL activities described they were glad to do SL. "I have been a volunteer since high school, and I have been glad to be a volunteer since then" (A02).

Type II from doubt to positive life attitude.
In the study, it also showed that few participants expressed their doubts or negative opinions concerning SL activities at the beginning of the course. However, they felt happy in the end.

> In my mind, it was a hard work to be a volunteer. That was why I was unwilling to do the SL activity at first……I felt happy when young kids came and said thanks to me after finishing the SL activity. (E04)

Type III from nervousness to positive life attitude.
Some participants felt nervous at the beginning of their SL activity, and were touched by the people they served.

> I was very afraid that I would hurt these special children unconsciously because I did not know how to interact with them. I felt better after the teacher of the center taught us how to interact with special children……I was moved by their learning efforts and after hearing their laugh during the SL period…… After the SL activity, I would try myself to help them ……studying early intervention would be my goal. (A25)

Type from doubt to nervousness to positive life attitude.
It was found few participants criticized about the SL activities during the course, and then felt nervous at the beginning of their SL activity. However, they were affected by the served and therefore changed their thought.

> Many people did SL just for assignments or grades, not voluntarily…… I felt fear when I first met special children/adults because I did not have any friends like them around me…… Their pureness and happiness infected me and my classmates……〔We〕should not judge people by their appearance. (C01)

From the perspective of early childhood teacher education, it seemed that the participants of different SL activities had different learning outcomes, especially in the themes of "professional skills" and "teacher traits" although all the activities shared the same emotion process.

Professional skills

"Communication Skills"、 "Instruction Skills" and "Teamwork" were the categories under the theme "Professional skills." As figured 1 showed, "Communication Skills" was presented both in SL activities with children and without children. "Instruction Skills" was the category only in SL activities with children, and "Teamwork" was the one happened in SL activities without children.

Concerning communication skills, participants of SL activities without children, especially in the fundraising activity, stressed the learning of communication manners. Also, it was interesting that communication means how to talk to different kinds of people. "I learned many communication skills, such as speaking in an appropriate manner, from the fundraising activity" (D01). "I learned how to communicate with people of different personality, especially facing their rejection" (D06).

For SL activities with children, it focused on how to consider communication factors, how to communication with peers, with special children/adults, or in different languages. For example, in consideration of communication factors, a participant considered that "communication was the most important part during the SL activity. These factors, such as sound, intonation, body language, emotion, speaking or contact distance, and positive attitude affected communication" (A09). In communication with peers, a participant wrote "we had different opinions during the discussion because we needed to design the activity from different perspectives" (A08). In communication with special children/adults, it was written that "I learned how to interact with special children and their family" (A32) and "I learned how to listen to special children and responded to them appropriately" (A29). In communication in different languages, a participant said "I was a little bit nervous at first because I did not know which language (in Mandarin or Taiwanese) I should use to communicate with them" (A38).

For the category "Instruction skills," it was found only in the SL activities with children. A participant expressed "we needed to take factors, such as materials, activity procedures, space, cost, time, and difficulty level into consideration during the activity design period, although we had some quarrels and felt frustrated a little bit during the discussion" (A10). Another participant said, "I learned we needed skills to teach special children. For example, we needed to provide stuff which children with attention deficit hyperactivity disorder (ADHD) were interested in and then it would help them control their own emotion" (A19). "I would consider carefully how to deal with any contingencies when I designed the next learning game activity" (G02). In addition, there was an interaction between "Instruction Skills" and "Communication Skills". For example, "we needed to design a game activity from different perspectives because we did not understand the ability of special children, and therefore there were many different opinions during the discussion and communication" (A08).

The category "Teamwork" existed in the SL activities without children. A participant mentioned that "we worked together and helped each other happily to clean the community, and It was finished soon although there was a lot of garbage" (B17). Another said, "I was happy to work together with my partners to finish the SL activity to collet receipts for fundraising although we asked people to donate receipts with frustration and with exhaustion" (D6). However, it was interesting that participants in SL activities with children did not mention teamwork although they were grouped together to design activities and play with children in some activities. The reason might be they were frustrated in working together "on the condition of the limited design time, narrow activity space, and lack of resources" (A32).

Teacher Traits

The Categories "Empathy," "Courage," and "Patience" were occurred in the theme of "Teacher Traits." However, "Patience" happened only in SL activities with children.

"Empathy" was the category appearing in all SL activities. Participants understood and shared feelings of the served. "I was very happy to play with special children because they were very pure, so we needed to learn how to respect a person instead of hurting them" (A34). "I learned not to litter garbage. I did think it was exhausting to clean the streets. I was very proud of and thankful to street cleaners after the service activity" (B12). In addition, it was found empathy influenced participants' courage and patience in the SL activity with children. "Before, I was scared of the disabled and I easily gave up when I faced difficulties. However, I would insist more and have courage to face difficulties after seeing their efforts" (C03). "From the SL activity, I learned that these special children were just like us and we just needed to be with them with patience" (A32).

The category "Courage" happened in service activities both with children and without children. For activity with children, a participant described that "I told myself to work harder when I met some difficulties because I saw that special children lived very bravely and with great effort even though they lived in a difficult world" (A28). For activity without children, a participant said, "I learned from the SL activity that I needed to be courageous and to be creative when I met something unknown" (F01).

The category "Patience" happened only in the activity with children. In addition, the category "Patience" was related to the category "Empathy." As a participant said, "I would be more patient to treat special children after I knew their diseases from the SL activity" (C10). Also, the category "Patience" was related to "Communication Skills". "I learned that special children would be understand what we said if we communicated with them patiently; in other words, we needed to tell them repeatedly and that would strengthen my patience" (A11).

DISCUSSION and IMPLICATIONS

The factor of Emotion Process

Our results showed that emotion process was an imperative factor that participants concerned among all the eight SL activities of the study. Participants experienced different kind of emotion processes during the SL. The factor of emotion was also found in some studies (Matheson and Petersen, 2020; Pratt & Danyluk, 2017; Rodríguez-Nogueiraa et al., 2020). Matheson and Petersen (2020) stated their students felt a little bit fear for SL. Pratt and Danyluk (2017) expressed that their students felt fear or anxiety in the initial period, and then doubts and frustrations in the next period, and finally appreciation for SL experiences. Rodríguez-Nogueiraa et al. (2020) found their students significantly reduced their personal distress after the activity according to their quantitative analysis. Our study found students' emotions occurred from their cognition or previous experience and from the interactions with the served or community/institution partners during the SL process. Participants who had a good SL experience would be happy to have another one. On the contrary, participants who did the SL for the first time or contacted unfamiliar people/task might feel nervous or anxious about SL. Also, participants who were skeptical of SL and under unwell designed SL activity would felt frustrated. However, they would turn to be happy at the end of SL under the community/ institution partner's assistances or when the served gave them positive feedback. In other words, as Gardner (2021) stressed "how" SL does is less explored in research, rather than knowing "what" emotions are, our study argues, for course instructors, "how" students' emotions occur and "what" are students' emotion processes of SL are suggested to be considered while conducting a SL course since some research found students' academic satisfaction and achievement are connected to fewer bad emotional experiences and more good emotional experiences (Kleine, 2005; Lee & Chei, 2020).

Pre-service Teacher Education

Research found SL promoted the positive learning outcomes of students, such as profession skills, communication skills, and collaboration. (Anderson et al., 2019; Leon et al., 2017; Lovat & Clement, 2016; Popovich & Brooks-Hurst, 2019; Pratt & Danyluk, 2017; Edmond & Driskill, 2019). So did the study find. This study found SL activities helped participants develop professional skills (i.e., "communication skills," "instruction skills," and "teamwork") and strengthen teacher traits (i.e., "patience," "empathy," and "courage."), which were important for pre-service teacher education (Hart & Teeter, 2002; Kennedy, 2006).

Among the skills and traits, "communication skills," "empathy," and "courage" occurred both in activities with children and activities without children. However, this study also found that "patience" and "instruction skills" only appeared in activities with children, and "teamwork" was in activities without children. In other words, different SL activities would cause different and same learning outcomes. Therefore, course instructors should consider how to balance the student choice and the desired goals of course from SL activity, although student choice is an important factor for SL (Steinke et al., 2002).

Concerning professional skills, while examining the same learning outcome, for example, "communication skills," the study found the communication skills in different activities had subtly different contexts. For participants in SL activities without children, communication skills focused on communication manners on how to face different kinds of adults. For participants in activities with children, the communication skills meant not only how to communicate with different kinds of people (i.e., children, peers, and children's family), but also how to interact with children in appropriate

teaching skills (i.e., sound, intonation, body language, and emotion) and with teacher traits (i.e., patience, empathy). In other words, participants were aware of or learned the importance of communication skills, such as enthusiastic manner, voice use, and gestures, for becoming effective teachers (Polk, 2006), or for being competent caregivers facilitating children's development (Akemoglu & Meadan, 2018; Akemoglu et al, 2020). However, the study also found participants in the study did not mention or learn some other communication skills, such as the importance of clarity and positive verbal feedback (Polk, 2006). Hence, the study recommends that communication skills in SL for pre-service early childhood teacher's professional development may require further research.

For instruction skills, which only happened in activities with children, participants for the activity with special children stressed they learned how to design teaching activity, manage or interact with special young children, consider teaching resources, provide safety environment for special young children, or adapt teaching to special young children with patience; participants for the activity in preschool learned instruction skills mainly from observing preschool teachers' teaching activity and interacting with young children; participants for a one-day primary school weekend camp expressed they learned they needed to consider sudden, unexpected occasions while teaching and to teach children with patience. Hence, as a SL course instructor in early childhood pre-service teacher education, it seemed traits of SL activity influenced participants' professional development. Participants would learn instruction skills more and deeply when participants had more interactions with children. However, although the abundant instruction skills were learned by the participants, this study was lack of a systematic instruction skill inventory, as in Sornson study (2015), for students to evaluate their learning outcomes, and therefore a systematic instruction skill inventory is recommended.

When looking into the learning outcome "teamwork," it was interesting to find only participants in the activities without children mentioned teamwork, although participants in the activities with children were also grouped to work together. What caused the difference? What did it mean for a SL course or pre-service teacher education? The reason might be the participants' emotion process during their SL activity. As the results showed that participants in cleaning the community expressed they worked together happily to help each other, while, on the contrary, participants in the activity with children felt frustrated for poor peer communication and the limited teaching design time and resources for SL activity. Since teacher collaboration is an important factor for early children education (Jones et al., 2012), the study argues pre-service early childhood teacher educators shall consider how to encourage and increase good teamwork behaviors while designing a SL course.

For teacher traits, this study found "empathy," "courage," and "patience" were occurred in the theme of "teacher Traits." However, "Patience" happened only in SL activities with children. In addition, as figure 01showed, the category "Empathy" would influence participants to be courageous and patient, and there were interactions between "patience" and "communication skills" and between "communication skills" and "instruction skills." In other words, from the perspective of early childhood pre-service education, "empathy" might be the basic, important factor to increase pre-service teachers' teacher traits and instruction skills. In addition, from the participants' reflections, participants in SL with children gained courage mainly from observing special children's insistence in life; participants in the service activities without children gained courage from overcoming the tasks they were assigned. Hence, the study proved that the teacher traits"empathy," "courage," and "patience" found in the study were not only "natured," but also could be "nurtured" from SL activities.

Conclusion

This study explored how 99 undergraduate students of early child care and education felt and learned in seven SL activities from the perspective of pre-service teacher education. The seven SL activities could be categorized as SL activities with children or without children. The study found these students experienced emotion processes for their SL and how and what they experienced formed their professional skills and teacher traits. However, the study also found different SL activities would cause remarkably different learning outcomes. Hence, the study suggests course instructors should take the

factor of "emotion process" into account and consider how to balance the student choice and the desired goals of course while constructing a courses with SL activities.

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Ethics and Conflict of Interest
Approval from Institutional Review Board is waived from Southern Taiwan University of Science and Technology. As the authors of this study, we declare that we collected data in accordance with ethical rules during the research process and acted in accordance with all ethical rules. We also declare that there is no conflict between the authors.

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PHYSICAL EDUCATION TUTORS PERCEPTIONS OF THE USE OF TECHNOLOGICAL TOOLS FOR REMOTE TEACHING DURING COVID-19

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Abstract

The emergence of the Covid-19 pandemic created the need for the use of dissimilar remote teaching methods and strategies in many subject areas including Physical Education (PE). While this was somewhat successful in developed countries, little is known about the use of technological tools to deliver PE lessons online in developing countries. This study examined the perceptions and experiences of colleges of education PE tutors in adopting technological tools for remote teaching during the Covid-19 pandemic. Semi-structured interviews were used to collect data from 12 tutors (4 females and 8 males) in Ghana. Content analysis was employed as the tool for the analysis of the data. Based on the results, the PE tutors perceived that accessibility was a major challenge to the successful teaching of practical PE lessons online. The tutors further posited that they were motivated to deliver practical lessons online because of the Covid-19 pandemic as they don't want students to be left idle. In furtherance, the participants recommended Transforming Teaching, Education and Learning and colleges' management for assisting them to participate in an online course and providing them with ICT support and data. Again, the participants agreed that they prefer face-to-face to online lessons as the latter do not promote socialisation, develop only the cognitive domain and even certificates acquired online are not given due recognition. It is recommended that theory lessons should be held online while face-to-face interaction is better for practical lessons in PE due to accessibility issues connected to poor internet connectivity and difficulty in performing some of the skills online.

Keywords: Online physical education, remote teaching, the community of enquiry model, technological tools.

INTRODUCTION

The advent of the Covid-19 pandemic created plentiful variations in the educational system (Sá & Serpa, 2020) which resulted in an adjustment to instructional disparities from the conventional method to a more remote approach online. Both theory and practical lessons were affected. Therefore, it was necessary to adjust the way Physical Education (PE) lessons were conducted (González-Calvo, Varea, & Martínez-Álvarez, 2020). The genesis of PE instructions required the subject to be taught socially, demanding learners to perform instructions based on what is seen and heard at specific places (Kirk, 2010). College of Education tutors in Ghana also migrated online for the first time with little/no knowledge on how to use technological tools to deliver effectively. Many of the tutors were given general information to teach without specific training in major areas resulting in unexplained challenges (Aboagye, 2020). PE tutors in colleges were among the groups who have been conducting lessons traditionally without prior experience in virtual teaching, specifically, practical lessons.

PE instructions are naturally considered practical in schools and therefore, one-on-one interaction and proximity are required. Notwithstanding, the advent of the Covid-19 pandemic created the need for compulsory online delivery in many places to promote social distancing and reduce the spread. This

generated a lot of challenges for the tutors especially in adaptation to the new learning environment. Gard and Pluim (2014) hypothesised that in the future, there will be a shift to digital PE in many places and this has been fulfilled by the emergence of the pandemic. However, Ghana is not renowned for using the technological approach to PE lessons delivery but rather a more conventional method that allows learners to engage in meaningful hand- on activities (National Council for Curriculum and Assessment, 2019). Presently, there are no clear-cut policies to direct how online practical lessons delivery should be conducted. This is an indication that individual tutors are adopting different strategies to deliver online. Again, studies conducted have examined the perception of PE teachers at primary and elementary schools in different parts of the world (e.g., Kim et al., 2021). However, little has been done on PE tutors at colleges of education. Therefore, this study top-up knowledge by examining the perceptions and experiences of colleges of education PE teachers in using technological tools for remote teaching during the Covid-19 pandemic. The main research problem was - What challenges do physical education teachers at colleges of education in Ghana face when using technological tools for remote teaching? The findings from this study will assist the Ministry of Education in Ghana on how to assist PE teachers in teaching practical lessons especially, how to effectively use technological tools in a remote approach.

Literature

Numerous studies have examined the impact of the Covid-19 pandemic on children's physical activity. For example, An (2020) in her study anticipated an increase in obesity among children, with substantial differences in race and gender, and recommended the need for public health intercessions. These were identified after she replicated a study to assess the effects of the closure of educational institutions and misplaced time for physical activity in PE. Again, findings from a short period study in the USA and China reported a decrease in PA activity during the period schools were closed down and subsequent staying at home by the children (Dunton, Do, & Wang, 2020; Xiang, Zhang, & Kuwahara, 2020). Arguably, this literature which identified the importance of consistent physical activity, recommends the public health requirement for an emphasis on physical activity for children during the Covid-19 pandemic. Considering this, it was eminent for PE tutors to adjust their pedagogical approaches to meet the basic health requirements of the populace especially, children.

The switch from the traditional approach to online delivery in the advent of the Covid-19 pandemic affected instruction delivery and learning. Many teachers adopted experimentation techniques in teaching remotely (Jeong & So, 2020). With PE as a demeaned area, the instructors are always excluded when it matters to design strategies to implement quality lessons without assistance (Richards et al., 2018). The situation became more compounded when the pandemic made it compulsory for them to move online. It is supposed that this condition isolated the teachers forcing them to make decisions influencing students learning results (Mercier et al., 2021). While some teachers made conscious efforts to continue with practical PE lessons, others stopped completely. This is an indication that the PE teachers require assistance in learning about how to effectively deliver in a more remote approach.

Some studies have been conducted on PE teachers' perceptions and experiences during the Covid-19 pandemic and how the subject has been taught in a more remote approach. In their study, Mercier, et al., (2021) explored the experiences of PE teachers with online technological tools amid the outbreak of the Covid-19 pandemic in the USA. Using a large sample size involving PE teachers in all the fifty states, the study reported exclusive limitations to deliver reasonable and effective isolated PE teaching. Varea, González-Calvo, and García-Monge (2020) examined the changes in the delivery of PE among preservice teachers in the advent of Covid-19 and identified that teachers are having difficulties in re-developing PE and that this has resulted in challenges such as distress and insecurity. Besides, the study identified a swing of pedagogical challenges. The participants found it ridiculous to understand why PE interactions could be successful without meeting the learners in one-on-one situations. Other findings identified from the study were challenges like experiences with digital technologies, which permitted specific starts and completions for PE interactions. Despite these studies, little is known about the challenges (experienced and perceived) PE tutors in colleges of education in Ghana face when using a remote approach.

Theoretical Background

The study is guided by the Community of Inquiry Model (CIM), which is adopted as a framework for the study and practice of online learning. According to Garrison (2007), this framework is influenced by the work of John Dewey and corresponds to constructivist approaches to learning. The framework consists of three core principles: classroom presence, social presence, and cognitive presence (Garrison, Anderson, & Archer, 2000). The combination of these three elements is relevant to enhanced learners' educational experience (Figure 1).

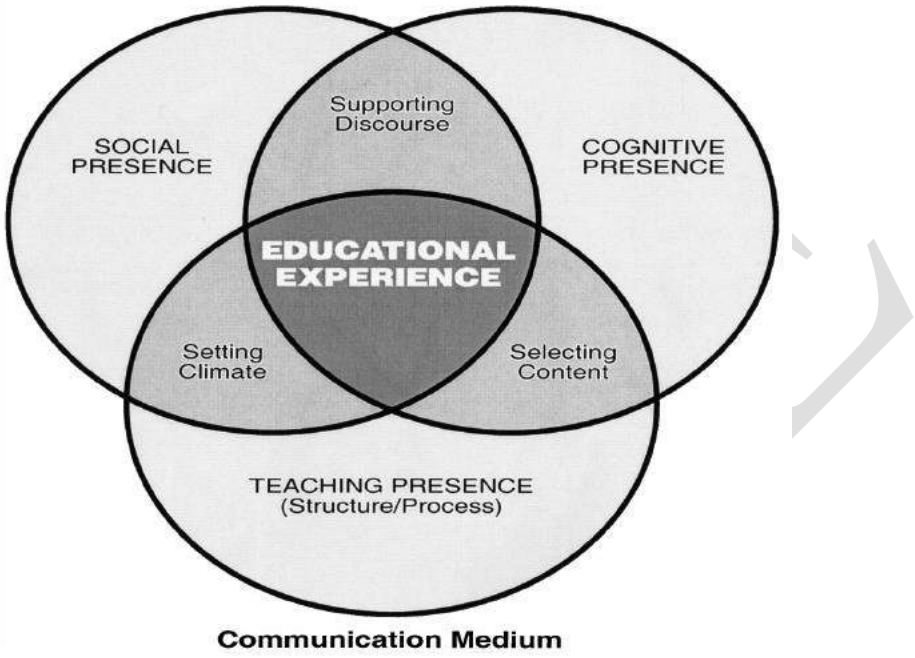

Figure 1. The community of inquiry model.

Cognitive presence refers to the extent to which learners in the research community can gain understanding through ongoing communication (Garrison et al., 2000). It is an important factor in intellectual discourse, an important element of critical thinking and learning (Kanuka & Garrison, 2004).

Social presence refers to "the ability of participants in the Community of Inquiry to project their characteristics into the community, thereby presenting themselves as "real people" (Garrison, Anderson, & Archer, 2001, p. 89). The interaction between the instructors and the learners, and between learners from diverse settings are significant issues because the level to which the individual perceives familiarity, proximity and their exact role in a relationship (Belderrain, 2006) result in social presence which represent the sense of togetherness with others and a sense of engagement with them.

The teaching presence is made up of two key components. The first component is the setting up of the educational experience, which comprises the selection, organisation and delivery of the course content (Lowenthal & Parscal, 2008) to occupy and stimulate students. The second component comprises facilitation to articulate eloquent and valuable knowledge (Garrison et al., 2000). During the instructional stage, teachers not only promote students' relations with materials and with their peers but also offer appropriate directives, experiences and responses to learners (Garrison et al., 2010). This theory was relevant to help determine if the three approaches were achieved in practical online PE lessons during the pandemic.

The overarching purpose of the study was to examine the perceptions and experiences of colleges of education PE tutors in adopting technological tools for remote teaching during the Covid-19 pandemic. The study was sub-divided into the following objectives:

1. To examine the perceptions of PE tutors at colleges of education in a remote teaching environment.
2. To determine the level of knowledge and skills of PE tutors in using technological tools for remote teaching.
3. To analyse what motivates PE tutors to participate in online lesson delivery.
4. To evaluate the behaviour and attitude of stakeholders (institutions, parents and students) during the remote teaching process.
5. To identify the type of preparations made by PE tutors to create a highly productive online teaching.
6. To critically analyse and evaluate the differences between online PE lesson delivery and face-to-face.

METHOD

Research Model

This study used a qualitative case study of enquiry to gather thorough information from the participants. Creswell (2007) confirmed that in qualitative research, the researcher is interested in obtaining in-depth information about an event, an activity, individual or process to define the situation naturally. This is important where the researcher is interested in acquiring detailed information and understanding of a social phenomenon and also, interested in finding answers to why, how and what questions (Ellinger, Watkins, & Marsick, 2005).

Data Collecting Tools

Semi-structured interviews were the main tool that served as data collection in the study. The interview questions were structured to receive open responses and to enable the participants to express their views (perceptions and experiences) on the research questions. The interviewees were provided with the opportunities to partially revise and edit the questions to enable them to express themselves well (Büyüköztürk et al., 2014; Sönmez & Alacapınar, 2014). The questions were based on six main themes perceptions of PE tutors in online teaching, PE tutors' knowledge and readiness for remote teaching, PE tutors' motivation for remote teaching, Behaviour and attitudes of stakeholders-institution, students and parents, PE tutors' preparations before online lessons and comparing face-to-face to online PE lesson delivery. The data collection item is displayed in Table 1

Table 1. The semi-structured interview questions

Questions	Main ideas
1. What are your perceptions about online remote teaching?	Perceptions of PE tutors in online teaching
2. What is your level of knowledge and skills in using Technological tools for remote teaching?	PE tutors' knowledge and readiness for remote teaching
3. What motivates you to take part in online lesson delivery?	PE tutors' motivation for remote teaching
4. What are the behaviours and attitudes of your institution and stakeholders like students and parents you work with for the remote learning process? To what extent have these attitudes and behaviours affected your satisfaction with the remote lesson delivery?	Behaviours and attitudes of stakeholders-institutions, students and parents
5. What kind of preparations do you conduct in order to create a highly productive lesson environment in remote physical education lessons?	PE tutors' preparations before online lessons
6. How would you rate the level of achievement of the student's target behaviors according to the face-to-face classroom environment? What are the plus or minus aspects? What aspects of Remote P.E. instructional delivery is the main reasons that make this difference?	Comparing face-to-face to online PE lessons delivery

When creating the interview form, the relevant literature was taken into account and these studies were considered. Items were submitted to experts for review and feedback was obtained to ensure the construct validity of the items on the interview form.

Study Group

The study used the Purposive sampling technique to reach the participants. In research of this nature, the intent was to acquire detailed information on the topic and therefore, require participants with in-depth knowledge (Buchanan, 2012). As Patton (1990, p.184) postulated, in qualitative studies' sample size is attained in agreement to the aim, what will be valuable and consistent; what can be done with the time and resources available to the researcher(s); that's the justification why there is no method for sample size in qualitative enquiry. Therefore, 12 PE tutors at colleges of education in Ghana who used technological tools for distance learning during the Covid-19 pandemic were selected because of their in-depth knowledge of the subject under study. Their ages aged between 35-50 years old, and they were all Ghanaians. The participants have teaching experiences of three to fifteen years as tutors at colleges of education in Ghana. The participants were asked to air their views on the use of technological tools to teach online both perceived and experienced. These tutors were teaching students studying for a degree in basic education. They lecture specific courses for students majoring in PE and general PE-related courses for all the students. The minimum educational qualification for the participants is a masters' degree with a doctorate as the highest qualification.

Data Analysis

Verbatim transcription of responses was done manually. In order to disguise the identities of the participants, code numbers were assigned to the names of the participants. Content analysis was used for data analysis. This analysis examines the content of the data, then groups the data into upper and lower classifications (Sönmez & Alacapınar, 2016). The codes were originally created and similar codes were merged to create categories. The coding and categorization of the data were done on several occasions by the researchers to ensure that no relevant information was leftover.

Validity and Reliability

Trustworthiness of the data was done through member checking where the participants were informed to review the interview transcripts and confirm if they represent what they actually wanted to say and provide additional thoughts or information (Lincoln & Guba, 1985). Eight of the participants representing 66.6% confirmed that the results represented what they wanted to say. They provided a few additions and subtractions.

Research Procedures

At the beginning of the academic year for the 2020/21 first semester, students at colleges of education in levels 200 and 300 were asked to study six weeks online and six weeks face-to-face. Therefore, all the tutors were expected to teach online including the PE tutors. This scenario created the need for the PE tutors to prepare adequately on how to use technological tools for this remote experience. They were expected to engage the students online and lecture them on practical aspects as well. This system continued as the introduction of degrees at the colleges created a shortage of accommodation compelling some students especially in levels 200 and 300 to rotate online and face-to-face.

The data collection was gathered based on 6 themes similar to the work of Orhan and Beyhan (2020) that were used to measure the perceptions and experiences of teachers on distance education. The themes were: perceptions of the PE teachers in using technological tools, PE tutors' readiness for remote teaching experience, PE tutors' motivation for remote teaching, behaviour and attitudes of stakeholders, PE tutors' preparation before online lessons and comparing online PE lessons to face-to-face. The semi-structured interviews conducted by the two researchers lasted 20-30 minutes and were audio-recorded. Each researcher interviewed six participants between June 2021 and October 2021 face-to-face. Before the main interview questions, broad questions were asked to determine the participants' number of years in the profession.

Ethical approval was obtained from the college of one of the researchers. The participants were made to sign consent letters before participating in the studies and pseudonyms were used to guarantee concealment of participants in writing the results. The pseudonyms used were T1, T2, T3, and T12.

FINDINGS and DISCUSSION

The first question of the interview was, to examine the perception of the PE tutors in the remote teaching experience and the responses and the analysis are displayed below in Table 2.

Table 2. Tutors perceptions of online PE lessons

Theme	Codes	Participants	Frequencies
Tutors Perceptions	Accessibility Issues	T2, T4, T5, T6, T7, T8, T11, T12	8
	Low Tutors Knowledge on Technology	T3, T8, T9, T10, T12	5
	Difficulty Demonstrating Certain Skills Online	T1, T2, T3, T8.	4
	Ways of Engaging Students	T5, T4, T6	3

Four different codes emerged from the analysis of Tutors' perceptions on online PE lessons delivery. "Accessibility issues, Low level of tutors knowledge on technology, difficulty in demonstrating certain skills online, ways of engaging the students".

8 tutors have the perception that the delivery of online PE lessons is associated with accessibility issues. Some of the accessibility issues raised are as follows:

"*Most of us, looking at our area, we cover from the middle belt of Ghana to the north, so we can look at the village nature which our students come to school with and the kind of phones they use.". [T2]. "Sometimes the network is not reliable, you may have the smartphone and the data alright but the network wasn't reliable". [T7] "Online teaching is very difficult in our part of the world; teaching is not effective as many students will not even come online"* [T11].

A low level of tutors' knowledge on technology was the perception of the PE tutors in online lesson delivery. The following were statements made to support this assertion; *"It wasn't easy and it has still not been easy because we are still teaching them online"*. [T8] reported "*I lack the practical skills, what I was doing was that I engage the ICT department and fortunately we have lab ICT assistants, they helped me. In fact, when I am supposed to be online, I arrange for them to come, they set up the lab for me I just teach, they record everything audio, video whatever and after that, they will edit and they will help me put it on the platform and the internet so, that is how we managed the situation".*

Again, the PE tutors perceived that there were difficulties in demonstrating certain skills online. This code is very relevant as internet issues and technological knowledge could be contributing factors. A tutor posited *"Teaching practical PE using the remote approach has been difficult because the skill that you would have wanted your students to exhibit on the face to face, you only have to show them how it is done by describing it which in this case is difficult to assess how they will also participate or exhibit that particular skill using the remote approach"* [T1]. *"How can I let the students perform underarm serve online? How can I assist them with the basic stands online, in fact, practical lesson delivery is not effective in an online lesson delivery"*? [T8].

Lastly, tutors perceived online learning to be a way of engaging the students. To augment this code, tutors, mention the following statements; [T5] also asserted, *"although the online teaching was tedious, it was a way of letting students do something during the pandemic era", many of our students were at home idle so the online teaching was to engage the students in some ways*" [T6].

On the level of knowledge and skills in using ICT and making use of P.E. technologies tutors expressed how experienced they were in numerous ways. This is presented in Table 3.

Table 3. PE tutors knowledge and readiness for remote teaching

Theme	Codes	Participants	Frequencies
PE Tutors Readiness for Remote Teaching	Colleges and T-TEL Organised Workshops	T1, T5, T6, T8, T9, T11, T12	7
	Little Experience in Online Teaching	T2, T3, T4, T6, T8	5
	Network Issues	T4, T6, T8, T10.	4

Based on the responses from Table 3, and Table 7 of the tutors confirmed that Transforming Teaching, Education and Learning (T-TEL) in collaboration with the colleges organised a workshop for them to prepare them for the online teaching experience. However, 5 of the tutors maintained that even after the workshop, they have little experience teaching online while 4 of the tutors asserted that their knowledge and readiness were affected by network issues making the remote experience tutor-centered. The following were some of the direct quotes from the tutors' responses.

"Prior to that, I had the opportunity to receive training online. Training programme organised by T-TEL that was a brief one though but it gave me the necessary skills and in-depth knowledge on how to organise online teaching lessons" [T1].

"For what I know now I cannot really say whether that is the best approach to be using, I think that the knowledge keeps on evolving so, emmm just as it is advancing then we also have to advance in our ideas and knowledge in it but so happened that we are still using the little experience and the old approach that we know." [T4].

"Hmmm because during the online teaching we were not interacting face to face with the students, mostly we record the…… what we want them to know and then do the videos and kinds of stuff. I think most of them were complaining that they couldn't get access due to internet problems, where they are coming from and then others too were complaining they couldn't understand the concepts with you recording it and putting it on the platform unless the students get access to it and decide to ask questions, you wouldn't know whether they understood it or not so that is something I think we have to look out to." [T10].

On what motivated the PE tutors to adopt the remote teaching approach, the main issues raised are presented below.

Table 4. PE tutors motivation for remote teaching

Theme	Codes	Participants	Frequencies
PE Tutors Motivation for Remote Teaching	Because of Covid-19	T2, T3, T4, T5, T6, T8, T10, T11,	8
	Students were Idle	T1, T2, T5, T4, T6, T7, T8	7
	Opportunity to Upgrade Online Teaching Skills	T3, T5, T6, T8, T12.	5

The tutors were asked to mention what motivated them to teach online and from Table 4, and Table 8 tutors claimed that it was the coronavirus pandemic that gingered them to engage in online lesson delivery. Again, 7 of the tutors confirmed that they found that many of the students were idle at home during the pandemic era. Considering this, they were motivated to teach because they don't want the student to be engaged. Lastly, tutors were motivated to teach online because they considered it as an opportunity to upgrade their online teaching and learning experience. Below were some of the direct quotes from the interviews to support the findings.

"Because that is the norm because of the Covid-19 pandemic" [T3]. *"One I will say it is a requirement by my college that I am supposed to teach online because of the Covid-19"* [T8].

"Apart from that, the students were at home, schools were closed down and yet they have to write exams, so, we're supposed to do whatever we can to help them and thinking about your students, as a teacher you know your students are your everything when they do well, you are happy and that alone was another motivation to help them so that they will do well in the exams, because whiles at home and they were not being taught, and they preparing to come and write exams was a motivation to teach." [T4].
"Another thing was, it was an opportunity to upgrade ourselves because we are in the era of technology so, if there is an opportunity to upgrade ourselves, we see that to be a motivating factor" [T5].

For a situation like the Covid-19 pandemic, the role of stakeholders is very significant to promote remote teaching Table 5 gives details about their roles during the pandemic.

Table 5. College, parents, students and T-TEL behaviours and attitudes

Theme	Codes	Participants	Frequencies
Behaviours and Attitudes of Stakeholders (College)	Supplied Data	T1, T2, T3, T5, T6, T8, T11, T12	8
	Supplied Laptops and Tablets	T1, T2, T6, T7, T8, T10	6
	Trained Tutors for Online Teaching	T3, T4, T6, T8, T12	5
	Made ICT Labs Available	T4, T5, T7, T10	4
Behaviours and Attitudes of Stakeholders (Parents)	Bought Smartphones and Tablets	T2, T3, T4, T6, T8, T10	6
	Provided Data	T1, T4, T7, T11, T12	5
Behaviours and Attitudes of Stakeholders (Students)	Prefer Assynchronous Learning	T2, T3, T4, T5, T6, T7, T8, T10	8
	Bought Data and Smartphones	T1, T2, T3, T6, T12	5
Behaviours and Attitudes of Stakeholders (T-TEL)	Organised Online Courses for Tutors	T1, T2, T3, T4, T5, T6, T7, T8, T9, T10	9
	Assisted Students to get Smartphones	T4, T5, T6, T11, T12	5

Concerning the college, 8 participants mentioned that they were provided with data to assist in the whole process. However, 3 out of the 8 disclosed that they were provided with data only at the beginning. 2 of the 6 participants who asserted that the colleges provided laptops or tablets mentioned that the management was supposed to provide laptops for tutors who don't have one. One of them confirmed that the tablets promised by the college are yet to be provided. 5 tutors explained that their institutions trained them for the remote experience while 4 of the tutors asserted that the institution made the ICT lab available for them. With parents, 2 of the tutors stated that they did not have any issues with the parents while 6 tutors confirmed that parents supported their wards with smartphones and laptops. Again, 5 tutors said that parents supported their wards with data to join online lessons. The attitude of the students was surprising, 8 tutors observed and confirmed that many of the students joined the online learning asynchronously. Lastly, 9 tutors mentioned T-TEL as stakeholders assisted tutors to attend online courses 5 participants acknowledge them for helping students to get smartphones that were used for remote learning. Below are some of the statements by participants about stakeholders:

"Apart from the services the computer and everything need to also be in place and good shape for us to also use and through that I think the college did well by supplying every tutor a tablet to enhance our work, so with that, I think college did their best it was a challenge for them and they lived up to the expectation". [T2].

"Now to other stakeholders, parents the online teaching came to stay and that was the means students at home were supposed to have their lessons, so most of them depend on their parents, so, they have to force parents to get them smartphones and you know it is not easy, money is not easy to come by especially during the era of Covid most parents work were in suspense so, it wasn't easy and some parents will call to find out, this is what our wards are saying is it true? So, parents also, have their challenges". [T4].

"T-TEL also, came in and they did so well, as a stakeholder, they contributed their part, they saw the need from the report coming from colleges that students don't have a smartphone, they arranged and

ordered smartphones from the UK at very affordable prices for students. So, T-TEL as a stakeholder concerning the online teaching this is where I can commend them for the good work done". [T5]

"Okay, for the students the only thing was that they don't come online. We have what we call synchronous and asynchronous. Some people will be online to learn. Others will not come, later then they come and read". [T6].

Before tutors go online to deliver, there was the need for them to prepare adequately. This was to enable them to teach effectively. The views of the teachers are presented in Table 6.

Table 6. Tutors preparation before online lessons

Theme	Codes	Participants	Frequencies
Preparation before Online Lessons	Preparing Videos and Audios	T1, T4, T3, T6, T8, T10, T11	7
	Preparing Powerpoints	T1, T2, T3, T4, T5, T6, T12	7
	Personal Research to Get Documents Ready	T3, T4, T5, T6, T7, T8	6
	Arrangement with the Lab crew	T2, T8, T9, T10, T11, T12	6
	Get Data on Phones	T4, T5, T6, T12	4

From the Table 6, preparing videos and audios and presenting them online as well as preparing PowerPoints were the most advanced preparations made by the PE tutors before the online delivery. Tutors also mentioned that they have to conduct personal research to get other documents ready before the lessons (6). Again 6 tutors asserted that they have to arrange with the lab crew to set up the place for them while 4 tutors argued that before the lessons one of the preparations made is getting data on their phones. Some of the statements made by the tutors can be found below:

"Okay with the preparation, when I have to do my studies, I select the topics and the areas that I will be teaching and then the content and just like every tutor or teacher does before going to class, you have to also, study and be equipped yourself with the content so that there will be mastery so that you can really impart concerning students understanding". [T2].

"Like I even said right now, before the lesson I do audio. I remind them that in the next 30 minutes or 1 hour we will start a lesson. Tell a friend to tell a friend is one. And one thing I make the lesson more practical. You call people who are online to respond. And when it is an activity, I the teacher, I perform the activity through a video and I send it to the platform". [T8].

"Besides, you need to make sure that when you are going to have the recorded version, is conducive enough so you prepare the place and, in my case, because I was that good in ICT, I have pre-arranged with the lab crew and for them to also prepare, sometimes they give me time that they would be free, so my lesson may not be necessarily come on at the regular schedule because it is a collaboration when they can help or feel free to help me". [T6].

"And sometimes, personally too you have to get your data, you make sure you have enough data on your phones and other things, so, these are some of the preparations we put in place to have effective lessons". [T5].

Finally, tutors were provided with the opportunity to compare the online teaching environment to the face-to-face lesson delivery. Table 7 showed the themes and codes generated.

Based on the results from Table 7, many of the tutors made statements that likened the face-to-face learning approach to the online method of delivery. The first two codes supported this (8) and (9). However, it was surprising to note that 6 tutors mentioned that online certificates are not given the needed recognition like the face-to-face approach in their part of the world. Also, 4 tutors were of the view that the face to face improves socialisation while four other tutors argued that online learning improves only the cognitive domain to the neglect of the other domains. Some of the expressions made are found below:

Table 7. Comparing face-to-face to online PE lesson delivery

Theme	Codes	Participants	Frequencies
Comparing Online PE Lessons to Face to Face	Face to Face is Better	T2, T3, T4, T5, T6, T8, T9, T11	8
	There Should be Online but Practical Should be Face to Face	T1, T2, T3, T4, T5,T6, T7, T8, T12	9
	Non-Credibility of Online Certificates	T5, T6, T4, T7, T8, T11	6
	Face to Face Improve Socialisation	T1, T2, T4, T5	4
	Online learning develop Only Cognitive Domain	T6, T7, T9, T12	4

"Now looking at the difference that we can make, as far as face to face and online is concerned, obviously, traditionally, most of us would have loved the face to face, because this is the student and as the name goes, face to face, the student is there, you look at the student face present the student sees everything teacher is doing and it makes learning lively and lovely and even the facial expressions of your students will signal you something whether things are going on well or not and students are there any question they don't understand you can ask". [T8].

"Getting students to participate in the remote lesson within this period, I think that the best approach would have been to, for the practical lessons, I think we should wait for the students to come so that we organise them in groups, not necessarily meeting the whole class at once because of the social distancing we have been asked to practice. Organising students will be good so that we teach them the skill direct". [T8].

"Mmm in my earlier submission I said that PE aims to help students to achieve the physical aspect, emotional, then the cognitive and the social but looking at the remote approach of teaching, I think students are getting only the cognitive aspects. They don't get social and the physical achievement I don't think they will get them and then affective, how they relate with others too". [T9].

"Because traditionally, even the main universities, even when you present a certificate and you studied online, they will not accept it. But now because of Covid, everybody is also trying to move here and there to accept that there is a way that we can also teach or earn a certificate without the face-to-face interaction". [T11].

DISCUSSION, CONCLUSION and SUGGESTIONS

While there is evidence of studies on PE teachers' experience and perception at the primary and elementary schools during the Covid-19 pandemic, little is done on the same topic at colleges of education. Therefore, to fill this gap, the current study examined the perceptions and experiences of the P.E. tutors at colleges of education in using technological tools for remote teaching during the Covid-19 pandemic. The results of this study support Varea et al., (2020) who confirmed that PE teachers face challenges with digital technologies. The findings from this study showed that PE tutors have accessibility issues and a low level of knowledge on technology which affected their ability to demonstrate certain skills online. Words such as village nature, not reliable and wasn't reliable further explain that tutors encountered network and accessibility issues. According to Aboagye et al., (2020), accessibility was the most important factor affecting students at tertiary institutions in Ghana in their quest to transition online from a more conventional approach. Again, Aboagye (2020) contended that network issues which encompass unstable internet connectivity and difficulty in students joining online interactions were challenges facing tutors in a smooth transition online. These studies were conducted in a developing country. Notwithstanding, a similar study in a developed country by Muilenberg and Berg (2005) did not identify any issues with cost and internet accessibility. This indicates that accessibility issues are challenges confined to developing countries. Ahmed and Nwagwu (2006) supported this finding with the claim that telecommunications, ICT policies and human resource development are relevant challenges confronting developing countries.

Regarding the tutors' low-level technological knowledge, Bodsworth and Goodyear (2017) confirmed that inadequate experience with online technology generates the negative perception of PE teachers in their quest to integrate and use them in their lesson deliveries. Kim et al. (2021) propounded that the lack of technological knowledge and experience was an important barrier affecting PE tutors to transition from face to online amid the coronavirus pandemic. Krause and Lynch (2018), postulated that despite numerous technological knowledge and skills needed in online lesson delivery, knowledge on the basic technology is not adequate for PE teachers to successfully conduct online classes. Therefore, PE tutors should be able to know how to use various technological tools to enable them to teach effectively online. This has been supported by Gök's (2015) assertion that educators should have knowledge and skills essential to conduct more effective remote learning. Mercier et al. (2021) identified similar unique challenges and recommended that there should be continued support for physical education teachers through professional development sessions and additional resources, particularly in groups where inequalities have been identified, as teachers prepare to set students on a new path to advancement to guide students' learning in PE.

The responses from the participants in this study indicate that workshops were organised by the colleges and T-TEL to prepare them on how to use technological tools for online delivery despite tutors complaining of little experience in online teaching and network challenges. The organisation of workshops and seminars prepares teachers for a new experience and changes their behaviour in a way that led to improvement in the performance of learners (Harwell, 2003). It could be argued that despite the organisation of such courses the whole experience was something new to the tutors as they have no prior experience with online lesson delivery. Some of the tutors were of the view that they don't even know whether they were adopting the best strategies during the online experience while others confirmed that the workshop gave them some relevant in-depth knowledge before the whole experience.

On what motivated tutors to teach online, the majority of the participants confirmed that it was the Covid-19 pandemic that led them to accept the whole process. It is an undeniable fact that the advent of the pandemic made many institutions adopt online lesson delivery. This was confirmed by Sá and Serpa (2020) who posited that the advent of the Covid-19 pandemic created plentiful variations in the educational system which resulted in an adjustment to instructional disparities from the conventional method to a more remote approach online. Therefore, it seems that tutors do not have any option other than to engage the students online. Another issue seems to stem from the fact that the students were idle and the only way to assist engage them during the whole process was to adopt the online approach. A handful of the tutors also found the adoption of remote lesson delivery as an opportunity to upgrade their online knowledge. Although not the main intent some of the tutors admitted that their online knowledge improved considerably.

On the role of the stakeholders-college, parents, students and T-TEL. This study found that they contributed diversely to enhance the whole remote experience of the tutors. Bolliger and Wasilik (2009) characterised possible factors that influence teachers' satisfaction in online learning environments as students, teachers and institutional factors. In the current research, tutors mentioned that the colleges supported them with data, laptops, made ICT labs available and organised workshops for them. However, Ohan and Beyhan (2020) found in contrast that teachers had no idea of the type of support provided by their institutions. On the part of the students, it was found that many of them prefer to learn asynchronously, meaning they were not participating in the synchronous lessons. One of the possible reasons could be that the students were not familiar with the whole online learning process and do not possess the necessary capabilities for online learning affected their participation (Johnson, 2008). The role of the parents was not directly related to the tutors but it seems they assisted their wards to get data and smartphones in the whole process. T-TEL assisted students to get smartphones at a reasonable price to participate in remote learning. It can be concluded that most of the tutors benefited directly from their colleges despite students' unwillingness to join the online sessions.

On preparation made before online PE delivery, the majority of the tutors prepare adequately before the online lessons. Some of them stated that preparations made were videos and audios, PowerPoints,

personal readings to get enough information for the lecture, arranging with the ICT members and getting data on phones. This means that the number of tutors who designed learning materials was many with both new and already prepared. The key factor could be that most of the tutors complained they don't have enough technological teaching experience and therefore, wanted to ensure effective delivery of the lessons. In contrast, Ohan and Beyhan (2020) confirmed that the number of distance education teachers who prepare before lessons was not considerable. Lloyd et al., (2012) opined that inadequate teaching experience in remote teaching and a change in the pedagogical approach compelled teachers to design effective teaching methods. It was not surprising that some of the tutors liaised with the ICT staff before the lectures to get technological support. This can improve the performance of the tutors and minimise frustrations and negative thoughts (Seaman, 2009).

On comparing the face to face to remote teaching, more than half of the tutors confirmed that the conventional method is far better than the online teaching in terms of practical PE lessons. Again, many of the tutors confirmed that there should be online for the theory but the practical lesson should be conducted face to face. Tutors also opined that online teaching does not promote socialisation and further develops the only cognitive domain. This contrasts with the Community of Inquiry Model (CIM) which posits that three key tenets are needed to enhance learning-teaching presence, social presence and cognitive presence (Garrison et al., 2000). In online interactions, only the cognitive aspects are enhanced neglecting the teaching presence and the socialisation. When tutors make videos and post them online, a student can encounter difficulties in performing these activities which the tutor will not be available to offer coaching points. Facial expressions that teachers at times use to determine whether students have understood particular lessons are lost in an online environment. McLean (2006) concurs that the absence of direct response and the absence of one-on-one communication in an online environment is worrisome to many teachers resulting in a decline in their interest. Kim et al (2021) in their study proposed that all the PE teachers look forward to the face-to-face approach in teaching the course because they missed interactions and in-person relationships with their students. The perception that certificates awarded online are not regarded by traditional universities and other institutions in our part of the world concludes that tutors prefer the conventional method to the remote approach not forgetting PE lessons which are more practical and demands an in-person relationship.

Conclusion and Suggestions

In conclusion, the findings of this study showed that the educators who participated in the study had accessibility issues arising from poor internet connectivity and were not prepared for the whole remote teaching. The participants maintained that they were motivated by the Covid-19 pandemic which made it a norm for them to transition online. Improving the network systems in institutions and the country at large can assist in delivering effective remote teaching.

Again, despite courses organised by the colleges and other stakeholders to prepare them for the online experience, most of the educators who participated in the study lack technological knowledge and have issues in presenting successful lessons online. At times, some of the tutors have to rely on the ICT personnel in their colleges for effective delivery. Therefore, more workshops and seminars should be organised for PE teachers on how to teach the course online.

Besides the participants claimed that they prefer the traditional face-to-face approach as the online lessons promote only the cognitive domain and did not provide opportunities for socialisation. The non-credibility of online certificates also, confirmed that students who did most of their courses online will encounter challenges in getting jobs and will not be given the due accreditation.

This piece suggests to practitioners that classroom teaching should be combined with online learning for all courses, both theoretical and practical. This offers teachers the opportunity to gain experience and become familiar with the use of both approaches. Again, the study suggests that stakeholders provide guidance on how to approach the essential components of physical education in the online environment.

For researchers, the study highlighted the need to examine teachers teaching at different levels and in different geographic locations to determine the nature of the challenges encountered when using remote approaches for hands-on teaching. This study has identified approaches that differ from studies conducted at other levels and in other parts of the world.

Limitations

The study did not involve any Physical Education lecturer at the universities offering the course as a major but rather only tutors at colleges of education. Again, senior high school PE teachers were not contacted to express their views on how they were teaching practical lessons during the pandemic. Therefore, future studies should use a quantitative strategy to capture PE teachers at all levels in the country.

Ethics and Conflict of Interest

The authors acted ethically during data collection and all other phases of the research process. We would also like to thank the tutors who dedicated their time to participate in the study during this pandemic period. The authors declared that there was no conflict of interest between them.

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IS READING COMPREHENSION ASSOCIATED WITH MATHEMATICS SKILLS: A META-ANALYSIS RESEARCH

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Abstract

The literature on the association between reading comprehension and mathematics skills is complicated and conflicting. This study seeks to illuminate the nature of the association between mathematics skills and reading comprehension by incorporating potential moderators, namely components of mathematics skills, domains of content standards in mathematics, age, language status, and developmental issues. The dataset for this study included 49 studies with 91 correlation coefficients representing 37.654 participants. The findings obtained in this study showed that reading comprehension had a significantly strong effect on students' mathematics skills. This association was moderated by components of mathematics skills, domains of content standards in mathematics, age, language status, and developmental issues. Moderation analyses revealed that problem-solving was the strongest moderator of the association between reading comprehension and mathematics skills, whereas spatial skills were the weakest moderator of this relationship. Based on domains of content standards in mathematics, geometry was the weakest moderator of the association between mathematics skills and reading comprehension. Moreover, the effects of reading comprehension on students' mathematics skills significantly differed in favor of elementary students, students with learning disabilities, and second language learners. Therefore, this research can shed light on the literature by synthesizing the effects of reading comprehension on students' mathematics skills.

Keywords: Mathematics skills, reading comprehension, meta-analysis, moderator analysis.

INTRODUCTION

Reading is an indispensable ability for individuals to succeed in real-world situations, as it serves to have an understanding of a topic (Mckee, 2012). Reading ability is vital as it makes the reader appear intellectual, knowledgeable, and sophisticated in daily life. Reading comprehension is one of the prominent components of reading ability. It is defined as the skill of a student to understand printed material (Lin, 2020). Reading comprehension is a mental activity through which an individual selects truths, data, or viewpoints from a written passage. Within this cognitive process of reading comprehension, an individual determines the meanings that the writer intends to convey; determines how they are associated with previous information; and evaluates the suitability and value of that written passage to achieve her own goals (Veeravagu et al., 2010). In reading comprehension, it is not enough to just read the text, but the reader should also be able to break down, analyze, and rearrange thoughts and data in a written passage (Mckee, 2012). Moreover, reading comprehension performance is closely related to the reader characteristics of previous experiences and prior knowledge (Schaffner & Schiefele, 2013). Therefore, reading comprehension is considered a comprehensive and versatile ability that requires readers to have both cognitive and language skills (Lerkkanen et al., 2005).

Reading comprehension is a crucial part of a student's educational development and is a strong predictor of mathematics skills (Mckee, 2012; García-Madruga et al., 2014). Reading comprehension is closely related to mathematics as it is a cognitive skill that supports students' smooth understanding of mathematical concepts and problem-solving (García-Madruga et al., 2014). A student's mathematics skills and learning process in mathematics can be influenced by reading comprehension, which is one of the most important predictors of academic performance (Bullen et al., 2020). There are many studies investigating the association between reading comprehension and mathematics skills. The

studies indicate that a significant and positive relationship between reading comprehension and mathematics skills (e.g., Vilenius-Tuohimaa et al., 2008; Boonen et al., 2013; Schaffner & Schiefele, 2013; Bullen et al., 2020). In contrast, the results of several studies showed no statistically significant relationship between reading comprehension and mathematics skills (e.g., Imam et al., 2013; Bullen et al., 2020; Trakulphadetkrai et al., 2020). Although it has been seen that a genetic overlap between reading comprehension and mathematics skills has been reported in the literature, little is still known about the association between mathematics skills and reading comprehension (Vilenius-Tuohimaa et al., 2008; Harlaar et al., 2012). Additionally, the previous studies on the relationship between mathematics skills and reading comprehension are complicated and conflicting. Studies on this topic have indicated ambiguous findings. Up to this point, studies have not provided much insight into how reading comprehension and mathematics skills are related. Therefore, a meta-analysis study investigating the association between reading comprehension and mathematics skills could provide a comprehensive and up-to-date understanding of the correlation between these structures, but the literature does not provide such a meta-analysis study. In conclusion, a study that focuses on the association between mathematics skills and reading comprehension while incorporating potential moderators may provide comprehensive, updated, and valuable findings on this topic.

Potential Moderators in the Context of Mathematics Skills and Reading Comprehension

It is not easy to understand the association between mathematics skills and reading comprehension since mathematics skills are a set of different skills consisting of arithmetic skills, logical reasoning, and spatial skills (Lin, 2011). Arithmetic skills are related to procedural knowledge and the correctness, flexibility, and fluency of arithmetic operations in natural numbers, integers, fractions, decimals, real numbers, percentages, algebra, and calculus (Xie et al., 2020). Logical reasoning covers the comparison, generalization, induction, analysis, and synthesis of real-world situations, rules, and quantitative relationships in the context of mathematics (Lin, 2011). Spatial skills are associated with mental rotation, visualization, spatial memory, spatial orientation, spatial perception, understanding symmetry, translation, and transformation of geometric figures, along with the interpretation of algebraic rules in the context of geometry (Xie et al., 2020). Moreover, the first thing that comes to mind when thinking of mathematical skills is problem-solving because the application of mathematical ideas in the real world and STEM fields can be reflected by problem-solving (Fuchs et al., 2020). Problem-solving has great prominence in each part of the mathematics curriculum and at each grade level from kindergarten to high school (Fuch et al., 2015). Therefore, problem-solving performance is the greatest indicator of mathematics achievement, as students' mathematics skills are generally assessed based on problem-solving tasks (Fuchs et al., 2020).

The greatest predictor of problem-solving is reading comprehension since the first stage of the problem-solving phase requires an individual to comprehend the problem statement and context (Özcan & Doğan, 2018; Pongsakdi et al., 2020). Albert Einstein is the most outstanding scientist of the 20th century and emphasizes, "*If I had an hour to solve a problem, I would spend 55 minutes thinking about the problem and 5 minutes thinking about solutions*." Thus, it is necessary to think carefully and understand the problem situation properly to solve a problem. Several studies results reveal that even students who have strong arithmetical skills, spatial skills, or logical reasoning have difficulty solving real-world problems due to limited reading comprehension and an incorrect understanding of the problem situation (e.g., Bjork & Crane, 2013; Boonen et al., 2014; Özcan & Doğan, 2018; Can, 2020). Most previous studies indicate that reading comprehension has a stronger impact on problem-solving than spatial skills, arithmetic skills, and logical reasoning (e.g., Lee et al., 2004; Hart et al., 2010; Bjork & Crane, 2013; Harlaar et al., 2012; Fuchs et al., 2015; Murrihy et al., 2017; Pongsakdi et al., 2020). For example, a greater relationship between reading comprehension and problem-solving (r = .45) than arithmetic skills (r = .42) and spatial skills (r = .34) among elementary students is reported by Murrihy et al. (2017). Likewise, a strong relationship (r = .60) between problem-solving and reading comprehension and a moderate relationship (r = .49) between reading comprehension and logical reasoning among elementary students are found by Can (2020). However, some studies (e.g., Swanson, 2004; Bullen et al., 2020) show that there is a greater relationship between reading

comprehension and arithmetic skills than problem-solving. Moreover, arithmetic skills, spatial skills, logical reasoning, and problem-solving (Harlaar et al., 2012; Cantin et al., 2016; Anselmo et al., 2017; Kikas et al., 2020) showed comparable relationships with reading comprehension. Therefore, the relationship between the components of mathematics skills and reading comprehension remains controversial, and the results of studies in the literature are also inconsistent. Besides, little is known about the association between reading comprehension and the components of mathematics skills.

In the literature, the relationship between reading comprehension and mathematics skills, mathematics achievement is measured by mathematics tasks that span the domain of numbers and operations, the domain of algebra, the domain of geometry, or all domains of the content standards. In particular, the content standard of algebra has its own language, and many students have difficulty learning the language of algebra. Students can solve word problems related to algebra by converting words into the language of algebra (Özcan & Doğan, 2018). Similarly, in the context of solving word problems related to numbers and operations or geometry, students should translate words into numbers or figures. Cummins et al. (1988) have emphasized that correct answers to word problems are associated with strong reading comprehension skills in the context of algebra tasks. Although it can be asserted that reading comprehension has a greater impact on algebra than other content standards, more extensive research to confirm this assertion is needed.

Research has revealed developmental differences in the reading comprehension skills of readers (Chae, 2004). The results of van den Broek's (1997) study indicated that younger students were not as able to use causal relationships and make inferences in the context of the text as older students. Moreover, older students in middle school have reading comprehension skills, especially in the use of causal relations, almost at the same level as adults. However, younger students have less reading comprehension skills in finding causal relationships and making interference in the text than middle and high school students (e.g., Broek, 1997; Chae, 2004). Therefore, reading comprehension may vary depending on an individual's cognitive abilities and age. At this point, age can be considered an important moderator between mathematics skills and reading comprehension. Previous studies indicated that the effects of reading comprehension on students' mathematics skills in elementary school significantly were greater than for middle and high schools (e.g., Björn et al., 2016; Salihu et al., 2018). Given the impact of age on reading comprehension, more extensive studies comparing the relationships between reading comprehension and mathematics skills across age groups may be valuable (Bjork & Crane, 2013).

The language background is one of the variables that moderate the relationship between reading comprehension and mathematics skills. Many studies reveal that mathematics achievement scores of first language learners are significantly higher than that of second-language learners (e.g., Martiniello, 2008; Goodrich & Namkung, 2019; Trakulphadetkrai et al., 2020). Second language learners' difficulties in reading comprehension cause them to lag behind their peers, especially in mathematics. Moreover, recent studies (Goodrich & Namkung, 2019; Trakulphadetkrai et al., 2020) reveal that there are differences in the relationship between mathematics skills and reading comprehension for first language learners and second-language learners. For example, Goodrich and Namkung (2019) and Trakulphadetkrai et al. (2020) find a strong relationship (r = .74) between problem-solving and reading comprehension for second language learners, whereas a weak or nonsignificant relationship (r = .49) between problem-solving and reading comprehension is obtained for first language learners. Although it can be argued that the relationship between reading comprehension and mathematics skills is stronger for second-language learners than for first-language learners, more extensive research is needed to confirm this claim.

Many studies have explored the relationship between mathematics skills and reading comprehension in both typical development students and students with learning disabilities (e.g., Alloway, 2007; Pimperton & Nation, 2010; Boonen et al., 2014; Fuchs et al., 2015; Bullen et al., 2020; Pongsakdi et al., 2020). Previous studies have shown that students with learning disabilities often struggle in both reading and mathematics (e.g., Lerkkanen et al., 2005; Bae et al., 2015; Salihu et al., 2018). Moreover,

Lerkkanen et al. (2005) have argued that students with reading disabilities probably have difficulties in arithmetic skills and problem-solving. The presence of large comorbidity between dyslexia and dyscalculia prompted researchers to examine the association between reading comprehension and mathematics skills in students with learning disabilities (Ostad, 1998; Fuchs & Fuchs, 2002; Pimperton & Nation, 2010). Since students with learning disabilities, such as Autism Spectrum Disorder (ASD), specific language impairment (SLI), and attention-deficit/hyperactivity disorder (ADHD), are likely to have deficits in reading comprehension, their deficits in reading comprehension are likely to influence their mathematics skills (Whitby & Mancil, 2009; Bae et al., 2015; Bullen et al., 2020). For example, students with SLI have difficulty in mathematics and exhibit poor performance regarding arithmetic skills (Koponen et al., 2007). A recent article has revealed that a strong association (r = .58, r = .52) was obtained between reading comprehension and arithmetic skills or problem-solving in students with ADHD, a strong relationship (r = .51) was found between reading comprehension and problem-solving in students with ASD, and a non-significant relationship was obtained between reading comprehension and problem-solving or arithmetic skills in typical development students by Bullen et al. (2020). However, several studies (e.g., Bae et al., 2015; Salihu et al., 2018) show a greater relationship between reading comprehension and arithmetic skills or problem-solving in students with typical development than in students with learning disabilities. Given the effects of developmental issues on reading comprehension, more extensive studies comparing the relationships between reading comprehension and mathematics skills among developmental status groups (i.e., students with or without learning disabilities) may be crucial.

The Present Research

There is a growing need for meta-analytic research that provides a comprehensive and updated perspective on the association between mathematics skills and reading comprehension in the literature. Therefore, this research seeks to illuminate the nature of the association between reading comprehension and mathematics skills by incorporating potential moderators, namely components of mathematics skills, domains of content standards in mathematics, age, language status, and developmental issues (i.e., with or without learning disabilities). Thus, the research questions in this study are:

i) Is there a significantly positive association between reading comprehension and mathematics skills?

ii) Does the association between reading comprehension and mathematics skills vary according to potential moderators?

METHOD

Research Design

As this research illuminated the association between reading comprehension and mathematics skills, the meta-analysis design was used in the present research. Meta-analysis allows researchers to make statistically accurate estimates since it is an analysis of analyses (Shelby & Vaske, 2008; Güzeller & Çeliker, 2019). Based on meta-analysis research, the results of various independent research studies on a specific subject were systematically collected, then these findings were combined and synthesized, and finally, a statistical analysis of the combined results was performed (Shelby & Vaske, 2008; Borenstein et al., 2009; Güzeller & Çeliker, 2019).

Literature Search and Inclusion Criteria

A wide range of academic databases is available for screening scientific studies. In this study, the databases Web of Science, Scopus, Google Scholar, ERIC, EBSCOhost online, and ProQuest Dissertations & Theses were searched for research reports with the combinations of the keywords "reading comprehension," "passage comprehension," "text comprehension," "mathematics skills," "mathematical ability," "mathematics achievement," "mathematical performance," and "mathematics success" for the years between January 1990 and December 2020. Besides, the selection of reports was based on the PRISMA protocol for meta-analysis (Moher et al., 2009). A total of 274 reports,

including research articles and dissertations, were selected from these academic databases after searching all research related to reading comprehension and mathematics skills. Then, the abstracts of these reports were reviewed using inclusion and exclusion criteria. Eighty-five reports were excluded at the abstract level since they were deemed inappropriate. The remaining 189 reports were analyzed in detail for their appropriateness against the inclusion criteria after reviewing the full text of the remaining reports. Duplicate reports were eliminated based on title and author information (n = 34). Nine reports were excluded because they reflected the literature review. Thirty-seven reports were eliminated since they were qualitative research. Twelve reports were excluded because they did not examine mathematics achievement tasks or reading comprehension. Forty-three reports were eliminated since they did not show a correlation between reading comprehension and mathematics skills. Five reports were removed because they were a pre-post-test design that did not reflect a correlational study. Thus, 140 reports were eliminated in this meta-analysis. In total, 49 reports met the inclusion criteria listed below (Figure 1):

- The research had to be published between 1990 and 2020.
- The research had to report the association between reading comprehension and mathematics skills.
- The research had to measure both reading comprehension and mathematics skills with any measure of task.
- The research had to include the statistical data necessary for this meta-analysis research (i.e., r, R^2, and N).
- Participants in the research had to be elementary, middle, or high school students.
- The research participants had to be either typical development students or students with learning disabilities.
- The research participants had to be either first language learners or second language learners.

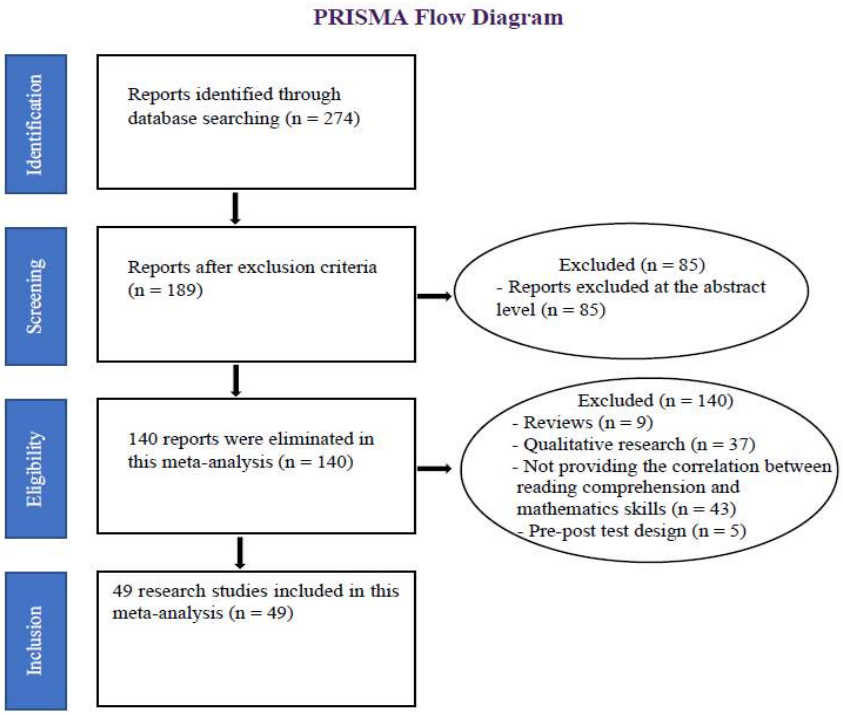

Figure 1. The PRISMA flow diagram associated with the present study

Coding Procedure

To reveal the association between reading comprehension and mathematics skills, components of mathematics skills, domains of content standards in mathematics were considered. Mathematics skills were coded as problem-solving, arithmetic skills, spatial skills, and logical reasoning. Content standards in mathematics were coded as numbers and operations, algebra, geometry, and mixed (i.e., including all domains of content standards) in the context of previous research on the association between mathematics skills and reading comprehension. To account for the effects of age on reading comprehension, the grade level of students was separated into three groups' namely elementary, middle, and high school in this study. To consider the effects of developmental issues on reading comprehension, developmental status was coded as typical development students and students with learning disabilities. Language status was also coded as first and second language learners. The coding form was composed of the categories of identification tag, the number of students, grade level of students, language status, developmental issues, mathematics skills, domains of content standards in mathematics, and correlation coefficients. The present research performed a meta-analysis of 49 research, with 91 effect sizes to investigate the correlation between reading comprehension and mathematics skills. The descriptive characteristics of these 49 studies with 91 effect sizes are provided in Table 1. Additionally, two researchers coded these individual studies separately and reached a nearly excellent agreement with Cohen's kappa coefficient of .92.

Table 1. Descriptive characteristics of the meta-analysis dataset

Variables	*f*	%
Components of mathematics skills		
Arithmetic skills	29	31.9
Spatial skills	10	11
Logical reasoning	8	8.8
Problem-solving	44	48.3
Domains of content standards in mathematics		
Numbers and operations	62	68.1
Algebra	2	2.2
Geometry	14	15.4
Mixed	13	14.3
Grade level of students		
Elementary	53	58.2
Middle	28	30.8
High	10	11
Developmental issues		
Typical development	76	83.5
Learning disabilities	15	16.5
Language status		
First language	85	93.4
Second language	6	6.6

Data Analysis

Correlation coefficients were seen as a measure of effect size to show the association between mathematics skills and reading comprehension. The effect size of each research was calculated independently since the unit of analysis was considered for each research in the meta-analysis (Kaya & Erdem, 2021). In this research, all analyses were conducted using the transformed Fisher's *z* values of all correlation coefficients and then all Fisher's *z* values were transformed back into correlation coefficients in an attempt to interpret easily (Güzeller & Çeliker, 2019; Xie et al., 2020). Also, it is assumed that each group is independent research when research contains multiple samples. Moreover, each component of mathematics skills is considered independent research when multiple mathematics skills are measured in research. Therefore, 49 studies with 91 effect sizes were included in this meta-analysis research. The range of values suggested by Cohen (2007) was utilized to evaluate the effect sizes. The test of homogeneity (*Q* statistic) and the test for heterogeneity (I^2) were conducted to assess whether a fixed or random-effects model fit the data set of this meta-analysis (Higgins et al., 2003; Güzeller & Çeliker, 2019). Funnel plot and Egger's regression were considered in this meta-analysis

to investigate publication bias. Subgroup analysis was performed to investigate whether the association between reading comprehension and mathematics skills was moderated by components of mathematics skills, domains of content standards in mathematics, age, language status, and developmental issues. The *Q*-between-groups test was conducted to analyze whether or not the effect size distribution differed significantly by subgroups/moderators (Kaya & Erdem, 2021). Moreover, meta-regression was conducted to evaluate the effects of multiple covariates on mean effect size (Borenstein et al., 2014; Xie et al., 2020). The Comprehensive Meta-Analysis (CMA Ver. 2.0) program (Borenstein et al., 2014) and JASP (JASP Team, 2020) were used for analyses.

RESULTS

General Characteristics of Research Data

The dataset for this study included 49 studies with 91 correlation coefficients representing 37.654 participants. The number of participants varied between 39 and 5162. In Table 2, the I^2 value (I^2 = 91.73) showed that the effect size distribution was extremely heterogeneous according to the criteria of Higgins et al. (2003). The test of homogeneity revealed that the *Q* value (1088.03, $p < .05$) was significant in this study (Güzeller & Çeliker, 2019). Therefore, analyses in this study were estimated using a random-effect model. The mean effect size of reading comprehension on participants' mathematics skills was $r = .50$, with a 95 percent confidence interval varying between .47 and .52. This statistically significant value revealed that reading comprehension had a large effect size on mathematics skills of K-12 students based on Cohen's (2007) criteria (Oh-Young et al., 2018).

Table 2. General characteristics of research data

		95% CI				ToH			
Relationship	***k***	***n***	**ES**	**LL**	**UP**	***p***	***Q***	***p***	I^2
RC → MS	91	37,654	.50**	.47	.52	.00	1088.03**	.00	91.73

RC reading comprehension; MS mathematics skills; CI confidence interval; ToH test of homogeneity **$p < .01$

Moderator Analyses

The present potential moderators were identified in this study: components of mathematics skills, domains of content standards in mathematics, grade level of students, developmental issues, and language status. These potential moderators were performed in subgroup analyses to unpack whether the association between mathematics skills and reading comprehension differed, or not. The results of subgroup analyses indicated that the association between reading comprehension and mathematics skills differed significantly by components of mathematics skills ($Q_b(3) = 15.61$, $p < .01$). The mean effect sizes between reading comprehension and arithmetic skills ($r = .45$, 95% CI [.41, .52], $p < .01$), spatial skills ($r = .36$, 95% CI [.26, .46], $p < .01$), logical reasoning ($r = .46$, 95% CI [.35, .55], $p < .01$), and problem solving ($r = .55$, 95% CI [.51, .58], $p < .01$) were significantly positive as shown in Table 3. Meta-regression analyses demonstrated that the mean effect size of problem solving was significantly greater than for arithmetic skills ($\beta = -.08$, $z = -2.75$, $p < .01$), spatial skills ($\beta = -.18$, $z = -4.24$, $p < .001$), and logical reasoning ($\beta = -.11$, $z = -2.27$, $p < .001$). Moreover, the mean effect size of arithmetic skills was significantly greater than spatial skills ($\beta = -.10$, $z = -2.14$, $p < .01$). Likewise, the effect size of logical reasoning demonstrated significant difference between spatial skills ($\beta = -.11$, $z = -2.26$, $p < .05$), along with mean effect sizes of arithmetic skills and logical reasoning indicated relatively equivalent relations between reading comprehension and mathematics skills.

As shown in Table 3, the association between mathematics skills and reading comprehension differed significantly by domains of content standards in mathematics ($Q_b(3) = 14.67$, $p < .01$). The mean effect sizes between reading comprehension and numbers and operations ($r = .51$, 95% CI [.48, .55], $p < .01$), algebra ($r = .54$, 95% CI [.34, .69], $p < .01$), geometry ($r = .35$, 95% CI [.27, 44], $p < .01$), and mixed ($r = .52$, 95% CI [.45, 59], $p < .01$) were significantly positive. Meta-regression analyses indicated that the mean effect size of geometry was significantly lower than for numbers and operations ($\beta = .11$, $z = 2.93$, $p < .001$), algebra ($\beta = .18$, $z = 3.58$, $p < .001$), and mixed ($\beta = .15$, $z = 4.21$, $p < .01$). Although algebra had the greatest effect size ($r = .54$), there were no significant

differences in the mean effect size of algebra between numbers and operations ($\beta = -.01$, $z = -.08$, $p > .05$), and mixed ($\beta = -.002$, $z = -.03$, $p > .05$), individually.

There were significant differences between the effect sizes of studies constrained to age that involved elementary, middle, or high school students ($Q_b(2) = 9.99$, $p < 0.01$). The findings showed that the mean effect size between reading comprehension and mathematics skills was significantly positive for elementary ($r = .53$, 95% CI [.49, .57], $p < .01$), middle ($r = .46$, 95% CI [.41, .51], $p < .01$ and high school students ($r = .40$, 95% CI [.30, .49], $p < .01$). Based on the results of meta-regression, studies, including elementary students, demonstrated a significantly higher mean effect size than studies including middle school students ($\beta = -.10$, $z = -2.38$, $p < .05$) or high school students ($\beta = -.14$, $z = -2.28$, $p < .05$), while the association between mathematics skills and reading comprehension was not significantly higher for middle school students than for high school students ($\beta = -.04$, $z = -.61$, $p > .05$).

Based on developmental issues, the subgroup analysis indicated that the mean effect sizes for typical development students ($r = .48$, 95% CI [.45, .51], $p < .01$) versus students with learning disabilities ($r = .57$, 95% CI [.50, .64], $p < .01$) differed significantly ($Q_b(1) = 4.7$, $p < .05$). Additionally, the mean effect size of studies involving students with learning disabilities was significantly larger than studies involving typical development students ($\beta = -.09$, $z = -2.32$, $p < .05$). Similarly, given language status, the findings revealed that the mean effect sizes for first language learners ($r = .48$, 95% CI [.46, .51], $p < .01$) versus second language learners ($r = .65$, 95% CI [.57, .72], $p < .01$) differed significantly ($Q_b(1) = 12.83$, $p < .01$). Also, the mean effect size of studies involving second language learners was significantly greater than studies involving first language learners ($\beta = -.16$, $z = -3.02$, $p < .01$).

Table 3. Association between reading comprehension and mathematics skills based on moderator analyses

Variables	*k*	*n*	*r*	*r* (95% CI)	Q_b (df)
Components of MS					15.61**(3)
Arithmetic skills	29	10715	.47**	[.41, .52]	
Spatial skills	10	6722	.36**	[.26, .46]	
Logical reasoning	8	1985	.46**	[.35, .55]	
Problem-solving	44	18232	.55**	[.51, .58]	
Domains of CSM					14.67**(3)
Numbers and operations	62	23340	.51**	[.48, .55]	
Algebra	2	743	.54**	[.34, .69]	
Geometry	14	7606	.35**	[.27, 44]	
Mixed	13	5965	.52**	[.45, 59]	
Grade level of students					9.99**(2)
Elementary	53	12376	.53**	[.49, .57]	
Middle	28	22057	.46**	[.41, .51]	
High	10	3221	.40**	[.30, .49]	
Developmental issues					4.70* (1)
Typical development	76	35767	.48**	[.45, .51]	
Learning disabilities	15	1887	.57**	[.50, .64]	
Language status					12.83**(1)
First language learners	85	33929	.48**	[.46, .51]	
Second language learners	6	3725	.65**	[.57, .72]	

MS mathematics skills; CSM content standards in mathematics; *$p < .05$; **$p < .01$

Publication Bias

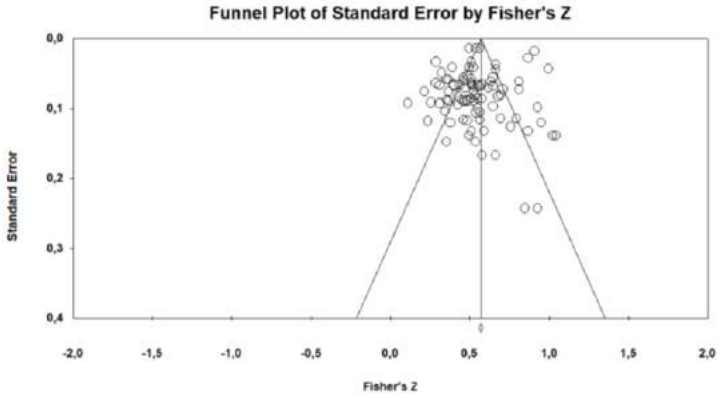

Figure 2. Visualization of effect sizes in the funnel plot

Publication bias analyses were conducted to investigate whether the dataset of this meta-analysis was influenced by publication bias. As presented in Figure 2, the funnel plot analysis revealed a reasonable symmetrical distribution. Based on Egger's test analysis (t = 1.23; p = .22), the mean effect size of the data set did not result in publication bias (Egger et al., 1997). In Table 4, the results of Duval and Tweedie's trim-and-fill test demonstrated that there was no difference between the observed values and the adjusted values. Therefore, no evidence of publication bias was obtained in this study.

Table 4. The findings of Duval and Tweedie's trim-and-fill test

	Studies trimmed	ES	95% CI		*Q*
			LL	UL	
Observed		.50	.47	.52	1088.03
Adjusted	0	.50	.47	.52	1088.03

DISCUSSION

The present research examined the nature of the association between reading comprehension and mathematics skills by incorporating potential moderators, namely components of mathematics skills, domains of content standards in mathematics, age, language status, and developmental issues. Based on Cohen's (2007) criteria (Oh-Young et al., 2018), the results demonstrated that there was a significantly strong and positive association between mathematics skills and reading comprehension (r = .50, 95% CI [.47, .52]). This finding is largely consistent with the results obtained from previous research that has revealed reading comprehension to be significantly, strongly, and positively associated with mathematics skills of K-12 students (e.g., Vilenius-Tuohimaa et al., 2008; Boonen et al. 2013; Schaffner & Schiefele, 2013; Bullen et al., 2020). Similar to the findings obtained in this study, a significantly strong and positive association was found between reading comprehension and mathematics skills in genetic research (Plomin & Kovas, 2005; Harlaar et al., 2012). In contrast, this result is inconsistent with only few studies, which indicated that the association between reading comprehension and mathematics skills is not statistically significant or weak (e.g., Imam et al., 2013; Bullen et al., 2020; Trakulphadetkrai et al., 2020). The significantly strong and positive association between reading comprehension and mathematics skills obtained in this meta-analysis research supports the literature and confirms the claim that reading comprehension is a strong predictor of mathematics skills (Mckee, 2012; García-Madruga et al., 2014). Moreover, the findings showed that the association between reading comprehension and mathematics skills was significantly moderated by components of mathematics skills, domains of content standards in mathematics, age, language status, and developmental issues.

To investigate the moderator effect in the context of the components of mathematics skills, the relationship between each component of mathematics skills was tested with reading comprehension. Results indicated that each component of mathematics skills was significantly associated with reading

comprehension. Problem-solving (r = .55) had a significantly greater relationship with reading comprehension than arithmetic skills (r = .45), spatial skills (r = .36), and logical reasoning (r = .46). Likewise, both arithmetic skills and logical reasoning showed a significantly stronger relationship with reading comprehension compared to spatial skills. On the contrary, logical reasoning and arithmetic skills showed comparable relationships with reading comprehension.

Drawing on the findings reported above, it was revealed that problem-solving was influenced by reading comprehension more. These results are not surprising since one of the most important phases of problem-solving is understanding the problem (Lau, 2006). It is the most important action for students to attempt to comprehend the problem since it is unlikely that a problem can be solved without comprehending it (Ozturk et al., 2020). Previous research has also shown that even mathematically strong children have difficulty solving problems owing to an incorrect comprehending of the problem situation or limited reading comprehension skills (e.g., Bjork & Crane, 2013; Boonen et al., 2014; Özcan & Doğan, 2018; Can, 2020). Moreover, most previous studies indicate that reading comprehension has a stronger impact on problem-solving than arithmetic skills, logical reasoning, and spatial skills (e.g., Lee et al., 2004; Hart et al., 2010; Bjork & Crane, 2013; Harlaar et al., 2012; Fuchs et al., 2015; Murrihy et al., 2017; Pongsakdi et al., 2020). Therefore, this finding is consistent with the studies in the literature on reading comprehension and mathematics skills.

Problem-solving demonstrated the strongest relationship with reading comprehension, which was in line with the research hypothesis. This result can be explained by task complexity (Peng et al., 2019). Problem-solving skills are more complex than arithmetic skills since solving real-world problems requires reading comprehension skills and arithmetic skills (Bjork & Crane, 2013). Although logical reasoning and spatial skills require students to use more complex skills, such as comparison, generalization, induction, analysis, visualization, spatial memory, spatial orientation, and spatial perception, there is a unique association between problem-solving and reading comprehension since reading comprehension has a unique role in problem-solving process (Lin, 2011; Bjork & Crane, 2013).

Spatial skills showed a weaker relationship with reading comprehension than problem-solving, arithmetic skills, and logical reasoning. This result can be explained by the nature of spatial skills. In the literature, tests that measure spatial skills are generally composed of items containing spatial shapes or figures, and they are closely associated with mental rotation, spatial orientation, spatial memory, and visualization process (Xie et al., 2020). These test items are generally represented by spatial shapes or figures (Ünlü & Ertekin, 2017). To solve the tests of spatial skills, students, first of all, attempt to comprehend spatial shapes or figures rather than to comprehend the text. Therefore, it can be suggested that the visualization process or comprehending spatial figures replace reading comprehension when students use spatial skills.

The present research showed that the relationship between reading comprehension and mathematics skills differed significantly by domains of content standards in mathematics. Moreover, results revealed that each domain of content standards in mathematics was significantly related to reading comprehension. Geometry (r = .35) demonstrated a weaker relationship with reading comprehension than numbers and operations (r = .51), algebra (r = .54), and mixed (r = .52). On the contrary, numbers and operations, algebra, and mixed (i.e., including all domains of content standards) showed comparable relationships with reading comprehension. One possible explanation is related to the nature of geometry, which is an important part of mathematics, and it deals with geometric shapes, geometric objects, their positioning in the real world, and spatial relationships (Ünlü & Ertekin, 2017). Problems associated with geometry are generally presented with visual format rather than text format (Xie et al., 2020). When solving geometric problems, it is a priority to make sense of geometric figures or shapes in the problem rather than comprehend the text. Therefore, this result supports the research hypothesis. Although algebra had the greatest effect size, the mean effect size of algebra and reading comprehension was not significantly greater than numbers and operations or mixed. This result is not in conformity with the research hypothesis. To solve algebraic word problems, a student needs to

convert words into the language of algebra and to switch between the language of algebra and text language appropriately (Özcan & Doğan, 2018). Cummins et al. (1988) have stated that students' performance in algebraic word problems depends on their mathematical knowledge and their reading comprehension skills. Moreover, they emphasize that errors related to algebraic word problems result from miscomprehending the problem. This finding can be explained by one possible explanation that only two studies associated with algebra in this meta-analysis lead to moderate heterogeneity (I^2 = 64.66) and make estimations about the relationship between algebra and reading comprehension less certain (Higgins et al., 2003). If the number of studies related to algebra is adequate regarding heterogeneity within the scope of reading comprehension, the number of effect sizes will increase in future meta-analysis studies. Therefore, an adequate number of effect sizes for algebra will make the association between reading comprehension and mathematics skills more certain.

Given the effects of age on reading comprehension, the moderator variable of the grade level of students is considered. This research revealed that reading comprehension had a significantly strong effect on students' mathematics skills at elementary school grades (r = .53), whereas reading comprehension had a significant medium effect on students' mathematics skills at middle (r = .46) and high school grades (r = .40). The results showed that the effects of reading comprehension on students' mathematics skills significantly differed in favor of younger students, which was in accordance with the research hypothesis. Previous research revealed that the association between mathematics skills and reading comprehension was significantly larger for elementary students than for middle and high school students (e.g., Björn et al., 2016; Salihu et al., 2018). This result can be explained by one possible explanation that younger students have less reading comprehension skills than middle and high school students, leading them to perform poorly when solving problems (e.g., Broek, 1997; Chae, 2004).

The present study demonstrated that the relationships between mathematics skills and reading comprehension were significantly positive for both typical development students (r = .48) and students with learning disabilities (r = .57). Moreover, the effects of reading comprehension on students' mathematics skills significantly differed in favor of students with learning disabilities, which was in line with the research hypothesis. One possible explanation is that since students with learning disabilities, such as ASD, SLI, and ADHD, are likely to have deficits in reading comprehension, their deficits in reading comprehension are likely to influence their mathematics skills (Whitby & Mancil, 2009; Bae et al., 2015; Bullen et al., 2020). The findings of a recent study have revealed that children who have mathematical disabilities are slightly more than twice as likely to have reading disabilities compared to typical development students (Joyner & Wagner, 2020). In consequence, it is an expected result that there is a significantly greater association between mathematics skills and reading comprehension in students with learning disabilities than in typical development students. Similarly, this study showed that the relationships between mathematics skills and reading comprehension were significantly positive for both first language (r = .48) and second language learners (r = .65). Moreover, the effects of reading comprehension on students' mathematics skills significantly differed in favor of second language learners, which was in line with the research hypothesis. Previous research indicated that second language learners' limited reading comprehension skills led them to be behind their peers, especially in STEM fields (e.g., Martiniello, 2008; Goodrich & Namkung, 2019; Trakulphadetkrai et al., 2020). Hence, we can argue that second language learners' mathematics skills can be influenced by reading comprehension more based on results.

Limitations

Several limitations were present in this meta-analysis. One of the limitations of this study was that the language of publications other than English was not considered in the present meta-analysis. Another limitation of the present study was related to the search strategy. In this study, generalized keywords, such as "reading comprehension," "passage comprehension," "text comprehension," "mathematics skills," "mathematical ability," "mathematics achievement," "mathematical performance," and "mathematics success" were considered. However, some publications may only engage in the specific

components of arithmetic skills and spatial skills, such as "number sense," "number estimation," or "spatial orientation." Although it was intended to include all publications related to the research problem in this meta-analysis research, some eligible publications might have been overlooked on account of the search strategy. Moreover, an inadequate number of effect sizes for algebra made estimations about the moderator effect of algebra in the association between reading comprehension and mathematics skills less certain. Therefore, more effect sizes for algebra would be helpful to clarify this association in future meta-analyses. Additionally, gender could not be considered a potential moderator variable since many publications did not present the necessary data for this meta-analysis. Finally, several factors are related to mathematics skills, such as working memory, phonological processing, and general intelligence did not consider as a moderator between reading comprehension and mathematics skills. Therefore, further studies which include publications other than English and have sufficient data for potential moderators, such as genders, working memory, phonological processing, and general intelligence, are needed to illuminate the nature of the association between reading comprehension and mathematics skills by incorporating other potential moderators.

Conclusion and Implications

This study portrays the association between mathematics skills and reading comprehension using a meta-analysis. Drawing on findings obtained in this study, reading comprehension had a significantly strong effect on students' mathematics skills. This association was moderated by components of mathematics skills, domains of content standards in mathematics, age, language status, and developmental issues. Moderation analyses revealed that problem-solving was the strongest moderator of the association between reading comprehension and mathematics skills, whereas spatial skills were the weakest moderator of this relationship. Based on domains of content standards in mathematics, geometry was the weakest moderator of the association between reading comprehension and mathematics skills. Moreover, the effects of reading comprehension on students' mathematics skills significantly differed in favor of elementary students, students with learning disabilities, and second language learners. Therefore, this research can shed light on the literature by synthesizing the effects of reading comprehension on students' mathematics skills.

This study proved that mathematics skills and reading comprehension were causally interrelated. Thus, the findings obtained in this study provide some educational implications related to how to train reading comprehension skills to enhance students' mathematics skills. Language training should be integrated into mathematics learning and teaching to help students comprehend real-world problems (Bae et al., 2015) because it is crucial to concentrate on improving students' reading comprehension to assist them to steer the complex nature of reading texts and solving real-world problems in the context of mathematics (Bjork & Crane, 2013). To develop students' mathematics skills, mathematics teachers should provide students with opportunities to enhance reading comprehension skills, procedural and conceptual learning in mathematics, everyday vocabulary, and mathematics vocabulary in the learning environment (Bae et al., 2015). Meanwhile, continuous focus on improving students' reading comprehension is more likely to enhance their mathematics scores both in problem-solving and mathematics aptitude tests (Bjork & Crane, 2013). Mathematics teachers can incorporate reading comprehension skills into their mathematics teaching by asking children to read texts aloud, helping them interpret the problem situation based on the data and asking for what is desired in the problem, helping them use decoding skills, especially in complex problems, making them explore new words using every day and mathematics vocabulary (Carter & Dean, 2006). The present study showed that a considerable strong relation between reading comprehension and mathematics skills in elementary students, second language learners and students with learning disabilities. Hence, incorporating reading comprehension skills into mathematics instruction can benefit these three groups. Consequently, the findings suggest that mathematics instruction through reading comprehension skills, especially for elementary students, second language learners and students with learning disabilities should be enriched.

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COMPARISON OF VALUES: GERMAN (BERLIN) SACHUNTERRICHT AND TURKISH LIFE STUDIES TEXTBOOK EXAMPLES

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Abstract

This comparative educational study aims to analyze the values in the Sachunterricht (Social Studies) 1/2 textbook in Germany and in the 2nd-grade Social Studies textbook in Turkey according to the "Basic Human Values Theory". For this purpose, the method of the study is the case study design, which is a qualitative research design, and the data were analyzed with the method of document analysis. Descriptive analyses were used in the analysis of the data. According to the results of the study, while values were emphasized 187 times in the units in the German Sachunterricht textbook, they were emphasized 328 times in the units of the Turkish 2nd-grade Social Studies textbook. Moreover, in the textbooks of both countries, the "conformity / rules", and "conformity / interpersonal" value types were emphasized. Additionally, the "universalism / nature" value type was included in each unit in the 2nd-grade Social Studies textbook of Turkey, and this value was included in only the unit related to nature in the Sachunterricht 1/2 textbook in Germany. It was concluded that values are shaped within the framework of multiculturalism in the German Sachunterricht (Social Studies) 1/2 textbook, whereas they are presented based on family, relatives, close environment, relationships, and cooperation in the Turkish 2nd-grade Social Studies textbook.

Keywords: Turkey, Germany, social studies, values education, comparative education.

INTRODUCTION

Values, as well as being criteria that attribute meaning and importance to the existence of a culture and society, are a measure of the acceptability of behaviors and actions (Ficther, 2015). Rokeach (1982) defined a value as "a persistent belief that an individual prefers over the opposite". The concept of value has been an important subject of study for years in social sciences such as philosophy, sociology, and psychology. The basis of the political, economic, and welfare levels of societies depends not only on individuals with knowledge and skills, but also on the efficacy of individuals who can manage this knowledge and skills with universal values. In this sense, values play a fundamental role in education. Values that have the mission of an acceptable roadmap in the social life of the individual have taken place in moral education and character education practices in the historical process. They were presented within the framework of basic citizenship education in the 1900s. It is aimed to raise individuals who have values such as those related to the family, patriotism, reliability, fairness, and peace (Mulkey, 1997). While the constructivist approach emphasizes the uniqueness of the individual, the importance of individual values comes to the fore. With the understanding of social constructivism, the effect of the social and cultural environment in the learning process of the individual has been expressed. In this respect, values and their classification could vary in the cultural dimension, where in some societies,

individual values come to the fore, and in others, social values become prominent (Antlová et al., 2015). Many theoreticians have examined values in different dimensions. While Spranger (1928) classified values as aesthetic, economic, political, scientific, social, and religious values, Rokeach (1973) classified values as instrumental and objective values (as cited in Rokeach, 1982). Allport et al. (1960) categorized values as aesthetic, technical, religious, scientific, social, and economic, whereas Winter et al. (1998) categorized them as individual values, familial values, and social values. According to the classification of Güngör (1993), values are listed as aesthetic, economic, theoretical, social, political, and religious values. Filiz (1998) made this classification as intentional and functional values. Dilmaç (1999) stated value categories as being loving, being happy, controlling ambition, being a good person, being compatible, making friends, being helpful, being knowledgeable, and desiring the happiness of others. Bacanlı (2017) stated that although values differ from society to society, the important thing is the content of the value and the way it is perceived by the individual. Based on this idea, Bacanlı (2017) proposed the value classification recommended in values education as "values related to the individual, values related to the society, and values related to nature and the universe" within the scope of the value awareness approach. Additionally, the dimensions of "positive and negative" and "personal and impersonal" values were emphasized (cited by Dinçer, 2018; Dilmaç & Ulusoy, 2020; Kopelman et al., 2013).

In the project named "sharing our values for a better world" supported by UNESCO and UNICEF in 1995, 12 basic universal and root values were included. These values are "happiness, honesty, humility, cooperation, freedom, love, peace, respect, responsibility, simplicity, tolerance, and unity". These values are aimed to be gained theoretically and practically for all children and adolescents to adopt personal and social values and transfer them to future generations with the education program called "Living Values". The living values recommended by UNESCO and UNICEF are fundamental and root values included in education programs in many countries today (Bacanlı & Dombaycı, 2012).

Various classifications of values have been made in the literature, but today, the most widely used one based on social and individual values on a universal level is the "Theory of Basic Human Values" classification, which is used in most societies as a result of the study conducted in 62 countries by Schwartz (1992)". The value classification according to Schwartz (1994) is given in Table 1.

Table 1. Schwartz's value classification

Value Types	Explanation	Example Values
Power	Social status and prestige, control	Social power, authority, wealth
Achievement	Developing competence according to social standards, dominance over people or resources, personal achievement	Being successful, talented, ambitious
Hedonism	Pleasure and sensory satisfaction for oneself	Enjoyinglife
Stimulation	Seeking excitement and novelty	Challenging life
Self-Direction	Independent thinking, free choice in actions, creativity, discovery	Creativity, curiosity, freedom
Universalism	Being understanding and appreciative, tolerant for the protection and welfare of all people and nature	Socialjustice, equality, broad-mindedness
Benevolence	Doing favors for the individual, asking about their well-being	Honesty, helpfulness, forgiveness
Tradition	Respect and commitment to traditional ideas, religions and cultures	Being humble, respectful of tradition
Conformity	Restriction of actions that offend others and damage the social order	Being kind, respectful to elders
Security	Individual and social harmony, peace, health and safety	National order, organization, health

Schwartz (2012) classified the values shown in Table 1 as "individual values and social values" in two different categories. Individual values consist of "power, achievement, stimulation, hedonism, and self-direction". With these values, the individual recognizes their individuality, focuses on self-realization, feeling pleasure, determining their likes, and discovering their potential. "Security, conformity, universalism, benevolence, and tradition" are social values. These values focus on the individual's relationship with society (Schwartz, 2012). According to Schwartz (1992), an action as a consequence of a value may be compatible with another value or generate conflicting psychological and social consequences. This point provides information about the universal relationships between the priorities of the values. According to "Schwartz's Values Theory", 10 value types are universal, but the priority order of the values may vary according to the social and individual needs of people.

There are various courses on gaining values that have this continuity in education. In Turkey, one of the courses in which values are taught on the primary school level is the social studies course. This course is a basic course with the aim of "raising individuals who have gained core life skills, know themselves, are sensitive to nature and their environment, do research, become productive and love their country" (MEB, 2018). The scope of the Social Studies course is based on Social Sciences and Natural Sciences, which are formed by bringing together the subjects of study in humanities and natural sciences (Aktepe & Gürbüz, 2019). The scope of social studies, which is a course related to life in general, consists of social sciences, natural sciences, art, philosophy, and values (Sönmez, 2010).

The social studies course, which has a few examples in the world, is taught from the first grade to the fourth grade on the Grundschule (Primary School) level in Germany as a course called Sachunterricht. The course topics of Sachunterricht (Social Studies) are shaped on the basis of five perspectives: social scientific, natural scientific, geographical, historical, and technological perspective (SenBJF, 2018). In the Sachunterricht course, students are confronted with problem situations they have experienced and may encounter in the world they live in, and it is aimed to give them a perspective on every relevant topic. With a social scientific perspective, children's life skills in terms of political, social and cultural diversity are improved. With a natural scientific perspective, responsibility towards nature, knowing about the environment is promoted. The geographical perspective involves understanding the world and its structure, the universe, and natural events. The technological perspective refers to the ability to use new technology, scientific language, and understanding the developing world. The historical perspective aims to create a responsibility-related connection between the past, the present and the future, emphasize the importance of time and have the perception that everything can change and develop.

In general, the aim of the social studies course, which aims to raise happy individuals who love themselves and their environment, plays an important role in reaching this goal, and conveying the thoughts and values that are frequently included in the curriculum. Values are presented in a holistic manner in the German (Berlin) Sachunterricht curriculum. One of the most important competencies that the Sachunterricht course wants to bring to the student is "being in agreement, compromise and harmony, as well as being individuals who have the values and skills to use their resources efficiently and responsibly". Additionally, all students are encouraged to adopt and be interested in values that are applicable for themselves and the society they live in as a whole (SenBJF, 2018). Values are also included in the Turkish2018 Social Studies curriculum as personal qualities and values such as "self-respect, self-confidence, patience, tolerance, respect, peacefulness, helpfulness, honesty, fairness, patriotism" which were determined as the basis of values education (MEB, 2018). The concept of value and types of values were emphasized in the social studies textbook and curriculum for both countries. In the literature, some studies (Brown et al., 2021; Mereya et al., 2012; Şentürk & Akbaş, 2015; Kafadar, 2019) have shown similarities between the curricula and textbooks of different countries in terms of values. Ekşi and Kaya (2021) stated that courses based on social studies are indispensable courses in the process of values education, and they emphasized the importance of providing values education by integrating it with academic content. No study that aimed to examine and compare the similarities and differences of values in the German Sachunterricht 1/2 and Turkish2nd-grade social studies textbooks was found in the literature. It is thought that the Social Studies course in Turkey is equivalent only to

the Sachunterricht course in Germany in the world, and this original study, which examines the international content and methods of the activities presented in this course, will contribute to the literature. For this purpose, the research questions were as follows:

In the German (Berlin) Sachunterricht 1/2 textbook and the Turkish2nd-grade textbook, respectively,

1) What are the similarities and differences between the values in the unit called "Wir sind schulkinder" (We are Schoolchildren) and those in the unit "Life in Our School"?
2) What are the similarities and differences between the values in the unit called "Miteinander Leben" (Living Together) and those in the unit "Life in Our Home"?
3) What are the similarities and differences between the values in the unit called "Gesund sein und sich wohlfühlen" (Be Healthy, Feel Good) and those in the "Healthy Life" unit?
4) What are the similarities and differences between the values in the unit called "Tiere und Pflanzen in Wiesen und Hacke" (Plants and Animals in the Meadow) and those in the unit "Life in Nature"?

METHOD

Research Design

In this study, the case study design, which is a qualitative research design, was used. Case studies are suitable for the nature of this study as they investigate a current phenomenon in its own context and can be used in situations where more than one piece of evidence or data source is available (Yıldırım & Şimşek, 2018). In this study, the Sachunterricht 1/2 Social Studies textbook in Germany and the 2nd-grade Social Studies textbook in Turkey were examined in depth and holistically, and data that would form the basis of the existing phenomenon were obtained. The values in the textbooks were compared on the basis of Schwartz's (2012) classification of values.

Material

The material of the study consisted of the Ernebliswelt 1/2 Sachunterricht textbook prepared for the state of Berlin in the academic year of 2020-2021 and the Social Studies textbook prepared by the Turkish Ministry of National Education (MONE). The purposive sampling method was used in the study. In the selection of the material, it was aimed to choose the social studies textbooks on the 2nd grade level of both countries. The reason for this was that the textbooks of these courses have similar units and contents.

Data Collection

Document analysis was used as a data collection method in the study. Using documents provides a rich source of data for qualitative research. Documents include extracts from documents that record and preserve context, such as written materials, official publications, and reports, personal diaries, memoranda, and correspondence (Patton, 2018).

In this study, the German textbook was translated from German to Turkish. Then, the units with similar contents in the German and Turkish textbooks were examined. As a result of the examination, the units "Wir Sind Schulkinder (We are schoolchildren)", "Miteinander Leben (Living together)", "Gesund sein und sich wohlfühlen (Be healthy and feel good)" and "Tiere und Pflanzen in Wiese und Hecke" (Plant and Animals in the Meadow) in the German textbook and the units "Life in our School", "Life in our Home", "Healthy Life" and "Life in Nature" in the Turkish textbook were accepted as similar. The print format of the German textbook was obtained, and the Turkish textbook was accessed from the official website of the Education Information Network (EBA) of the Ministry of National Education. Subsequently, it was confirmed that the obtained documents were original. The subjects examined in the textbook were translated into Turkish by the researcher whose second foreign language is German and checked by a field expert who is a native speaker of German.

Data Analysis

As a result of the document review, the data were subjected to descriptive analysis. The data obtained in the descriptive analysis were summarized and interpreted on the basis of Schwartz's (2012) classification of values. The purpose of descriptive analysis is to present the findings to the reader in an organized and interpreted form (Yıldırım & Şimşek, 2018). Thus, the basic attributes of the values in the German and Turkish textbooks and the way they are included in the presence of visual evidence were analyzed.

After the completion of the analysis of the collected data, assistance was received from two instructors who are experts in the field of primary education. The coder reliability formula of Miles and Huberman (1994) was used to ensure reliability. The codes determined by the researchers and other instructors were compared to each other using this formula. The agreement level was calculated as "Reliability = Number of Agreements / Number of Agreements + Number of Disagreements". The rate of intercoder reliability between the researchers and the experts was determined as .94 for the German textbook and .90 for the Turkish textbook. Since the average of the intercoder reliability coefficient obtained as a result of the document review was .92, the analysis of the data collection tool used in this study was considered reliable.

RESULTS

Values in the units "Wir sind schulkinder" (We Are Schoolchildren) and "Life in Our School"

The values in "We are Schoolchildren" in the German textbook and in "Life in our School" in the Turkish textbook are given in Table 2, and Table 3.

Table 2. Types of values in the unit "Wir Sind Schulkinder (We are schoolchildren)"

Value Types	*f*
Conformity / Rules	16
Conformity/Interpersonal	7
Hedonism	6
Self-directed thinking/action	5
Security /Interpersonal	3
Universalism / Tolerance	3
Benevolence and caring	3
Security / Social	2
Total	**45**

As seen in Table 2, the value types included in the unit "Wir sind schulkinder" (We are Schoolchildren) in the German textbook were as follows in a descending order of frequency: "conformity/rules" (n:16), "conformity/interpersonal" (n:7), "hedonism" (n:6), "self-directed thinking/action" (n:5), "security/interpersonal" and "universalism/tolerance", "benevolence and caring" (n:3, each), and "security/social" (n:2).

Table 3. Value types in the unit "Life in Our School"

Value Types	*f*
Conformity / Rules	25
Conformity /Interpersonal	23
Hedonism	14
Security/ Social	12
Universalism / tolerance	9
Benevolence and caring	8
Universalism/nature	4
Self-directed thinking/action	4
Total	**99**

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As seen in Table 3, the values in the "Life in Our School" unit in the Turkish textbook were as follows in a descending order of frequency: "conformity/rules" (n:25), "conformity/interpersonal" (n:23), "hedonism" (n:14), "security/social" (n:12), "universalism/tolerance" (n:9), and "benevolence and caring" (n:8),"universalism/nature" (n:4) and "self-directed behavior" (n:4).

Although the value types in the first units of the German and Turkish textbooks were mostly similar, there were differences in the total numbers of values. As seen in Table 2, in the first unit called "Wir Sind Schulkinder" (We are schoolchildren), a total of 40 values were emphasized. As shown in Table 3, a total of 97 values were emphasized in the Life at Our School unit. The most frequently emphasized value type in the first unit of the textbooks of both countries were “conformity/rules”. In the first units of both textbooks, the “conformity/interpersonal” value type took the second place, and the "hedonism" value type took the third place. The value type that was not encountered in the first unit of the German textbook but included in the first unit of the Turkish textbook was the value type "universalism/nature". Figures 1 and 2 show the visual emphasis of the "conformity/rules" value type, which was the most common type of values identified in the first units of the German and Turkish textbooks.

Figure 1. The activity of command and orderat school (Egger, Felbauer, Hallitzky, Kollmaier, & Valdix, 2021, p.18).

As seen in Figure 1, the value of "conformity/rules" was conveyed in the unit "Wir Sind Schulkinder" (We are schoolchildren) in the German Sachunterricht textbook, mostly supported by visuals.

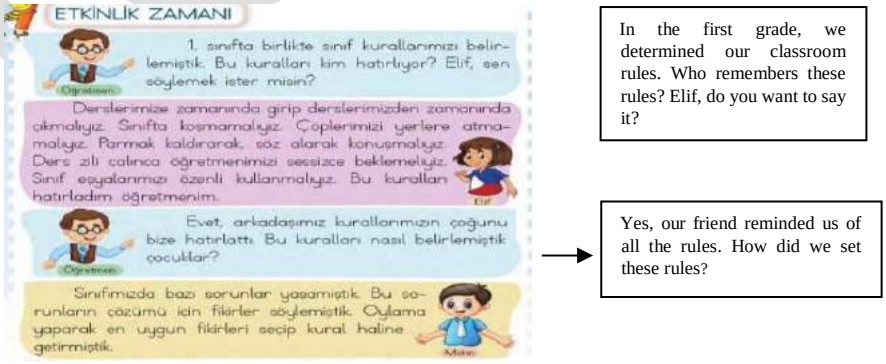

Figure 2. The activity of classroom rules (Dokumacı, Özdemir-Gök & Dokumacı, 2019, p.23).

As seen in Figure 2, it was determined that the values belonging to the category of "conformity/rules" in the "Life in Our School" unit in the Turkish textbook were partially supported by visuals in the activities of creating classroom rules, and more text was included.

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Values in the units "Miteinander Leben" (Living Together) and "Life in Our Home"

The values in the "Living Together" unit in the German textbook and the "Life in our Home" in the Turkish textbook are given in Tables 4-5.

Table 4. Value types in the unit "Miteinander Leben" (Living together)

ValueTypes	*f*
Conformity /Interpersonal	18
Self-directed thought/action	13
Tradition	10
Hedonism	10
Benevolence and caring	7
Universalism/ Tolerance	5
Security/Personal	4
Stimulation	3
Conformity/ Rules	2
Total	**72**

As seen in Table 4, the value types mentioned in the second unit named "Miteinander Leben" (Living together) in the German textbook were as follows in a descending order of frequency: "conformity/interpersonal" (n:18), "self-directed thought and action" (n:13), "tradition" and "hedonism" (n:10, each), "benevolence/caring" (n:7), "universalism/tolerance" (n:5), "security/personal" (n:4), "stimulation" (n:3), and "conformity/rules" (n:2).

Table 5. Value types in the unit "Life in Our Home"

Value Types	***f***
Benevolence/caring	32
Self-directed thought/action	17
Conformity/Rules	13
Universalism/nature	11
Conformity/interpersonal	10
Hedonism	9
Tradition	8
Security/personal	4
Universalism/Tolerance	2
Total	**106**

As seen in Table 5, the values in the second unit of the Turkish textbook called "Life at Home" were as follows in a descending order of frequency: "benevolence/caring" (n:32), "self-directed thought and action" (n:17), "conformity/rules" (n:13), "universalism/nature" (n:11), "conformity/interpersonal" (n:10), "hedonism" (n:9), "tradition" (n:8), "security/personal" (n:4), and "universalism/tolerance" (n:2).

Although the values in the second unit of the German and Turkish textbooks were similar, there were differences in the frequency orders of the values. In the value types included in the German textbook, the "conformity/interpersonal" value type came first, while the value type "benevolence/caring" came fist in the Turkish textbook. In the German textbook, the value type "conformity/interpersonal" included values in the form of "controlling emotions, being harmonious in society, correct communication process, communication skills in a multicultural life". Some examples of these values are given in Figure 3, and Figure 4.

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Figure 3. The activity of conflict and emotions (Egger, Felbauer, Hallitzky, Kollmaier, & Valdix, 2021, p.32).

As seen in Figure 3, the activity in the German textbook, in which a student expresses their discomfort to another student sitting in their seat and communicates this situation within the rules of courtesy, is an example of the "conformity/interpersonal" value type.

Figure 4. The activity of family solidarity and relationships (Dokumacı, Özdemir-Gök & Dokumacı, 2019, p.33).

In the Turkish textbook, the value type "benevolence/caring" included the values of cooperation, sharing and solidarity in kinship and neighborly relations on the basis of the "tradition" value, as seen in Figure 4. “Self-directed thought/action” ranked second in the second units of both textbooks. Some examples from the two textbooks related to this matter are given in Figure 5, and Figure 6.

Figure 5. The activity of feeding animal and need and desire (Egger, Felbauer, Hallitzky, Kollmaier, & Valdix, 2021, p.25).

Figure 6. The activity of feeding animal and need and desire (Dokumacı, Özdemir-Gök & Dokumacı, 2019, p.96).

As seen in Figure 5, in the German textbook, the person's "self-directed thinking and action" values were emphasized. The activity of expressing this and talking about these processes was presented to the family of a child who can freely take responsibility. As in Figure 6, in the unit named “Life at Home” in the Turkish textbook, the values of “self-direction, thought and action” were frequently mentioned in the context of determining priorities on the basis of one's wishes and needs, and in making choices and decisions among them. While the third value type frequently mentioned in the second unit of the German textbook was “tradition”, it was “universalism/nature” in the Turkish textbook. The value type “universalism/nature” was not included in the second unit of the German textbook. In the second unit of both countries, the 4th-most frequently included values were "security/personal". Some examples are given in Figure 7, and Figure 8.

Figure 7. The activity of “security and privacy” (Egger, Felbauer, Hallitzky, Kollmaier, & Valdix, 2021, p.35).

Figure 8. The activity of “security and privacy” (Dokumacı, Özdemir-Gök, & Dokumacı, 2019, p.75).

As seen in Figure 7, in the German textbook, the "security/personal" value type was described to include security and privacy. In the Turkish textbook, the "security/personal" value type was conveyed with a text explaining that a child lost in the amusement park, as seen in Figure 8, was saved from being lost when he went to the security guard and called his father's phone. “Universalism/tolerance” was a value type included in both textbooks. In the German textbook, it was emphasized that students in their classes on the day might have many different friends, and all of them may have different thoughts and physical characteristics; we need to be respectful and understanding, otherwise the school cannot be an enjoyable learning environment.

Values in the “Gesund sein und sich wohlfühlen” (Be healthy, feel good) and “Healthy Life” units

The values in the "Be healthy, feel good" unit in the German textbook and the "Healthy Life" unit in the Turkish textbook are given in Table 6, and Table 7.

Table 6. Value types in the unit “Gesund sein und sich wohlfühlen (Be healthy, feel good)”

Value Types	***f***
Hedonism	21
Security/personal	18
Self-directed thought/action	4
Strength	3
Universalism/tolerance	2
Total	**48**

As seen in Table 6, the values in the unit called “Gesund sein und sich wohlfühlen” (Be healthy, feel good) in the textbook were as follows in a descending order of frequency: “hedonism” (n:21), “security/personal” (n:18), “self-esteem”, self-directed thought/action” (n:4, each), “power” (n:3), and “universalism/tolerance” (n:2).

Table 7. Value types in the unit “Healthy Life”

Value Types	***f***
Conformity/rules	23
Security/social	17
Security/personal	11
Universalism/nature	8
Self-directed thought/action	8
Hedonism	7
Power	4
Total	**78**

As seen in Table 7, the value types in the “Healthy Life” unit of the Turkish textbook were as follows in a descending order of frequency: “conformity/rules” (n:23), “security/social” (n:17), “security/personal” (n:11), “universalism/nature” (n:8), “self-directed thought/action” (n:8), “hedonism” (n:7), and “power” (n:4).

Value types were mostly similar in these units in both textbooks. While the most frequently repeated value type in the unit in the German textbook was “hedonism”, it was “conformity/rules” in the Turkish textbook (Figure 9, and Figure 10).

Figure 9. The activity of table manners (Egger, Felbauer, Hallitzky, Kollmaier, & Valdix, 2021, p.60).

Figure 10. The activity of table manners (Dokumacı, Özdemir-Gök, & Dokumacı, 2019, p.116).

As seen in Figure 9, in the "Be healthy, feel good" unit in the German textbook, the "hedonism" value type was often associated with the sports that children like and hobbies and activities related to having a healthy body. In the "Healthy Life" unit in the Turkish textbook, the most frequently emphasized value type was "conformity/rules". The “conformity/rules” value type included recommendations and rules of healthy nutrition, balanced nutrition and sports to have a healthy and strong body. As seen in Figure 10, etiquette was presented in the form of table manners. The "security" value type took the second place among the values in the units related to being healthy in both textbooks (Figure11, and Figure 12).

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Figure 11. The activity of personal tooth cleaning and knowledge about healthcare professionals and institutions (Egger, Felbauer, Hallitzky, Kollmaier, & Valdix, 2021, p.68).

Figure 12. The activity of personal tooth cleaning and knowledge about healthcare professionals and institutions (Dokumacı, Özdemir-Gök, & Dokumacı, 2019, p.122).

As seen in Figure 11, in the German textbook, dental care and tooth brushing techniques were presented under the "security/personal" value type in the context of self-care skills. In the "Healthy Life" unit of the Turkish textbook, the "security/social" value type took the second place. As seen in Figure 12, besides personal healthcare, health institutions and organizations were introduced, and their duties and responsibilities were mentioned. Additionally, personal hygiene and cleanliness were explained in the subject of cleanliness for health, and the “security/personal” value type was emphasized. One of the different value types in the corresponding units of the two textbooks the “universalism/nature” value type. While this value was not included in the "be healthy" unit in the German textbook, it was included in the Turkish textbook, and this value was frequently emphasized in the context of environmental cleanliness.

Values in the units named “Tiere und Pflanzen in Wiesen und Hacke” (Plants and animals in the meadow) and “Life in Nature”

The values in the "Plants and animals in the meadow" unit in the German textbook and in the "Life in Nature" unit in the Turkish textbook are given in Tables8-9.

Table 8. Value types in the unit “Tiere und Pflanzen in Wiesen und Hacke”(Plants and animals in the meadow)

Value Types	***f***
Universalism/nature	19
Stimulation	3
Total	22

Table 9. Value types in the unit “Life in Nature”

Value Types	***f***
Universalism/nature	17
Security/social	13
Benevolence/caring	7
Self-directed thought/action	5
Stimulation	2
Hedonism	1
Total	45

As seen in Table 8, the values included in the unit named "Plants and Animals in the Meadow" in the German textbook were as follows in a descending order: "universalism/nature" (n:19) and "stimulation" (n:9). As seen in Table 9, the values in the unit named “Life in Nature” in the Turkish textbook were as follows in a descending order: “universalism/nature” (n:17), “security/social” (n:13), “benevolence/caring” (n:7), “self-directed thought/action” (n:5), “stimulation” (n:2), “hedonism” (n:1).

The values in the corresponding units of both textbooks were mostly of similar types. The value type "universalism/nature" was in the first place in the nature-related units of both textbooks (Figures13-14).

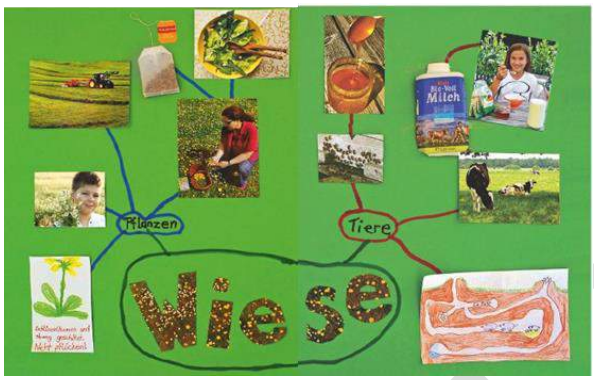

Figure 13. The activity of living in the meadow *(*Egger, Felbauer, Hallitzky, Kollmaier & Valdix, 2021, p.86-87).

This type of value was included in the German textbook in relation to the concepts of creating awareness and interest in the lives of various plants and animals living in the meadow, and activities in which the mind map of meadow life is drawn, as seen in Figure 13.

Figure 14. The activity of recycling (Dokumacı, Özdemir-Gök, &Dokumacı, 2019, p.222).

In the unit called "Life in Nature" in the Turkish textbook, the names of plants and animals, topics about plant breeding and animal nutrition, natural events, recycling, and the value type of universalism were frequently included. In Figure 14, an example of this value from the textbook is given under the category of recycling. The first of the values that were not included in the German textbook unit related to nature but included in the Turkish textbook unit was the “security/social” value type. In the Turkish textbook, this value type included the descriptions of events such as floods, landslides, tornadoes, earthquakes under the title of natural disasters, as well as ways of protection from natural disasters. Other different types of values were “benevolence/caring, hedonism, self-directed thoughts and actions” values. In the Turkish textbook, these value types were frequently included in the form of growing plants and owning pets, having a sense of responsibility, conscientiousness, positive emotions, and skill outcomes acquired in this process.

DISCUSSION and CONCLUSION

In this study, the similarities and differences of the values in the German (Berlin) Sachunterricht (Social Studies) 1/2 textbook and the Turkish 2nd grade Social Studies textbook were investigated based on the classification of values explained by Schwartz et al. (2012).

The first research question of the study aimed to find similarities and differences between the first unit of the German textbook named "Wir sind shculkinder" (We are schoolchildren) and the first unit of the Turkish textbook named "Life in our School". According to the results, the most frequently emphasized value type in the first units related to school life in both textbooks was the "conformity/rules" value type. Since the topics in the units were similar topics such as school life, determining class rules, friendly relationships, it was expected for similar value types to emerge. While the "universalism/nature" value type was not emphasized in the unit in the German textbook, in the Turkish textbook, this value was presented in the form of the responsible use of school (public space) resources. This result supports the conclusion reached by Kowasch and Lippe (2019), who provided limited information about the use of resources in their study of German and Austrian students on sustainable value ethics and the analysis of textbooks.

The second research question of the study aimed to find similarities and differences between the second unit of the German textbook named "Miteinander leben" (Living together) and the second unit of the Turkish textbook named "Life in our home". While the "conformity/interpersonal" value type had the first place in the German textbook, the "benevolence/caring" value type was in the first place in the Turkish textbook. The reason for this difference may the reflection of the differences in the multicultural structures of the countries in the textbooks. Han et al. (2018) and Tan et al. (2018) reached similar findings by concluding that the values most frequently mentioned in exemplary moral events are values of interpersonal harmony. One of the points of difference is that the value type of traditionalism was emphasized more frequently in the German textbook than in the Turkish textbook. This result contradicts the finding in Kafadar's (2019) study that the value of "traditionalism" was overly included in the textbooks and curriculum of the Turkish education system. The reason for this contradiction may be the aim of presenting the concept of "family" based on a multicultural life in the German textbook, emphasizing that each family may have a different culture and tradition, and presenting different family types from various parts of the world. On the other hand, in the Turkish textbook, it is possible to mention a single type of culture and the inclusion of values more associated with cooperation, love and respect within the family. In the second units of the textbooks of both countries that were examined in this study, the self-directed thought value is included to similar extents. This finding also supports the report by Heng et al. (2017). This unit also consisted of topics including how the child takes steps towards socializing and the main idea of in-family communication. Based on the findings of this study, we may state that the process of socializing was expressed in value types in a broader framework in the German textbook, while it was emphasized under the benevolence value types in the context of family and kinship relationships in the Turkish textbook. Likewise, according to Tabak and Yaylak (2020), the family is the place where the student socializes and learns the culture of their society best, and values such as respect, cooperation and sharing should be included in matters involving the family and communication in the family.

The third research question of the study aimed to find similarities and differences between the third unit of the German textbook named "Gesund sein und sich wohlfühlen" (Be healthy, feel good) and the third unit of the Turkish textbook named "Healthy Life". While the third unit in the German textbook most frequently mentioned "hedonism", the value type "conformity/rules" took the first place in the third unit in the Turkish textbook. This difference may be due to the way the topics were presented in the units. While healthy and favored sports were included in the German textbook, the Turkish textbook mostly included etiquette in the forms of food and table rules. The value of universalism/nature was not included in this unit of the German textbook, but it was included in the Turkish textbook.

The fourth research question of the study aimed to find similarities and differences between the fourth unit of the German textbook named "Tiere und Pflanzen in Wiesen und Hecke" (Plants and animals in the meadow) and the fourth unit of the Turkish textbook named "Life in Nature". The most frequently included used value type in the fourth units of both textbooks was "universalism/nature". This result was similar to the results of other studies in the literature and the report of Tse et al. (2017), who stated the value type "environmentally friendly" in this category. One of the differences was that the universalism/nature value type was included in every unit of the Turkish textbook. However, this value type was in only the nature-related unit in the German textbook.

Limitations

The limitations of this study may be expressed in several ways. The first limitation was the types of values included in the topics in the units of the German and Turkish textbooks. The second limitation was the evaluation of the values in the relevant units of both textbooks in terms of the "Basic Human Values Theory". In this framework, as a result of the analysis, the values in the 2nd-grade Social Studies textbooks of both countries were compatible with the corresponding units. Here, on the basis of the differences reached in this study, it is important to note that values are transferences that live under the influence of the environment and culture. In this sense, it may be argued that although the types of values emphasized in the Social Studies textbooks of the two countries differed, they still included universal values. On the other hand, these results led us to the following conclusions within the framework of the limitations of the research. It may be stated more emphasis is made on values and multiculturalism in the German textbook in comparison to the Turkish textbook. Additionally, the universalism value type included different subtypes of values between the two textbooks. In the Turkish textbook, the value of nature was emphasized more than it was in the German textbook. Despite these differences, the values in the textbooks of both countries were overall similar. The degree of emphasis on values and the reason why different value types were included in the units may have been due to the fact that the distribution weights of the topics in the textbooks were different. Furthermore, the emphasis on the traditionalism value type in the Turkish textbook was evaluated within the framework of the Basic Human Values Theory, and the traditionalism value type here was emphasized in the context of "family, family types and family relationships".

Recommendations

In general, the value types included in the social studies textbooks of both countries were similar to each other, and it was concluded that there were differences in the frequency of the value types and the way they were expressed. There may be several reasons why the overall emphasis on values was more frequent in the Turkish textbook. These reasons may include the presentation of value types in the social studies textbook in Turkey with more than one value in the text, and the presentation of values in the social studies textbook in Germany with activity questions supported by visuals rather than text content. Additionally, it is possible that the Sachunterricht course in Germany would be offered from the 1st to the 4th grade, and some values in the textbook would be included in the upper-grade 3/4 textbooks. The leading values in the units of both countries were social values. The self-realization of the person, which had the second place of the values in which the individual's needs were emphasized, serves the purpose of the Social Studies course, which aims to raise a happy individual who is compatible with both themselves and their environment. Cultural and social differences between Germany and Turkey may also lead to differences in the transfer of different values and types of values. In future studies, longitudinal and cross-sectional designs for methods of transferring these types of values to students, which are universal in the textbooks of both countries, may be included. Additionally, the value type universalism/nature may be included more frequently in the German Sachunterricht (Social Studies) 1/2 textbook. Multiculturalism-based values may be given more place in the Turkish Social Studies 2nd-grade textbook.

Ethics and Conflict of Interest

A part of this study was presented as an oral presentation at the 1st International Marmara Scientific Research and Innovation Congress. We also declare that there is no conflict between the authors.

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AN INVESTIGATION OF THE ECOLOGICAL FOOTPRINT AWARENESS LEVELS OF 60-72-MONTH-OLD CHILDREN

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Abstract

Like many other development areas, awareness and attitudes towards environmental issues take shape in early childhood and have an important place in forming positive attitudes and behavior towards the environment in later life. For this reason, sustainability education in early childhood plays an essential role in society's transition to sustainable lifestyles. This study examines the ecological footprint awareness levels of 60-72-month-old children attending preschool. A total of 266 children (127 girls and 139 boys) enrolled in six schools (one private school, one primary school, and four preschools) in a city in the Aegean region of Turkey. One of the novelties of the study is the use of a game-based survey model, Ecological Footprint Awareness Scale for 60-72-Month-Old Children (EKAY-O), developed by the researchers of this study. Non-parametric tests were applied in the analysis of the data using SPSS 22. Results show that children's awareness of the concept of an ecological footprint was mostly at the medium level (51.5%). Some key findings indicate that their awareness varied significantly depending on the type of school they attended. The students in private schools demonstrated higher performance. Their parents' education levels also had a significant effect on awareness. This study contributes to studies and practices aimed at raising awareness of ecological footprints in preschools, thus aiding the development of collective efforts to minimize the negative impact on the environment to help bring about a sustainable future.

Keywords: Ecological footprint, young children, preschool education, sustainability.

INTRODUCTION

Due to the increasing industrial and human effects on the environment, environmental problems are becoming more common and intense (Yadav, Singh, Srivastava, & Mishra, 2021). Today's economic systems, which gained momentum, especially in the Industrial Revolution, aim at unlimited economic growth and increasing prosperity. However, in seeking to achieve these goals, the environment is being strained by the consumption of natural resources and the generation of waste caused by human production (Karalar & Kıracı, 2011). Therefore, in order to build a sustainable future, people need to make changes in their unsustainable lifestyles (UNESCO, 2019). Because sustainability aims to protect natural resources and ensure their availability to future generations, the increase in ecological problems is an obstacle to sustainability. Therefore, as Lopez, Orro, and Novales (2021) stated, it is our responsibility as human beings to ensure sustainability, that is, to ensure that we satisfy our needs without compromising the ability of future generations to meet theirs. Determining and evaluating sustainability indicators come to the fore in making sustainability concrete. Sustainability indicators allow the quantification of consumption impacts on the earth. At the same time, these indicators provide important clues in the process of identifying environmental problems that weaken sustainability. Sustainability indicators enable the transfer of this complex concept to society, as well as understanding the measures that need to be taken to reduce these problems and how these measures can be

implemented. This is an important step in the process of preventing environmental problems (Haberl, Fischer-Kowalski, Krausmann, Weisz, & Winiwarter, 2004).

The ecological footprint (EF), which is one of the concrete indicators of sustainability, quantitatively expresses how much the biological capacity of the planet is consumed by human activities (Wackernagel & Rees, 1996). Since EF has educational value (Cordero, Todd, & Abellera, 2008), it would be effective for individuals to learn positive behaviors for sustainability in educational settings (Çetin, 2015).

Researchers remark that environmental knowledge and attitudes towards the environment start to take shape in early childhood, and that the environmental awareness gained in this period has an important effect on positive attitudes and behavior towards the environment in following years (Ardoin & Bowers, 2020; Spiteri, 2021). It was also highlighted that negative behaviors toward the environment cannot be easily fixed (Molinario et al., 2020). For this reason, sustainability education in early childhood has an essential place for societies seeking to transition to sustainable lifestyles. Studies show that young children can understand the principles of waste management and energy saving, including reusing, reduction, and recycling, at an early age (Grodzinska-Jurczak, Stepska, Nieszporek, & Bryda, 2006; Haktanır, et al., 2011; Kahriman-Öztürk, Olgan & Güler, 2012; Prince, 2010).

In the literature, there has been an increase in educational research on sustainability in early childhood education, there are several studies showing that children can display skills related to ecological sustainability (e.g. Ärlemalm-Hagsér, 2013; Borg, Winberg, & Vinterek, 2017; Büyüktaşkapu-Soydan & Öztürk-Samur, 2017; Kahriman-Öztürk, et al., 2012; Körükçü & Güngör, 2021; Özkan, Çelik, Güngör, & Akşin-Yavuz, 2019; Stuhmcke, 2012).

Ärlemalm-Hagsér (2013) analyzed how preschool children in Sweden made sense of Earth Hour, which was organized internationally to draw attention to environmental problems in the world. In the research, it was determined that the children were willing to participate in dialogues related to the subject, to make sense of it and to take part in the process. Louv (2012) stated that young children are aware of issues such as global warming, water scarcity, extreme weather events, and threatened species. According to Ji (2015), even very young children have the ability to think complexly, identifying problems related to socio-environmental issues and seeking solutions.

As McNichol, Davis, and O'Brien (2011) stated, due to its easy-to-understand nature, EF can be an effective mechanism to help young children in their learning about sustainability and their actions related to it, and even reach the wider communities in which they live. However, the literature on directly focusing on the awareness of the EF of young children is limited (Güngör & Cevher-Kalburan, 2018; Güngör, 2019; Simsar, 2021). Güngör and Cevher-Kalburan (2018) proposed an innovative data collection tool: 'The Ecological Footprint Awareness Scale for Children (EKAY-O)'. Güngör (2019) revealed that the EF awareness levels of children increased with the sustainability practices carried out in preschool. Simsar (2021) applied EKAY-O to the group of 100 preschool children aged 5-6 in Turkey to examine their EF awareness and environmental attitudes. The results of the study show that the children's awareness of the EF was low and their environmental attitudes were anthropocentric. Also, according to the results, the children's mothers were an important factor in the children's EF awareness and environmental attitude behaviors. This finding is in line with the idea that sustainable behaviors in early childhood can be learned by modeling adults, as reported in the literature (Borg, et.al., 2017; Bozyiğit & Madran, 2018). Therefore, eco-friendly experiences provided by parents and teachers, who are part of the immediate environment of young children, have an important role in terms of EF awareness. There are studies that show that attitudes and behaviors are positively associated with education level (Aydın & Çepni, 2012; Bülbül, Büyükkeklik, Topal, & Özoğlu, 2020; Değirmenci, 2012). The aforementioned studies have shown that university graduates have higher environmental friendly attitudes and behaviors than others.

Another way children learn is through school experiences. The programs implemented in the school, the physical facilities provided, and the social environment created are important elements of these

learning experiences. Preschool education in Turkey is carried out in different types of schools, such as public or private, as well as preschool alone or preschool within a primary school. Private preschools in Turkey can create their own programs instead of following the national preschool education program. In addition, preschools can integrate different projects or intervention programs into the existing program. Private preschools can provide better financial opportunities. Preschools alone can be more advantageous than preschools within primary schools in terms of physical facilities. Therefore, all these differences between private and public schools may play a role in affecting children's awareness of EF.

Mainly motivated by these ideas, the proposed study aims to contribute to the advancement of the EF related literature by using a novel game-based scale, Ecological Footprint Awareness Scale for 60-72-month-old Children (EKAY-O), and considering the following research questions:

- What are the EF awareness levels of the participating children?
- What are the awareness levels of the children on the sub-components of EF?
- Are the EF awareness levels of the children affected significantly by the education levels of their parents?
- Are the EF awareness levels of the children affected significantly by the type of the school they attend?

METHOD

Research Model

This research is a descriptive study which aims to reveal the EF awareness levels of 60-72-month-old children attending preschools. Descriptive studies are generally conducted to enlighten a given situation, to make evaluations in line with standards, and to reveal possible relationships between events (Büyüköztürk, Kılıç-Çakmak, Akgün, Karadeniz & Demirel, 2016). The independent variables of the study were the education levels of the parents and the type of school the child attended.

Study Group

The study group consisted of 60-72-month-old children attending preschools in a city in the Aegean region of Turkey. The stratified sampling method was used to determine the study group. This method is used when the selected sample represents the features of variables considered at the same rate as the universe they come from (Büyüköztürk, et al., 2016). The condition considered in the creation of the stratified sample in the research is the socio-economic levels of the regions where the schools are located. In determining these levels, the opinions of the Local National Education Directorate were used. The schools in the study group were chosen from those that volunteered from the schools categorized based on the socio-economic levels of the region. Demographic information of the study group is classified and presented in Table 1.

Table 1. Demographic information of the study group

Demographic Information		n	%
Gender	Female	127	47.7
	Male	139	52.3
	Total	266	100
Education level of mother	Primary school – high school	131	49.2
	College	135	50.8
	Total	266	100
Education level of father	Primary school – high school	130	48.9
	College	136	51.1
	Total	266	100
Type of school	Official preschool	163	61.3
	Private preschool	52	19.5
	Official preschool within a primary school	51	19.2
	Total	266	100

Data Collection Tools

In the study, a Demographic Information Form developed by the researchers was used to determine the age and gender of the children, the education levels of the parents and the type of school the children attended. The Ecological Footprint Awareness Scale for Children (abbreviated as EKAY-O in Turkish), which was developed by Güngör and Cevher Kalburan (2018), was used to determine the EF awareness levels of children. It is a novel game-based measuring tool which consists of 19 items under five themes: "Evaluation of waste: Recycle, reduce, re-use", "Energy consumption", "Water consumption", "Food consumption", and "Transportation". The total score of these themes determines the EF awareness level of the participant. The EKAY-O uses the following materials needed for the game to collect data from the participant.

- 2x2 m playing mat (Figure 1)
- Story cards consisting of pictures that show the items on the scale (Figure 2)
- Six-sided dice
- Felt-covered platform on which the story cards are placed
- Miniature recycle bin
- Miniature trash bin

Figure 1. Playing mat

Figure 2. EKAY-O story cards

Regarding the scoring of the scale, when the child chooses the right option, if the answer they give to the question "why" is related to the EF, they get "1" point, that is associated with their EF awareness, and "0" point if it is not related to it. When the child chooses the wrong option, the child is not asked the question "why" and gets "0" point. The highest score is 19 and the lowest is 0. Analyses are performed on the total scores obtained from the scale. For the internal consistency reliability of EKAY-O, the KR-20 coefficient was calculated as .66. Özdamar (2004, p.632-633) states that KR-20 values between .80-.1.00 are highly reliable, while those between .60-.80 are quite reliable.

Data Collection Process

After the necessary official permissions and parental approvals were obtained, prospective children were briefed about the study and asked if they would like to participate. The EKAY-O was applied to the children who volunteered by the researcher in a quiet room of the preschool they attended. The researcher explained the game used in the scale to the child and asked the child to move on the game set with the dice they threw. For each item, the researcher showed the child a picture, briefly explained the event depicted in the picture, and asked questions about how the character in the picture thought he should behave or where he would throw the waste in front of him. The child was asked the question "why?" regarding their choice, and their score was determined. For example, in the article on waste, by showing the child cards with pictures of different types of waste (recyclable or non-recyclable), the child was asked "Where do you think we should throw this waste? Would you throw it in the recycle bin or the trash?" Depending on the answer given, the child may be asked "why?" The game consists of 10 items after the game part of the scale is finished, the child is seated on the ground and the story part is started. In this section, the child is told a story. As each of the items related to EF appears in the story, the corresponding card is shown to the child, and the child is asked "How would you like the child in the story to behave?" The story continues by including the answer given by the child in the story. The story section consists of nine items. Administration of the EKAY-O takes approximately 15-20 minutes per child.

Data Analysis

The data of the study were analyzed using the SPSS 22.0 statistical package program. First, Kolmogorov–Smirnov test values were examined to determine whether the data followed a normal distribution to decide which statistical tests to use. Since the data did not fit a normal distribution (K-SZ= .117; $p<.05$), Mann–Whitney U and Kruskal–Wallis tests, which are nonparametric tests, were used to analyze the data ($p<.05$).

RESULTS

This section presents the findings obtained from the data analysis following the order of the research questions.

Table 2. The lowest mean score, the highest mean score, the average score (Mean) and the standard deviation (Std.Dev.) values of EKAY-O

	n	Lowest Score	Highest Score	Mean	Std.Dev.
Scale	266	0	17	10.64	3.465

According to Table 2, the lowest score obtained by the children participating in the study was 0 and the highest was 17. In the study, in order to determine the children's EF awareness levels, the scores were categorized into low, medium, and high levels by using the arithmetic mean and standard deviation values. The findings obtained are shown in Table 3.

Table 3. Score ranges, frequency, and percentages related to children's EF awareness levels

Category	Ecologic Footprint Awareness Score Range	*f*	%
Low	$0<X\leq6$	40	15
Medium	$6<X\leq12$	137	51.5
High	$12<X\leq19$	89	33.5
Total		266	100

When Table 3 is examined; 15% of the children participating in the study were in the low "ecological footprint awareness" score range, 51.5% were in the medium range, and 33.5% were in the high range. From these results, it can be claimed that the children's EF awareness levels were mostly at the medium level.

Table 4. Mean and standard deviation of each item included in the EKAY-O

Scale Items	Mean	Std.Dev.
item 1 (energy consumption, renewable energy)	.32	.467
item 2 (waste management: recycling, plastic)	.65	.479
item 3 (waste management: recycling, glass)	.61	.490
item 4 (waste management: recycling, battery)	.66	.475
item 5 (waste management: recycling, tin)	.58	.494
item 6 (waste management: recycling, paper)	.73	.445
item 7 (waste management: recycling, organic waste)	.82	.385
item 8 (waste management: reduce)	.07	.252
item 9 (waste management: reduce)	.59	.493
item 10 (food consumption)	.08	.270
item 11 (transportation, using public transportation)	.23	.424
item 12 (waste management: reduce)	.41	.492
item 13 (energy consumption)	.82	.385
item 14 (waste management: reuse)	.61	.488
item 15 (waste management: reuse)	.84	.369
item 16 (waste management: reduce)	.80	.403
item 17 (transportation, walking)	.64	.480
item 18 (food)	.38	.487
item 19 (water consumption)	.81	.391

The arithmetic mean, total score, and standard deviation values obtained for each item in EKAY-O are shown in Table 4. As shown in Table 4, item 15 on waste management is the item with the highest total score and the highest mean. For item 15, two pictures were shown to the child. The first picture depicted a child closing the caps of her felt-tip crayons after using them, so she could use them again. In the second picture, the child left the caps of the felt-tip crayons open and asked for new crayons from her teacher, as she could no longer use hers. Then the question is asked: "Which child in the picture do you use felt-tip crayons like?" For item 8, the item with the lowest total score, the researcher told the child: "There is food waste in this bag. Do you want to give this waste to stray animals such as cats and dogs or do you want to throw it in the trash? Drop the waste wherever you want." Then the child was expected to make a choice. The other 17 items in EKAY-O were similarly applied to the children of the study group.

Table 5. Mann-Whitney U Test Results for the EF Awareness Levels of the Children According to the Mother's and Father's Education Level

Education Level of Mother	***n***	**Mean Rank**	***U***	***Z***	***p***
Primary school – high school	131	119.93	7065.000	-2,845	.004*
College	135	146.67			
Total	266				
Education Level of Father	***n***	**Mean Rank**	***U***	***Z***	***p***
Primary school – high school	130	123.40	7527.000	-2,102	.036*
College	136	143.15			
Total	266				

*p< .05

Table 5 indicates that the EF awareness levels of the children significantly differed according to the education level of the mother. The levels of the children whose mothers were university graduates were higher than those of children whose mothers were high school and primary school graduates. Similarly, the EF awareness levels of the children whose fathers were university graduates were significantly higher than those of children whose fathers were primary and high school graduates.

Table 6. Kruskal-Wallis test results for the EF awareness levels of the children according to school type

Type of School	*n*	Mean Rank	*Df*	x^2	*p*
Private school	52	133.54	2	10.274	.006*
Official preschool within a primary school	51	103.48			
Official preschool	163	142.88			
Total	266				

*p< .05

Table 6 reveals that the EF awareness levels of the children significantly differed according to the type of school they attended (X^2=10.274, p<.05).

Table 7. Mann–Whitney U test results for the EF awareness levels of the children according to the variable of school type

Type of School	*n*	Mean Rank	*U*	*Z*	*p*
Private school	52	57.87	1021.000	-2,021	.043*
Official preschool within a primary school	51	46.02			
Private school	52	102.17	3935.000	-,779	.436
Official preschool	163	109.86			
Official preschool within a primary school	51	83.46	2930.500	-3,190	.001*
Official preschool	163	155.02			

*p< .05

Table 7 shows that the EF awareness levels of the children who attended a private school were significantly higher than those educated in an official preschool within a primary school (p <.05). Likewise, children who attended a preschool had significantly higher EF awareness levels than children educated in an official preschool within a primary school (p <.05). Although the difference between the EF awareness levels of children attending a private school and those educated in a preschool was in favor of the latter, the difference was not significant.

DISCUSSION and CONCLUSION

The findings of the study indicate that the EF awareness levels of the children were mostly (51.5%) at the medium level (6 <x ≤12, the highest score being 19). In his study, conducted to examine the relationship between children's EF awareness levels and their environmental attitudes by using EKAY-O, Simsar (2021), found that the EF awareness levels of children were low, and he associated these low levels of awareness with the cognitive development levels of the children. From the point of view of cognitive development, the cognitive development of children is greatly affected by their interactions with their immediate environment. Therefore, the moderate level of EF awareness of children can be associated with their school and home experiences related to waste, energy and water use, food consumption, and transportation. However, it is considered necessary to conduct a more in-depth study to discover the factors that affect children's low or high EF levels.

The item with the highest mean score of the children in the scale is related to recycling. It was observed that the topic of recycling in early childhood education has become popular both in Turkey and the rest of the world in recent years (e.g. Bolanos, Reeve, Reeve, Sidener, Jennings, & Ostrosky, 2020; Buil, Roger-Loppacher, & Tintoré, 2019; Kartal & Ada, 2020; Mackey, 2014; Onur, Çağlar, & Salman, 2016; Öztap & Bartan, 2019; Schill, Godefroit-Winkel & Hogg, 2020; Tosun & Demir, 2018). Mackey (2014) studied children for their understanding of the concept of recycling and emphasized that during the sustainability education process included in the program, preschool sought ways to improve their sustainability practices. In the study by Schill, et al., (2020), it was seen that children were

knowledgeable and worried about recycling. The findings also showed that children developed their recycling abilities through self-learning and observation-based learning, often at school and sometimes in the family setting. On the other hand, in the study by Kartal and Ada (2020) involving children aged 3-6, it was revealed that children's perceptions about recycling were limited. However, the data of the research obtained through children drawing and talking about recycling showed that as the age of the children increased, their knowledge of recycling also increased. Another study, Onur, et al., (2016), found that children's paper recycling activities contributed to the development of their environmental awareness. In parallel, Öztap and Bartan's (2019) study showed that being involved in art activities in terms of 'reuse' increases children's awareness of recycling. In light of the studies in the literature, it can be stated that the level of recycling knowledge and skills of children increases with age; and also school experiences play an important role in the development of recycling awareness.

The lowest average score in the study was observed in the item related to waste reduction. Grodzinska-Jurczak et al. (2006) revealed that children's attitudes towards paper waste were not positive enough in relation to waste reduction. It was stated that the reason for this is that families may not have a sufficient level of awareness. On the other hand, Davis, Rowntree, Gibson and Eglington (2005) found that the education program for sustainability positively affected the skills of preschool children in reducing waste. In an experimental study with preschool children by Buyer (2013), both teachers and parents admitted that children did not engage in any practices related to reduced/reducing consumption in both home and school environments. At the end of a six-week practice based on the principle of reduce, reuse, and recycle composting, it was determined that the children's increased experience with reducing reflected positively on their behavior in this regard. Based on the above studies, it can be said that children need to model the positive behaviors of adults, both at home and at school, and to increase their opportunities to gain direct experience.

According to the results of the research, it was seen that the children had high average scores on energy and water consumption in the items in EKAY-O. Similarly, in the study of Grodzinska-Jurczak et al. (2006), it was found that children were competent in saving water and energy. In parallel, Samaltani and Christidou (2013) claimed that young children can develop positive attitudes and values towards sustainable water use. In the action research carried out by Güngör (2019) on reducing the ecological footprint in a preschool, teachers reported that children sincerely participated in actions on water and energy saving, enjoyed educational activities on these subjects, and that their behavior towards conserving water and electricity developed rapidly. Based on this, it can be said that preschool children can make sensible choices about water and energy consumption.

According to the research findings, children's awareness of food consumption and transportation (preferring public transportation) are low. This finding can be associated with insufficient efforts by schools and parents on the subject. Children usually do not make food and transportation decisions. Parents and school officials decide how children arrive at school and what they eat at school. However, children can participate in decision-making processes related to improving sustainability and actively engage in EF-reducing behaviors. Cevher-Kalburan and Güngör (2019) offered suggestions on reducing ecological footprint via consuming seasonal foods, growing vegetables and fruits as much as possible, and choosing to shop locally for food. As another idea, Davis, Gibson, Pratt, and Eglington (2005) study found that the ' litterless lunch' practice, which promotes healthy lunches prepared at home, positively affects children's awareness. Regarding food consumption, measures can be increased with the participation of children at home and at school.

In the action research carried out by Güngör (2019), it was understood that school personnel's awareness of transportation increased, but behaviorally positive changes did not occur. On the other hand, it was found that if children were allowed to actively participate transportation-related activities, which could be adapted to the developmental level of the children, positive changes in children's awareness, attitudes, and behaviors were expected to occur. Similarly, in the study of Grodziéska-Jurczak et.al. (2006), it was determined that while children prefer environmentally friendly transportation, parents prefer the opposite. Regarding this difference, the researchers emphasized that children could develop

environmentally friendly attitudes and behaviors through resources such as books and television and by modeling individuals other than their parents, such as teachers. In this respect, it can be said that the experiences offered to children within preschool programs play a critical role in the development of EF awareness.

According to the results of the study, the EF awareness levels of the children showed significant differences based on the education levels of their parents. The levels of children whose parents were university graduates were higher than those whose parents were high school and primary school graduates. From the decisions taken at the World Summit held in Rio de Janeiro in 1992 on education for sustainability to the present day, significant progress has been made in integrating sustainability education at all levels around the world through the efforts of UNESCO. The targets for 2030 are to provide all students with the knowledge and skills required for sustainability through education on sustainable lifestyles (UNESCO, 2019). These developments have also positively affected education policies in Turkey, and the projects for the dissemination of environmental education at all levels have also been reflected in education policies. Therefore, it can be considered that individuals with a high level of education have more opportunities to gain educational experiences that improve their attitudes and behaviors towards the environment. Bronfenbrenner (1986) described the family and school environment as a critical environment for children to learn behavior and develop attitudes appropriate to their culture. In this context, the increase in the education level of parents may have increased the EF awareness levels of the children by affecting the positive attitudes and behaviors of the parents towards the environment.

Kahriman-Öztürk, et al. (2012) stated that the possibilities of different school types to provide educational visual and printed stimuli may differ; therefore, they suggested that school type (e.g. private or public) should also be examined as a variable due to its possible effects on children's ecological behavior. In the current study, the children's EF awareness levels were evaluated according to the type of school they attended, and it was determined that their levels differed significantly according to the school type. Children attending private schools had significantly higher EF awareness levels than those educated in an official preschool within a primary school. Similarly, children who attended a preschool had significantly higher EF awareness levels than those educated in a preschool within a primary school. Güngör (2019) states that ecological awareness levels of children increased with the sustainability applications carried out in a preschool. In the literature, there are studies pointing out that training provided on the subject has positive effects on children's attitudes and behaviors towards the environment (Benzer & Şahin, 2013; Çabuk & Çabuk, 2017; Erol & Ogelman, 2019; Güven, 2014; Hadzigeorgiou, Prevezanou, Kabouropoulou & Konsolas, 2011; Karimzadegan, 2015; Liefländer 2015; Şallı 2013; Uslucan, 2016). These differences between schools detected in the study can be associated with the perspective of schools on sustainability education. Schools that attach importance to sustainability education will undoubtedly reflect this importance in their practices for children, which increases children's awareness on the subject, as can be seen in the studies in the literature.

According to the results of the research, educational programs for children, parents, and teachers could be developed and expanded, especially in the fields of food consumption and transportation. In future studies, the effects of these educational programs on EF awareness can be determined.

This study is limited to 266 children who attended preschools in central areas of the city. A future study could be implemented with a larger sample size that includes both central and rural areas in various cities, even in different countries. The independent variables considered in this study are limited only to parental education levels and preschool types. However, there are various other factors that affect children's awareness of sustainability. It is thought that it would be useful to investigate the effect of different variables such as teachers' awareness of EF, the existence and characteristics of the practices within the scope of sustainability education in preschools, child's school attendance year, parent's occupation, and income level. Another limitation of this study is that EF was only examined with EKAY-O. Conducting research using qualitative and/or mixed models with different data collection tools, such as observation and interviews, is important in terms of obtaining in-depth information.

Another aspect of the research is to include qualitative studies in which the opinions of teachers and parents are collected in addition to the opinions of children. Furthermore, longitudinal studies on the subject could be conducted in order to understand the development and nature of EF among children.

Ethics and Conflict of Interest

The authors declare that the study has not unethical issues and that research and publication ethics have been considered carefully. This study was partially presented as an oral presentation in Turkish at the International Congress of Research in Education held on 09-11.05.2018 in Manisa, Turkey. The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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THE EFFECT OF CHILD-TO-CHILD TEACHING APPROACH ON STUDENTS' LEVEL OF SOCIAL RESPONSIBILITY IN SOCIAL STUDIES

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Abstract

This study aims to investigate the effects of the child-to-child teaching approach on students' level of social responsibility in primary social studies courses. A mixed-method experimental intervention approach was adopted in this research. The study participants were 5th-grade students, students' parents, and a social studies teacher. The social responsibility scale, semi-structured interviews, unstructured observation, control list, video records, student products, anecdotes, and researcher's diary were used as data collection tools. The results revealed that the child-to-child teaching approach (CtC) applied in social studies courses statistically impacted students' social responsibility levels. Moreover, it was determined that the CtC contributed to the students' social responsibility development according to the students', parents', and social studies teacher's views. It was also determined that participants had positive views regarding the CtC, and they thought that the approach was useful and enjoyable.

Keywords: Social studies, social responsibility, child-to-child teaching approach.

INTRODUCTION

In recent years, social responsibility has been evaluated in connection with social entrepreneurship, sustainability, community service, and character development & leadership programs and is gaining importance, especially in education, business, and public administration (Sosik, Koul, & Cameron, 2017).

The core concept of social responsibility as a reinterpretation of citizenship education and briefly can be explained as a personal investment in the well-being of others and the planet (Berman, 1990). Faulkner and McCurdy (2000) defined social responsibility as an individual's active participation in activities carried out with the purpose of social welfare. Similarly, Sosik, Koul, and Cameron (2017) stated that social responsibility is helping other creatures of your own will, with no thought of personal gain, for the common good and recognizing this as a duty.

Social responsibility is associated with psychological processes such as cognition, creativity, personality, morality, and fairness, as well as attitudes and behaviors related to the purposes of the social studies course, such as the sense of belonging, commitment, participation, and satisfaction (Secchi & Bui, 2018). In addition, socially responsible individuals are generally those who have characteristics of effective citizenship, have moral sensitivity, are academically successful, establish strong social networks, act in accordance with human nature, are self-confident, and act logically (Sosik, Koul, & Cameron, 2017). Accordingly, social responsibility is closely associated with the

essential components of the social studies course, such as human rights, social justice, and social engagement (Kelly & Salmon, 2008).

One of the most important courses taught in Turkey's primary schools related to raising citizens with a sense of social responsibility is the social studies course. According to the main philosophy and purpose of the social studies curriculum (SSC), it can be argued that educating students to help them become socially responsible citizens is important. Social studies teachers use various instructional approaches, strategies, methods, techniques, and activities to achieve these objectives of the social studies course. The Child-to-child teaching approach (CtC) can be regarded as one of the effective instructional approaches that social studies teachers can use to provide social responsibility for their students. Because the main focus of the CtC approach is to help children develop social responsibility skills (Serpell, 2011).

Child-to-child Teaching Approach

CtC consists of understanding, learning, planning, implementation, evaluation, and expanding stages. With this approach, children try to transmit the knowledge and experiences they obtained during the social studies course to their friends, families, and other individuals (Deveci & Selanik Ay, 2014). At the understanding stage of CtC, students collect information about the subject that will be covered in the social studies course. The learning stage involves the learning and deep reinforcement of the subject by students under the teacher's guidance. At the planning stage, students plan the subject they learned in the social studies course to make it ready to transmit to the target audience. The implementation stage includes the realization of the activities they planned. The evaluation stage is carried out under the guidance of the teacher and includes evaluation of the practices carried out through various in-class activities. Finally, at the expanding stage again under the guidance of the teacher, students develop ideas for increasing the effectiveness of the activities.

CtC approach does not consider child, family, and society as separate elements. They rather accepted as interconnected and complementary elements. This method establishes a relationship between the needs of the society and the social studies lesson. It contributes to the sustainability of learning and provides students with knowledge, skills, and values related to social responsibility, thucontributing to their effective socialization (Pradhan, 2007).

A literature review on CtC revealed that all studies were carried out with pre-school or primary school students. A majority of these studies are related to the health education of students in less developed countries (Knight, Grantham McGregor, Ismail, & Ashley, 1991; Ahmad, 1997; Chalker, 1997; Freeman & Bunting, 2003; Mwebi, 2005; Alazab, Elsheikh, & Kamal, 2008; Leena & D'Sozua, 2014). Besides, there are some reports on nutrition and health education of students about the CtC in developing countries (Hanbury, 1997; Ataman, 2009; Özyürek et al., 2016). However, little research has been done in developed countries on implementing the CtC approach to health education (Kirby and Gibbs, 2006). Additionally, there are some studies on the assessment of CtC implemented within the scope of some projects (Gilkes, 1997; Kattel & Carniege, 1997; Demir et al., 2009; Bhutta & Sylva, 2015; Serpell, Mumba, & Chansa-Kabali, 2011). Surprisingly, there are no studies concerning the implementation of CtC within a course to our best knowledge. Moreover, there are no studies on associating CtC with the development of social responsibility in students.

This study presents a solution to fill the gap in the literature concerning the effect of the CtC applied in primary social studies courses on students' level of social responsibility. The primary purpose of this paper is to find answers to the following questions:

- Does the CtC approach implemented in primary social studies courses affect students' level of social responsibility?
- Regarding the effect of CtC implemented in primary social studies courses on the students' level of social responsibility; What are the views of
  - students?

- parents?
- and the social studies teacher?

METHOD

A mixed-method experimental intervention approach based on explanatory sequential mixed-method was employed in this research. Firstly, the quantitative data obtained through the experimental procedure was analyzed, and then, qualitative data were obtained and analyzed to explain or support the study's quantitative findings (Creswell & Plano Clark, 2018).

Study Group

The study group consists of the students in the control and experimental groups, parents of the students in the experimental group, and a social studies teacher. Multilevel mixed-method sampling was used to determine the experimental and control groups, as shown in Figure 1.

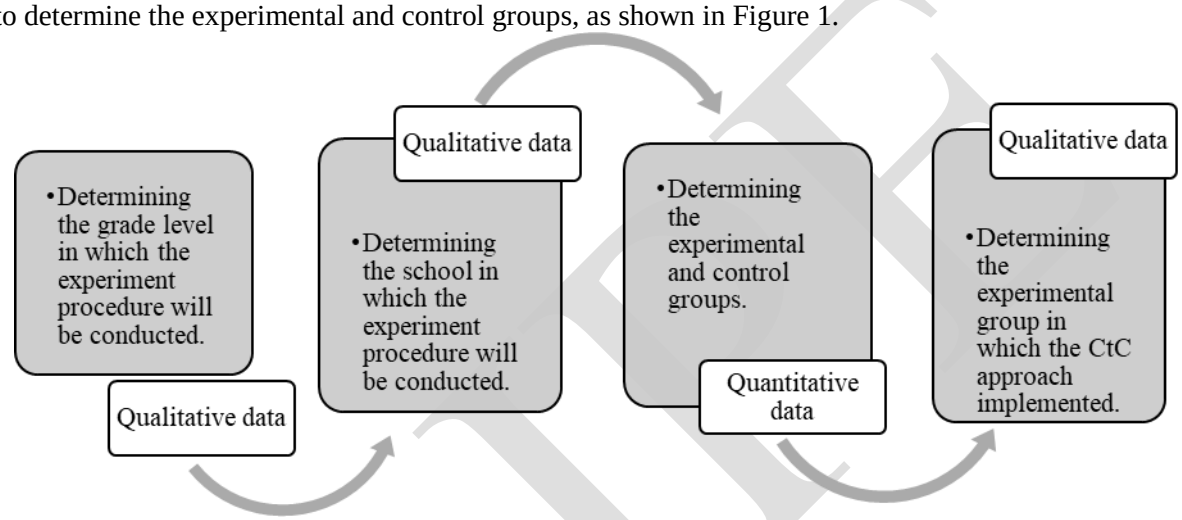

Figure 1. The determination process of the experimental and control groups using multilevel mixed-method sampling.

Social studies teachers and experts were consulted to determine the grade level at which the experimental procedure will be conducted. The study was conducted in the 5th-grade social studies course based on the opinions obtained. While determining the school, to minimize possible language problems during communicating, the school with the least number of foreign students and at least with two 5th-grade classes were considered as criteria. While determining the school that meets these criteria, the R&D department of the Provincial Directorate of National Education was consulted, and the school was determined located at the city center. The Social Responsibility Scale (SRS) was implemented in the selected school, and two classes with the closest average scores were decided as experimental and control groups. Because control and experiment groups should be equal as possible to determine the effect of experimental manipulation. While determining the experimental and control groups, two classes having the same social studies teacher were determined. According to the opinion of the social studies teacher, one of these classes was determined as the experimental group and the other one as the control group. The demographic information of students in the experimental and control groups is given in Table 1.

In addition to the students in the experimental and control groups, parents of 9 students in the experimental group who voluntarily agreed to participate in the study were also included in the study group. Six of these parents were male, and three were female. Two of the male parents were teachers, the others were a shopkeeper, worker, civil servant, and retired police officer; female parents were a teacher, worker, and housewife. Moreover, a social studies teacher has also joined the study group. The social studies teacher was graduated from the social studies teacher education program of a state university in 2005. The teacher has been working as a social studies teacher in state schools since 2008.

Table 1. Demographic information of students in the experimental and control groups

Demographic information		Control Group		Experimental Group	
		f	%	f	%
Gender	Girl	13	56.5	11	50
	Boy	10	43.5	11	50
	Total	23	100	22	100
Father's Job	Retired	3	13	1	4.6
	Self-employment	5	21.7	5	22.7
	Shopkeeper	2	8.7	3	13.6
	Worker	2	8.7	7	31.8
	Civil Servant	9	39.2	6	27.3
	Farmer	2	8.7	0	0
	Total	23	100	22	100
Mother's Job	Housewife	20	87	11	50
	Worker	1	4.3	2	9.1
	Civil Servant	2	8.7	7	31.8
	Self-employment	0	0	2	9.1
	Total	23	100	22	100
Father's Education	Illiterate	0	0	0	0
	Literate	1	4.3	1	4.6
	Primary school	5	21.8	2	9.1
	Secondary school	3	13	0	0
	High school	9	39.2	10	45.4
	College	3	13	8	36.3
	Post graduate	2	8.7	1	4.6
	Total	23	100	22	100
Mother's Education	Illiterate	1	4.3	1	4.6
	Literate	2	8.7	0	0
	Primary school	6	26.1	3	13.6
	Secondary school	6	26.1	6	27.3
	High school	8	34.8	5	22.7
	College	0	0	7	31.8
	Post graduate	0	0	0	0
	Total	23	100	22	100
News Tracking Frequency of Student	Daily	13	56.5	9	40.9
	Every few days	7	30.6	7	31.8
	Once a week	1	4.3	1	4.6
	Once every two weeks	1	4.3	2	9.1
	Once a month	0	0	0	0
	Never	1	4.3	3	13.6
	Total	23	100	22	100
Participation Status in Social Responsibility Projects	Yes	0	0	0	0
	No	23	100	22	100

Data Collection Tools

SRS, semi-structured interview form, video recordings, unstructured observation, anecdote, student products, control list, and researcher's diary were used as data collection tools. Details regarding data collection tools used in this study are explained below.

Social Responsibility Scale

A Likert-type SRS developed by the authors was used to determine students' level of social responsibility in the experimental and control groups. At first, an item pool was created and experts were consulted to evaluate the items in the scope of the content validity. For the content validity of the SRS, expert opinions were analyzed using Lawshe's technique (Yurdugül, 2005). Next, exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA) were used to determine the SRS construct validity. As a result of the EFA, a structure consisting of 4 subscales as environmental awareness, helpfulness, collaboration, and social awareness and 17 items was obtained. This structure

was verified in DFA. To determine the reliability of the SRS, Cronbach's Alpha internal consistency coefficient was calculated, and the test-retest method was used. The Cronbach's Alpha internal consistency coefficients for the subscales of SRS are presented in Table 2.

Table 2. The Cronbach's Alpha internal consistency coefficients for the subscales of SRS

Subscale	Internal Consistency Coefficient (Cronbach's Alpha)
Environmental Awareness	.718
Helpfulness	.685
Collaboration	.541
Social Awareness	.633
Total	.828

As seen in Table 2, the Cronbach's Alpha internal consistency coefficient of SRS is .828. A Cronbach's alpha coefficient range from .80 to 1.00 indicates strong reliability (Yaşar, 2014; Alpar, 2016; Karagöz, 2017; Yıldız & Uzunsakal, 2018). Accordingly, the SRS was determined as highly reliable. Moreover, while environmental awareness, helpfulness, and social awareness subscales were determined as reliable, the collaboration subscale was displayed lower but acceptable reliability. However, Akbulut (2011) stated that the Cronbach's Alpha internal consistency coefficient is highly dependent on the number of items and suggested examining correlations among the items for a structure with a small number of items. This could also be the reason to calculate Cronbach's Alpha internal consistency coefficient value of subscales as lower than 0.72. In this case, it is suggested to examine the correlation value between items and they should be at least .20. A correlation value range between .20 and .29 indicates an adequate and .30 and indicates a highly desirable internal consistency (Robinson, Shaver, & Wrightsman, 1991, as cited in Demirel & Sungur, 2018). The examination of the inter-item correlations for all subscales revealed that the correlation values for all items were above .20. Therefore, the total SRS and subscales were considered reliable according to the internal consistency coefficients.

Moreover, Pearson Correlation Coefficients were calculated for the scores obtained between the first and final testing of the test-retest method, and the obtained value of .764 indicated that SRS is highly reliable (Alpar, 2016). Finally, the scope and structural validity of the SRS consists of 4 subscales, and 17 items were confirmed and determined as highly reliable. The development study of the SRS was published as an article in a peer-reviewed international journal (Eryılmaz & Deveci, 2019).

Semi-structured interview forms

Different semi-structured interview forms were prepared for students, parents, and the social studies teacher. In addition, two separate interview forms were prepared for the social studies teacher. Expert opinions were consulted for all interview forms, and the forms were modified accordingly. Moreover, within the scope of validity study of student interview forms, a pilot interview was conducted with two students in the experimental group, which were not included in the analysis. Following the pilot interview, semi-structured interview forms were reviewed again and finalized.

Video-recordings

During the research period, video recordings of the applications implemented in the experimental group were made in line with the SRS. The video recordings comprised 717 minutes and 39 seconds of video data in the Culture and Heritage and People, Places, and Environments learning strands and were completed during 26-course hours. The video recordings were made between 26.10.2018 and 28.12.2018.

Unstructured observations

Unstructured observations were carried out in the experimental group to obtain deeper information on the activities carried out, especially in the evaluation and expansion stages of the CtC. During the observations, the students' attitudes, their behaviors, developments during the process, relations with

their peers and teachers, and evaluations regarding activities implemented in the planning and implementation stages were monitored.

The researcher collected the data regarding unstructured observation by taking notes by seeking to avoid attracting the students' attention and avoiding affecting the experimental process for the purpose of the research.

Anectode

At the beginning of the experimental process, a notebook was given to each student to keep their anecdotal records. An anecdotal record sheet was added on the first page of the anecdote notebooks, including a guideline and template on keeping anecdotal records. Previously, the anecdotal record sheet was reviewed by an expert. The record sheet was then finalized. After completing the posttests applied to the experimental group, the social studies teacher collected the anecdote notebooks.

Student products

During the experimental procedure, students who were in the experimental group recorded videos about their activities in the implementation stage of CtC. Moreover, students expressed their feelings and thoughts relating to the activities in the evaluation stage in writing. Besides, they also expressed their opinions on how to conduct the activities implemented during the evaluation phase more effectively in writing.

The control list

The control list was prepared to observe if the activities directly or indirectly associated with CtC are implemented in the control group. The control list includes items regarding the stages of CtC. Next to each item, done and not done marks were included. Additionally, an Explanations section was also included for each item. Expert opinions were obtained on the control list. Then the control list was reviewed accordingly and finalized.

Researcher's diary

The researcher had kept a researcher's diary regularly during the entire study period. The researcher had used this researcher's diary during the collection of quantitative and qualitative data, analysis of the data, and reporting of the findings.

Data Analysis

Various quantitative and qualitative data analysis methods were employed to analyze the data obtained during the research process. The independent sample t-test was conducted between the pretest scores of the experimental and control groups on the SRS at the beginning of the experiment. On the other hand, One-way covariance analysis (ANCOVA) was applied to the posttest scores of the experimental and control groups. The posttest scores of the experimental and control groups were checked for test assumptions of ANCOVA, including normality, equality of variances, linear relationship between pretest (determined as the covariate variable) and posttest (determined as the dependent variable) scores of the experimental and control groups, and finally, the test for equality of the within-group slopes of the regression lines.

The effect size of the experimental procedure was also estimated using partial η2 values obtained in the one-way ANCOVA. Moreover, the power of the experimental procedure was also reported. The quantitative data obtained with the experimental procedure were analyzed using the SPSS software version 21.0.

On the other hand, the inductive data analysis approach was conducted to analyze qualitative data. Most of qualitative data were converted into text files. However, some qualitative data, such as student products, were copied by taking a photo and saved as photos to the computer. They were analyzed by NVIVO 12 Pro Qualitative Data Analysis Software. Moreover, the researcher's diary and unstructured observations were used to analyze the qualitative data.

Pilot Study

Individual and Society which is the first learning strand of the SSC was selected for the pilot study. The pilot study was conducted during 9-course hours and observed by the social studies teacher of the class. At the end of the pilot study, the lesson plans for the experimental procedure were modified according to the opinions and suggestions of the social studies teacher and the experiences obtained during the process.

Experimental Procedure

During the experimental procedure, the researcher and the social studies teacher discussed how the lesson should be taught and how and when to use the materials. The same teacher taught social studies in both classes. While the social studies teacher implemented the lesson plans developed by the researcher for the experimental group, the control group continued their education using the regular plans. The process of CtC conducted in the experimental group is shown in Figure 2.

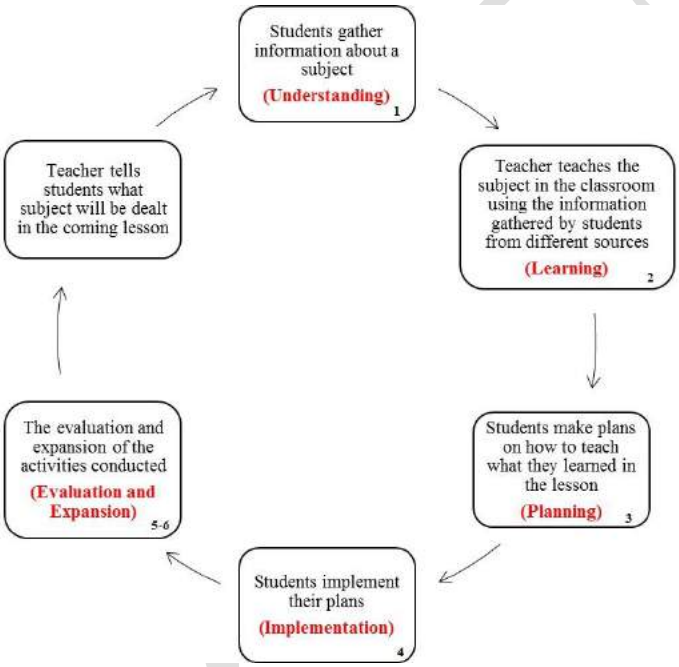

Figure 2. The learning process of CtC conducted in the experimental group.

As shown in Fig. 2, the learning process of CtC conducted in the social studies course consists of six stages. In the understanding stage of CtC, students collected information relating to the subject from various sources. The learning stage was performed in the class, and students shared information with their peers. Additionally, the social studies teacher gave more comprehensive information to raise awareness on the related subject by considering students' information-sharing in-class activity. In the planning stage, students made plans on how to transmit information they learned to their families, friends, or other people. In the implementation stage, students implemented the activities they planned. In the evaluation stage, students evaluated practices they implemented under the teacher's guidance through various activities. Finally, in the expanding stage, students develop ideas on how to transmit the subject more effectively to the target audience through various activities conducted by the social studies teacher.

Trustworthiness of the Study

To increase the trustworthiness of the research, the authors used participant approval, expert assessments, and diversified data sources and data collection tools. Moreover, the researcher made long-term interactions in the research field, kept researcher diaries related to the research, and used direct quotations from the data obtained from the participants.

The Role of the Researcher

The researcher had been in constant communication with the social studies teacher both in writing and orally during this process. The researcher discussed ideas with the social studies teacher about the activities and gave feedback before, during, and after the lessons.

Before all interviews, the researcher informed the participants about how to archive data, how to protect personal information, and how to report personal information by keeping data confidentiality, received verbal consent of the participants and performed audio recording during the interviews. In addition, the researcher tried to conduct the interviews in a friendly atmosphere to obtain frank and in-depth data from the participants. The researcher also ensured that interviews were conducted privately where people other than the participants were not present to prevent the participants from being affected.

Besides all, this research was conducted as a part of a Ph.D. thesis. Accordingly, the entire research was conducted by the first author of this paper, the author of the thesis. The second author of this paper is the thesis supervisor, who guided the first author during the entire research period and provided feedback.

Research Ethics

Research and publication ethics permissions were obtained from a state university, then, other necessary permissions were obtained from the Ministry of National Education and Provincial Directorate of National Education. Before the experimental procedure, a PTA meeting was held to inform parents of the students in the experimental group. Written consents were obtained from all participants (students in the experimental and control groups, parents, and the social studies teacher) for the research through the voluntary participation forms. During the analysis and reporting stage of qualitative data, code names were used in accordance with the principle of maintaining confidentiality.

FINDINGS

T-test Results of the Pretest Scores of the Experimental and Control Groups

Assumptions including normal distribution and homogeneity of the data were examined to decide whether the data set is suitable for a parametric test. The descriptive statistics and the results of the normality tests and Levene's test for equality of variances were applied to the pretest scores of the experimental and control groups are shown in Table 3.

Table 3. The descriptive statistics and the results of the normality tests and Levene's test applied to the pretest scores of the experimental and control groups

Groups	Descriptive Statistics			Shapiro-Wilk		Skewness	Kurtosis	Levene's test			
	N	Mean	Std.Dev.	Df	p			Levene Statistics	sd1	sd2	p
Experimental	22	55.13	1.553	22	.247	-.326	-1.026	2.236	1	43	.142
Control	23	57.60	1.182	23	.644	-.252	-.407				

As shown in Table 3, while skewness and kurtosis values of the pretest scores of the experimental group were found as -.326 and -1.026, respectively, the values of the control group were calculated as -.252 and -.407, respectively. These results indicated that the data did not show excessive deviation from normal distributions. Moreover, the Shapiro-Wilk test was also used to examine whether the scores were normally distributed. As displayed in Table 3, the pretest scores of the experimental and control groups were determined as not significant at the .05 level, and therefore, did not show excessive deviation from normal distributions. Furthermore, Levene's test for equality of variances demonstrated that the data were insignificant at the .05 level. Consequently, these results confirmed that the independent sample t-test could be performed to the pretest scores of the experimental and control groups. Accordingly, the independent sample t-test was performed between the pretest scores of the experimental and control groups and the obtained results are presented in Table 4.

Table 4. Results of the independent sample were performed between the pretest scores of the experimental and control groups.

Group	N	Mean	Std.Dev.	Df	T	p
Experimental	22	55.134	7.28	43	1.274	.210
Control	23	57.608	5.67			

As shown in Table 4, no statistically significant difference was found between the pretest scores of the experimental and control groups at the .05 level ($t_{(43)}$= 1.274: p>.05). Based on these results, it was concluded that the social responsibility levels of the students in the experimental and control groups were similar.

The results of the One-way ANCOVA Conducted on the Posttest Scores of the Experimental and Control Groups

Before the analysis, posttest scores of the experimental and control groups were evaluated for the one-way ANCOVA assumptions. Therefore, normal distribution and homogeneity of the posttest scores of the experimental and control groups were examined. The descriptive statistics and the results of the normality tests and Levene's test for equality of variances were applied on the posttest scores of the experimental and control groups are presented in Table 5.

Table 5. The descriptive statistics and the results of the normality tests and Levene's test for equality of variances applied on the posttest scores of the experimental and control groups.

Groups	Descriptive Statistics			Shapiro-Wilk		Skewness	Kurtosis	Levene's test			
	N	Mean	Std.Dev.	Df	p			Levene Statistics	sd1	sd2	p
Experimental	22	60.22	1.204	22	.70	-.623	-.715	.320	1	43	.575
Control	23	57.08	1.351	23	.593	-.147	-.508				

As shown in Table 5, while skewness and kurtosis values of the posttest scores of the experimental group were found as .623 and -.715, respectively, the values of the control group were calculated as -.147 and -.508, respectively. Moreover, the posttest scores of the experimental and control groups were found as not significant at the .05 level in the Shapiro-Wilk and therefore, did not show excessive deviation from normal distributions. Furthermore, the results of Levene's test for equality of variances demonstrated that the variances were homogeneous since the test was not significant at the .05 level.

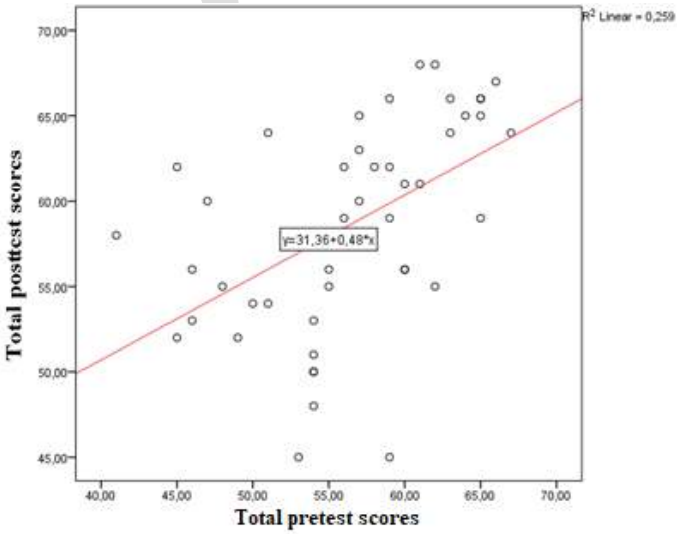

Figure 3. The relationship between the pretest and posttest scores of the experimental and control groups on the SRS.

In addition to these assumptions, the relationship between the pretest (the covariate variable of the study) and the posttest (the dependent variable of the study) scores of the experimental and control groups was examined before performing one-way ANCOVA. The scatter plot showing the relationship between the pretest and posttest scores of the experimental and control groups is shown in Figure 3.

As seen in Figure 3, a linear relationship was determined between the pretest (the covariate variable of the study) and the post-test (the study's dependent variable) scores of the experimental and control groups.

It was also examined whether there were significant differences between the experimental and control groups' pretest scores and the classroom variable to perform the one-way ANCOVA. The analysis results regarding the Classroom-pretest interaction for pretest scores of the experimental and control groups are shown in Table 6.

Table 6. Results of the classroom-pretest interaction

Source of Variance	Sum of Squares	Df	Mean of Squares	F	p
Corrected Model	674.649[a]	31	224.883	8.952	.000
Classroom	28.343	1	28.343	1.128	.294
Pretest	561.108	1	561.108	22.337	.000
Classroom-pretest	**13.726**	**1**	**13.726**	**.546**	**.464**
Error	1030	41	25.120		
Total	156350	45			

As seen in Table 6, the Classroom-pretest interaction was determined as not significant at the .05 level ($F_{1\text{-}41}$=.546; p>.05). These results indicated that the within-group regression slopes are all equal. According to all analyses, it was concluded that both scores are suitable to perform the one-way ANCOVA to determine the effect of CtC teaching approach on students' social responsibility levels. The results of the one-way ANCOVA conducted for the posttest scores of the experimental and control groups are presented in Table 7.

Table 7. The results of the one-way ANCOVA conducted for the posttest scores of the experimental and control groups

Source of Variance	Sum of Squares	Df	Mean of Squares	F	p	Partial η^2	Power
Corrected Model	660.924[a]	2	330.462	13.299	.000	.388	.996
Pretest	550.036	1	550.036	22.135	.000	.345	.996
Group	**219.295**	**1**	**219.295**	**8.825**	**.005**	**.174**	**.827**
Error	1043.654	42	243849				
Total	156350	45					

As shown in Table 7, a significant difference at the .05 level was determined between the posttest scores of the experimental and control groups that corrected according to the pretest scores ($F_{1\text{-}42}$=8.825; p<.05). Considering these results, the experimental procedure was decided as statically significant. Moreover, the effect size of the experimental procedure was also examined using partial η^2 values. As displayed in Table 7, the partial η^2 value was calculated as .174. Accordingly, the effect size of the experimental procedure was large. Furthermore, the power of the experimental procedure was also evaluated and calculated as .82. Therefore, the null hypothesis of the study, that is, The CtC approach has no impact on the social responsibility levels of the primary school students assumption is rejected by 82%, and the power of the experimental procedure was found to be greater than expected (Christensen, Johnson, & Turner, 2015).

Considering the analyses results discussed above, it was concluded that the CtC approach implemented in the social studies course had shown a significant impact on the social responsibility levels of the primary school students, the experimental procedure had a large effect, and its power was greater than expected. Qualitative data obtained from the study group including students in the experimental group, parents, and teacher were analyzed to deeply understand and explain how effective the CtC teaching approach is on students' social responsibility levels.

Students' Opinions Regarding the Contribution of the CtC Teaching Approach

The findings acquired by analyzing the information obtained from students revelated that the CtC approach implemented in the social studies lesson had contributed to the development of students. These findings are shown in Figure 4.

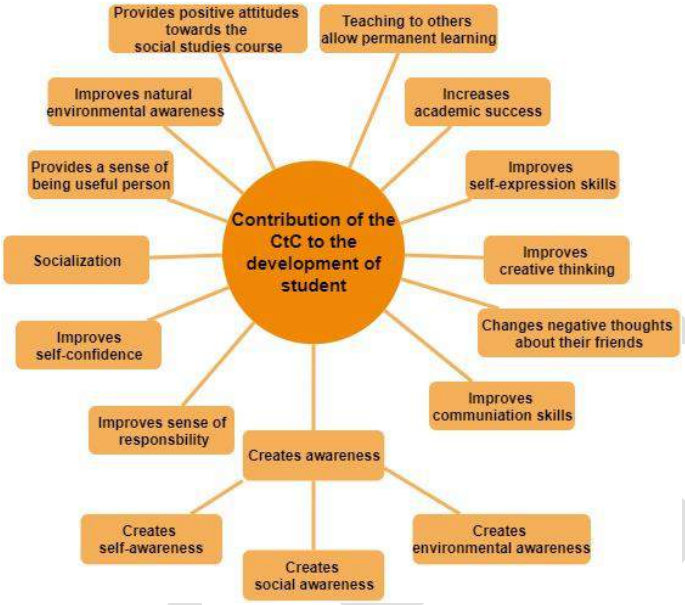

Figure 4. Contribution of the CtC to the development of students

An examination of Fig. 4 shows that the obtained findings include items associated with social responsibility. The current study's findings showed that the CtC had contributed to improving some students' self-expression, creative thinking, and communication skills relatedto social responsibility. One of the students in the experimental group, Tamer stated that "he can express himself better as a result of the activities he conducted within the scope of the CtC by saying, in the past, I could not introduce myself well to others. Now I started to feel better about expressing myself (Student Interview (SI), 10.01.2019)". Selen explained that the CtC process contributed to her creative thinking skills by giving an example, "I had thought of something recently. I would bring something like a bin for the school bus. We would throw the garbage there (SI, 10.01.2019)". Omar believes that the CtC implemented in the social studies course had contributed to his communication skills by saying, "My social communication with people has improved. I could already speak well with people. I already have this ability. Here, I have increased this feature (SI, 10.01.2019)".

Other findings showed that the CtC had contributed to the development of a sense of responsibility relatedto social responsibility through improving their sense of responsibility, self-confidence, and a sense of being a useful person. One of these students, Ecem said that this activity made her feel responsible by stating, "I felt a sense of responsibility since we conducted an important, pleasant, and useful task (Student Product (SP), no date)". Büşra's anecdotal records indicated that she believes the activities they planned and implemented provided her self-confidence: "I explained something to our analyzing today and realized that my self-confidence has increased. Because I used to be excited when I was telling someone something. But now, I realized that I'm better (Anecdote Record (AR), 05.10.2018)." Moreover, Öznur stated that the clean-up activity made her feel a sense of being useful person by explaining, "I enjoyed garbage collection. Because at least we made something good for the environment (SI, 10.01.2019)".

Moreover, the obtained findings indicated that the CtC had contributed to the development of environmental and social awareness, socializing them, and helping to be aware of the natural environment, which are relatedto social responsibility. One of these students, Tamer said that the CtC

provided social awareness by stating "It made me feel that we shouldn't think only about ourselves. It is not just us living in this World (SI, 10.01.2019)". Ozan stated that it created environmental awareness by saying, "My opinion has changed. I don't think the environment was so dirty. I'm surprised when there were so many. We didn't care before (SI, 10.01.2019)". Gökay said that the CtC made them socialize by saying "We became more social than all lessons. We meet with my friends at school every day. We socialize with them (SI, 10.01.2019)". Additionally, Ecem stated that the CtC had improved their awareness towards the natural environment by saying: "It had changed me for the environment. When I was little, I didn't care much about nature, but as I did such activities, I understood the state of nature (SI, 10.01.2019)".

In addition to these, it was found that the CtC implemented in the social studies course provided students with permanent learning since they had to teach what they learned to others, increased their academic success, changed their negative thoughts about their friends, and provided positive attitudes towards social studies course.

Parents' Opinions Regarding the Contribution of the CtC Teaching Approach

The findings acquired by analyzing the information obtained from parents indicated that the CtC approach implemented in the social studies lesson provided some contributions to the development of the students and family. Findings associated with parents' opinions regarding the contribution of the CtC approach to the development of students and families are shown in Figure 5.

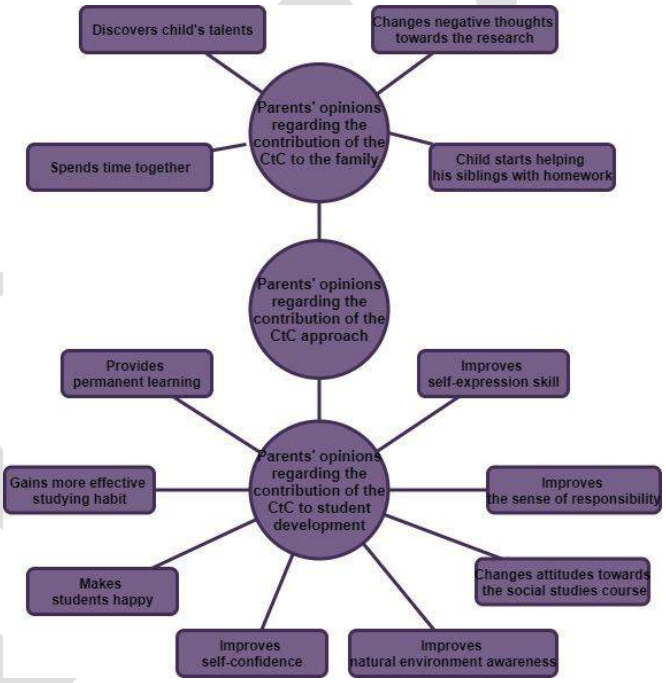

Figure 5. Parents' opinions regarding the contribution of the CtC approach

As presented in Figure 5, most of the obtained findings are related to social responsibility. The results indicated that the CtC approach implemented in the social studies course improved students' sense of social responsibility according to parents' opinions. Moreover, the research findings showed that some parents thought implementing the CtC in the social studies course contributed to the development of children's sense of responsibility and self-confidence. Ms. Işıl, one of the parents supporting this finding said "I constantly tell him that he has homework. I would follow as if I'm a student myself. For the first time, he said consciously, 'I will do it', and he did (Parent Interview (PI), 15.01.2019)". Mr. Hakan, another parent, emphasized that the CtC contributed to the development of his child's self-confidence by saying,

> I think the activities are useful. He was different before. His self-confidence has increased after he conducted the activities. Sometimes he was afraid of narrative things. I already told him last night. I said, 'You couldn't speak like this before.' He replied 'Now I'm speaking, dad,'. He was hesitant before (PI, 11.01.2019).

Moreover, it was found that some parents had the view that this process contributed to their children's natural environment awareness. Mr. Halil, one of these parents, stated that his child's awareness of the natural environment had increased by saying;

> He began to be more concerned (sensitive) about the waste. For example, he said to me, 'We shouldn't throw anything out of the car. Sometimes, even if it's a little stuff, we've thrown some things a few times, we shouldn't do this anymore' he said (PI, 14.01.2019).

Besides, some parents stated that the CtC approach had contributed the development of the self-expression skills of their children. Mrs. Hande, a parent suggesting this view said, "Now she started to make proper sentences. I always wanted her to make good sentences to express herself better. Finally, my daughter did it fondly. Her self-expression skills have improved. Because she enters into such settings (PI, 17.01.2019)".

In addition to the outcomes mentioned above, parents also believe that the CtC practiced in the social studies course changed their children's attitudes towards the social studies course, provided them a more effective studying habit and permanent learning. Moreover, parents stated that the CtC also provided some benefits themselves. For example, they said that they discovered their child's new talents, their child started helping his sibling with his homework, they spent more time together, and their negative thoughts towards the research had changed.

Social Studies Teacher's Opinions Regarding the Contribution of the CtC Teaching Approach

During this research, findings regarding the contributions of CtC on the development of the students, teaching-learning process of social studies course, and the social studies teacher. Social studies teacher's opinions regarding the contribution of the CtC approach are shown in Figure 6.

As seen in Figure 6, most of the findings are related to social responsibility. As a result of this research, the social studies teacher stated that the CtC contributed to the development of students' self-expression and creative thinking skills associated with developing a sense of social responsibility in students. Regarding the improvement of the students' self-expression skills, the social studies teacher said;

> There are differences between the classroom we implemented the approach in and the other in terms of children's positive attitude, expressing themselves, and participating in the class. For example, Cansu, whom I had trouble getting her to speak with, talked about the negative aspects of technology for almost three minutes today (Interview of Social Studies Teacher (ISST), 14.02.2019).

Regarding the contribution of the CtC to the students' creative thinking skills, the social studies teacher stated "I was happy to see the evaluation of the progress by children during the evaluation and expansion stages, especially the emergence of different ideas regarding the expansion (ISST, 10.12.2018)".

Moreover, the social studies teacher suggested that the CtC had improved student's social responsibility. In this regard, the social studies teacher said;

> I think maybe 10-15% of the students are aware of what they are doing. Of course, this will be more sensitive when they discover it themselves. However, I also observed that some students are discovered it. During those expansion activities, I saw that they are aware of this. During those activities, their speeches and writings indicated this (ISST, 10.12.2018).

Furthermore, the obtained results implied that the social studies teacher believed that the CtC improved student's awareness of the natural environment as well, which is associated with social responsbility. The social studies teacher explained that especially the 'flyer preparation' and 'clean-up the

environment' activities performed by the students during the process increased the student's awareness of the natural environment as follows:

> There was an activity in the preparation process before the garbage collection activity (flyer preparation). Students were motivated in that activity. Therefore, we have already prepared them mentally and spiritually. Regarding the subject, they have learned about environmental problems, nature and environment have become uninhabitable, and we must respect nature. In my opinion, as a result, children gained this awareness and felt a responsibility to do something for nature, the environment, or for living things (ISST, 14.02.2019).

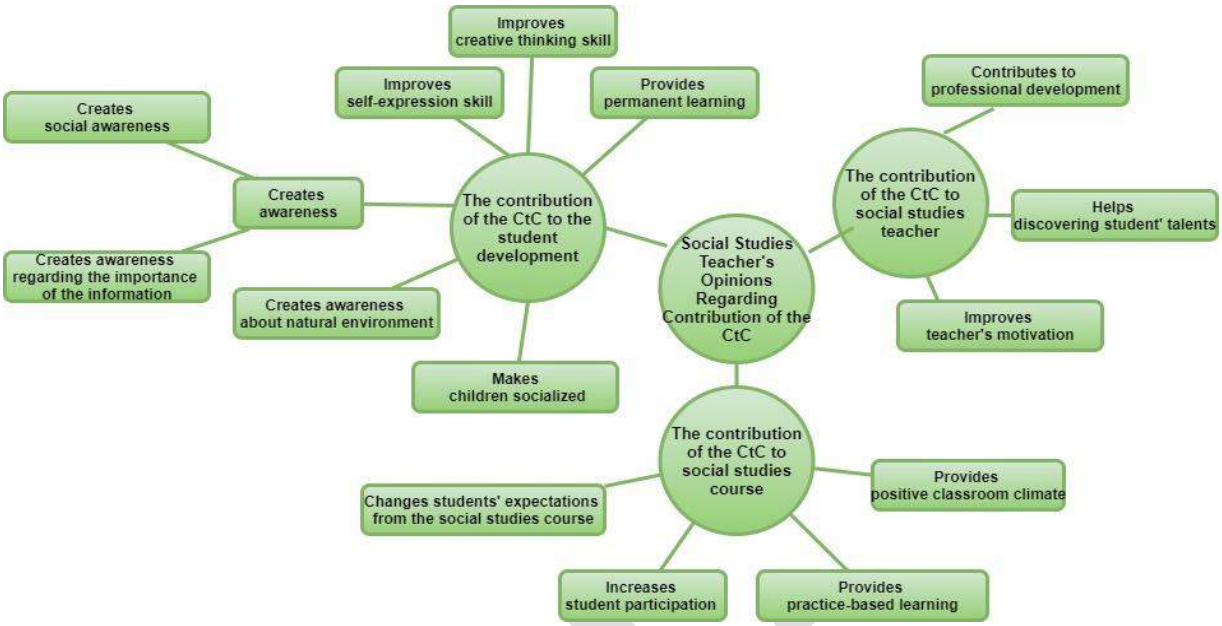

Figure 6. Social Studies Teacher's opinions regarding the contribution of the CtC

Additionally, the CtC was identified by the social studies teacher as a mechanism that socializes children, contributes to the awareness regarding the importance of the information, and provides permanent learning. On the other side, the social studies teacher also expressed that the CtC provided some benefits such as contribution to his professional development, discovering students' talents, and improving his motivation. Moreover, according to the social studies teacher, the CtC also contributes to the education process of social studies. Furthermore, the social studies teacher stated that the CtC offers a positive classroom environment, provides learning from experience, and enables effective participation of the students in the lesson. Finally, it was also stated that after implementing the CtC method, students' expectations from the social studies coursewere changed.

RESULTS, DISCUSSION, and RECOMMENDATIONS

The present study results revealed that the CtC approach implemented in the primary social studies course increased the students' level of social responsibility. In studies carried out by Demir et al. (2009), Serpell, Mumba and Chansa-Kabali (2011) and Özyürek et al. (2016) also found a positive and significant impact of CtC approach on students in different grades. Additionally, many reports supporting these findings can be found in the literature. For example, Gibbs, Mann and Mathers (2002) suggested that the CtC promoted students' understanding and life skills needed for a more livable world. Serpell (2011) defined the CtC as an approach focusing on social responsibility awareness. As explained above, the results described in the present study are consistent with the related published reports. Therefore, it can be claimed that the CtC contributes to developing a sense of responsibility in students.

Based on the views of the students, parents, and the social studies teacher, CtC contributed to students' self-expression skills. This finding is also consistent with previous studies (Somerset, 1988; Gilkes,

1997; Hanbury, 1997; Kattel & Carniege, 1997; Demir et al., 2009). Moreover, Freedman and Hunting (2003) emphasized that the CtC helps to improve students' communication and life skills. Therefore, considering the results of these studies and explanations, the CtC can be identified as an approach contributing to students' communication and life skills.

The CtC's contribution to the students on raising awareness and sensitivity toward the natural environment is also one of the results of this research. In a study by Somerset (1988), it was demonstrated that the CtC not only contributes to students' awareness but also contributes to the awareness of the people with whom students come in contact. The results of the study carried out by Knight, Grantham-McGregor, Ismail and Ashley (1991) indicated that the CtC had a significant positive impact on the test scores of the students in the experimental group regarding the conserved and healthy environment. According to a study conducted by Hanbury (1997), the CtC approach enabled children to learn how to protect the environment. In a research carried out in Bangladesh by UNICEF (2012), the students in the experimental group exhibited more developments regarding sensitivity toward the natural environment than those in the control group after implementation of the CtC. In addition to the studies mentioned above, Bailey, Hawes, and Bonati (1992), suggested that the CtC can be used to effectively teach subjects related to the environment. Gibbs, Mann and Mathers (2002) stated that the CtC is more effective when used in the subjects associated with the social issues where students can experience. According to these findings of studies, it can be suggested that the CtC helps to promote natural environment awareness in students.

It was concluded in the study that CtC contributed to the students' creative thinking skills according to the social studies teacher's opinion. Similar results were reported in the studies carried out by Gilkes (1997), Demir et al. (2009) and UNICEF (2012). Moreover, in a study by Chalker (1997), parents stated their children started developing creative skills due to the CtC. In addition to these reports, Pradhan (2007) emphasized that CtC enabled students to be aware of their own creative features. In this regard, the obtained findings and the supportive studies indicated that the CtC contributes to the students' creative thinking skills.

Based on the students' and parents' views, this study also provided evidence that the implementation of the CtC in the social studies course contributes to the development of the sense of social responsibility in the students. The contribution of the CtC to the students' social responsibility was also determined by the reports of Ahmad (1997) and Demir et al. (2009). Furthermore, Özyürek et al. (2016) also found that activities conducted within the scope of the CtC helped students learnto take responsibility. Furthermore, Gibbs, Mann, and Mathers (2002) explained how CtC encourages students to take responsibility. According to these results, it can be said that the CtC makes contributions to the development of students' sense of social responsibility.

Bailey, Hawes, and Bonati (1992) found that the CtC improves self-confidence in children since children plan and implement the activities regarding the CtC themselves. A similar finding was obtained by Gibbs, Mann and Mathers (2002), the CtC projects that require children's active participation improves their self-confidence. There are many reports published in the literature support these findings (Somerset, 1988; Gilkes, 1997; Mwebi, 2012; UNICEF, 2012; Demir et al., 2009; Özyürek et al., 2016). Similar to the previous reports, the current study also provided evidence about the contribution of the CtC to the self-confidence in students based on the views of students and parents. Therefore, it can be argued that the CtC provides a contribution to the students' development of self-confidence.

The result of the present study showed that the CtC helps students to develop a sense of being a useful person in society. Similarly, in a study of Somerset (1988), it was found that the CtC enabled students to be aware of being useful individuals to society. The results of a study carried out by Kattel and Carniege (1997) demonstrated that children were aware that their contribution to their schools and society is valuable through the activities held within the scope of the CtC. Moreover, Hanbury (1993) stated that children felt a sense of being an important and useful person to society because the CtC

requires students to take responsibility and develop activities for the solution of a social problem. Gibbs, Mann, and Mathers (2002) stated that the CtC approach enabled the development of the sense of belonging among students since the CtC provides children to develop activities regarding the solution of a social problem within the society they live in. Based on the results of the present study and supporting reports, the authors claim that the implementation of the CtC contributes to students developing a sense of being a useful person to society.

In addition to the findings of this study, previous studies demonstrated some other contributions of the CtC on the students, such as collaborative work, questioning, research, critical thinking, problem-solving, and decision-making skills. Additionally, it was also found that the CtC approach helps students to improve self-control, organization, self-assessment, literacy, planning, and time management skills. Furthermore, recent reports suggest that the CtC has a positive impact on some students' skills, such as the development of a sense of self-esteem and social belonging, accepting different ideas, healthy eating, being clean, and being aware of the opportunities offered by society. In addition to these, the implementation of the CtC improves family, school, and community partnership, social awareness, and creativity of teachers (Knight, Grantham-McGregor, Ismail & Ashley, 1991; Bailey, Hawes, & Bonati, 1992; Hanbury, 1993; Ahmad, 1997; Chalker, 1997; Eunson, 1997; Gilkes, 1997; Hanbury, 1997; Kattel & Carniege, 1997; Breslin, Madrid, & Mhhize, 1998; Gibbs, Mann, & Mathers, 2002; Pradhan, 2007; Alazab, Elsheikh & Kamal, 2008; Ataman, 2009; Demir et al., 2009; Serpell, Mumba, & Chansa-Kabali, 2011; Mwebi, 2012; UNICEF, 2012; Özyürek et al., 2016). Finally, based on the present study's findings and previous reports, it can be argued that the CtC approach helps students gain valuable knowledge, skills, values, attitudes, behaviors, and awareness related to social responsibility.

Based on the findings obtained in the present study, the authors make the following recommendations regarding the implementation and further studies:

Recommendations regarding the implementation

- Teachers can use the CtC approach to provide students with social responsibility awareness or increase students' level of social responsibility.
- Teachers can use the CtC approach to help students gain many skills and values associated with social responsibility in the curriculums.
- Teachers can use the CtC approach for students' personal, social, and emotional development.
- Teachers can use the CtC approach to strengthen the links between students, school, and society.

Recommendations for further studies

- Experimental or quasi-experimental studies may be conducted to examine the impact of the CtC on some variables.
- Experimental or quasi-experimental studies may be conducted to examine the effect of a dependent variable on the primary school students' social responsibility levels.
- The implementation of the CtC in different courses should be examined in future studies.
- Follow-up studies should include relational research to determine the relationship between social responsibility and different variables.
- Relational research may be conducted to identify the variables predicting social responsibility in primary school students.
- Further studies may include research determining the social responsibility perceptions of primary school students and social studies teachers.

Ethics and Conflict of Interest
This article is based on a PhD dissertation conducted under the direction of the second author by the first author in the area of Social Studies Education at the Anadolu University Institute of Educational Sciences. This research was funded by Anadolu University the Scientific Research Projects Department (Grant Number: 1804E079). The authors declared no potential conflicts of interest.

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THE EFFECTIVENESS OF SCHOOL-WIDE POSITIVE BEHAVIORAL INTERVENTIONS AND SUPPORTS IN EARLY CHILDHOOD SETTINGS: A MIXED MODEL RESEARCH

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Abstract

It is important to support children's appropriate behaviors and social skills to extinguish problem behaviors at an early stage as much as possible. Therefore, researchers are in search of effective evidence-based interventions to deal with the problem behaviors of young children. The "Positive Behavioral Interventions and Supports (PBIS) Approach" seems to be the most widespread approach since the 2000s. PBIS aims to increase the quality of life of the child by making positive changes in the environment of the child. The study explores the effectiveness of the School-Wide Positive Behavioral Interventions and Supports Turkish education model (SWPIBS-TR) on problem behaviors and social skills within the early childhood settings. The intervention was carried out in four main stages and 14 steps. The study was conducted with the school managers, teachers, school staff, primary caregivers, and all children with and without disabilities in a preschool/kindergarten in Turkey. The research is mixed-method research and the "parallel convergent research" model has been adopted. The findings indicated significant decreases in the problem behaviors of children and increases in the social skills level. So, researchers, policymakers, and teachers should put the SWPBIS-TR approaches in their curriculum in Turkey.

Keywords: Behavioral problem, positive behavior/al support, school wide positive behavior/al support, early intervention, social skills.

INTRODUCTION

Early Childhood and Problem Behaviors

Early childhood refers to the 0-6 age range according to the Turkish Ministry of National Education (MoNE) Preschool Education Program (PEP) (2013), but it covers the 0-8 age range according to UNICEF (2001). Since linguistic, cognitive, sexual, social, and emotional development occurs in the early childhood years, this period is very important in the child's life. The skills acquired by the child in early childhood directly affect the behavior and development of the child in later years. All development areas directly affect one another and social and emotional development should be fostered well, especially in the acquisition of positive behaviors and appropriate social skills (Er-Sabuncuoğlu & Diken, 2010). From childhood, children who have not been able to develop an age-appropriate social-emotional development due to various reasons, cannot have a positive life in later life and often exhibit problem behaviors or may have the risk of showing problem behaviors. Children who exhibit problem behaviors fail to develop appropriate social adaptation skills in their environment and have difficulties in establishing positive social communication with individuals (Young, Caldarella, Richardson, & Young, 2012). However, from a young age, it is necessary to teach children appropriate behaviors and social skills, just like the skills in other developmental areas. Looking at MoNE-PEP (2013), the social skills program for children aged 3-6 is observed to include

goals such as fulfilling responsibilities, self-confidence, knowing self, being respectful, problem-solving, and obeying the rules. According to Young et al. (2012), achieving these goals is crucial for children to be able to develop positive behaviors and social skills from an early age. Indeed, children who can cope properly with the problems they encounter exhibit pro-social skills (eg, cooperation, respect, forgiveness, sharing) quite well (Dereli-İman, 2013). However, when they cannot gain the skills to cope with the problems they encounter, they may display problem behaviors such as aggression and belligerence (Young et al., 2012).

To prevent problem behaviors, parents, and teachers should be very careful in the early childhood years. Therefore, teachers of children who have started their education in any kindergarten need to observe and know their children well (Fox & Little, 2001). Pre-school children's problem behaviors should be detected and taken under control by their teachers as early as possible and (Stormont, Lewis, & Convington, 2005b). In fact, when appropriate intervention programs are not applied to children who show problem behavior or are in the risk group, many children exhibit these problem behaviors more intensely in their future schooling (Golly, Stiller, & Walker, 1998; MoNE & UNICEF, 2013).

Teachers usually struggle with similar problem behaviors of certain children in their lessons and try to come up with solutions. However, to produce more permanent and effective solutions, it is more important for them to develop an effective intervention program by determining the general needs and characteristics of children and the school to intervene in these problem behaviors, to gain positive behaviors and appropriate social skills (Fox, Dunlap, Hemmeter, Joseph, & Strain, 2003; Fox & Little, 2001). For the program to be applied to intervene in problem behaviors to be effective and efficient, this program should be applicable, reliable, and evidence-based. However, evidence-based intervention methods applied to address problem behaviors are quite limited in the literature. Intervention programs such as the First Step to Success (FSS) (Walker, 1998), Head Start and Positive Behavioral Interventions and Supports (PBIS) (Horner & Sugai, 2000) are the main evidence-based practices that are applied especially to prevent, reduce and eliminate problem/problem behaviors. The Head Start program offers financial and educational services to children aged 0-6 living in socio-economically and culturally disadvantaged living areas (Eliana, Thomas, & Currie, 2002). FSS is an intervention program that can be applied in different age groups and includes classroom and home-supported practices that guide the child to appropriate behaviors (Walker, 1998; Diken & Rutherford, 2005). Among these programs, PBIS is an intervention approach that has been widely used in recent years. When these programs are implemented by following the systematic and scientific application steps and when decisions based on scientific data are made in the implementation process of the programs, they are highly effective in teaching appropriate social skills and behavior (Fox & Little, 2001; Stormont, Lewis, & Beckner, 2005a).

Positive Behavioral Interventions and Supports Approach

PBIS is an approach that has adopted the philosophy of positive psychology and has certain goals. The PBIS approach includes intervention practices that provide children with positive learning environments and individual behavioral support (Horner & Sugai, 2000). According to Horner and Sugai (2000), by setting observable and measurable rules according to the needs and cultural characteristics of the school, the PBIS approach primarily aims to have all children follow these rules.

The PBIS approach aims to increase the level of knowledge and skills of primary caregivers in the family, teachers, and school staff at school in approaching children and supporting them appropriately in their education and training. Thus, children can develop positive behaviors and appropriate social skills (Carr et al., 2002), and so, their living standards improve (Erbaş, 2008; Kincaid et al., 2016).

In the literature, following the general features and implementation steps covered by the PBIS approach, PBIS can be applied at three levels as primary, secondary, and tertiary intervention strategies in schools and classrooms (Lewis & Sugai, 1999; Walker et al., 1996; Sugai & Horner, 2002). In addition, all three levels of the PBIS approach can be applied individually or separately, in all age groups from kindergarten to high school, as well as to individual, classroom, school-wide, or

larger-scale groups (Simonsen, Sugai, & Negron, 2008). A review of the related literature shows that in recent years, especially in the USA, various levels of school, regional or state-wide practices have been performed for all age groups (Kincaid et al., 2016). Nowadays, PBIS is mostly applied at school or province-level because school-wide or provincial practices can produce the most effective solutions to intervene in problem behaviors, especially since they involve collaborative practices of many stakeholders (Bradshaw, Mitchell, & Leaf, 2010).

School-Wide Positive Behavioral Interventions and Support (SWPBIS)

SWPBIS strategies include studies to determine the needs of all stakeholders in the school, taking into account especially the social, cultural, and economic characteristics of the school environment (Bradshaw et al., 2010; Sugai & Horner, 2006). As such, SWPBIS is an evidence-based practice that creates solutions to meet the needs of the school and to equip children with appropriate skills by cooperating with all stakeholders (Lewis & Sugai, 1999). According to Walker et al. (1996), Sugai and Horner (2002), the SWPBIS approach includes especially prevention-based intervention practices at three levels within the framework of the basic features and implementation steps of the PBIS. SWPBIS practices are classified as tier-1, tier-2, and tier-3 interventions. According to Walker et al. (1996), tier-1 level interventions include practices that cover all students by developing effective interventions to plan disciplinary rules at school and interfere with problem behaviors. According to Sugai and Horner (2002), interventions applied at this level generally have a positive effect on 85% of children. Tier-2 interventions include strategies such as identifying children who continue to exhibit problem behaviors despite tier-1interventions or who tend to exhibit problem behaviors, controlling their own behaviors and applying anger management tactics, and initiating school-family cooperation, and interventions applied in small groups to children with behavioral problems in daily life (Sugai & Horner, 2002; Walker et al., 1996). The tier-3 level interventions are implemented for children who continue to exhibit problem behavior despite tier-1 and tier-2 interventions. At this level, individual intervention programs are developed for the child in cooperation with many experts from the child's immediate environment and experts (Walker et al., 1996). If the child showing problem behavior is at high school, it includes high-level interventions such as getting support from correctional houses and providing individual counseling when necessary (Walker et al., 1996). According to Sugai and Horner (2002), this level of interventions covers 5% of all children at school or in classrooms. They are aimed to the problem behaviors of the children that disturb the environment and themselves and cause permanent social-emotional damage in the child that prevent learning. Elements of an effective SWPBIS education model are (a) forming the team (b) determining the goal/behavior to be acquired, (c) gaining the relevant behavior, (d) reinforcing positive behaviors, (e) giving feedback to problem behaviors, (f) measuring and evaluating, and (g) creating a systematic and individual support network (Fox & Little, 2001; Horner & Sugai, 2000; Stormont et al., 2005a). The SWPBIS team decides how and when the SWPBIS will be implemented, and this team determines the level of implementation of the PBIS by taking into account the basic needs of the school (Horner & Sugai, 2000).

SWPBIS strategies can be applied to different age groups in schools. The initial PBIS practices only focused on high school students, but later, secondary school and primary school applications have begun, and since the 2000s PBIS has been implemented with early childhood children (Simonsen et al., 2008). Since SWPBIS is mostly applied in older age groups, applied SWPBIS research on early childhood period is very limited (Fox & Little, 2001). However, the implementation of the PBIS steps does not differ much according to age levels (Stormont et al., 2005a). Compared with the practices for other age levels, the early childhood PBIS practices often appear to include prevention-based interventions because problem behaviors in young children are not yet established as in older age groups. PBIS practices generally consist of four basic components: "system, data, implementations and gains". Similarly, according to Stormont, Lewis, Beckner, and Johnson (2008), SWPBIS practices in early childhood also include these components. Early childhood SWPBIS implementation includes certain steps as in other age levels. According to the literature, these steps are (a) determining three to five behavioral objectives/outcomes by considering the needs of the school and children, (b) equipping children with these behaviors, (c) providing appropriate feedback for the positive and problem

behaviors of children, (d) providing positive learning environments, (e) making objective scales and evaluations and making decisions based on data, and (e) providing systemic and individual support (Horner & Sugai, 2000; Medley, Little, & Akin-Little, 2008).

Considering the national research literature, Melekoğlu (2017) is the first SWPBIS-TR research conducted at the preschool level. This study is a doctoral dissertation, which was developed and implemented to intervene in the problem behavior of young children. In the national literature, there is a limited number of PBIS applications (Atbaşı, 2016; Erbaş, 2008; Olcay, Koç, Vuran, & Köksal, 2020; Ünlü et al., 2013) no evidence-based article is available on SWPBIS-TR for both early childhood and other age levels (Melekoğlu, 2017; Melekoğlu, Bal, & Diken, 2017).

In general, most of the children in national and international schools behave negatively and the lessons are inefficient (Golly et al., 1998; MoNE & UNICEF, 2013). When problem behaviors observed in younger age groups are not eliminated by intervening especially before the age of nine and appropriate behaviors are not achieved, these problem behaviors are maintained in the older ages in various other ways, which become permanent and cause more severe harm to the individual and his/her environment (Foul, Stepensky, & Simonsen, 2012). In addition, such intervention into problem behaviors requires longer time, stronger financial support, and more experts. Therefore, early intervention is critical (MoNE & UNICEF 2013). The interventions for problem behaviors applied in Turkey are quite limited (Çelik et al., 2016; Dereli-Iman, 2013; Melekoğlu, 2017; Tomris, 2012).

With the education model of SWPBIS-TR used in this study, pre-school children were prevented from being labeled as children causing problems in society. When the outcomes of the study are examined, it is clear that it helped attain many environmental and social achievements. Children who display problem behaviors firstly harm themselves psychologically and socio-economically and then harm their close and distant environment. According to the related literature, when appropriate evidence-based practices are implemented with children at appropriate times, their positive behaviors increase and their problem behaviors are reduced (Faul et al., 2012; Golly et al., 1998). Since the current study targets children who exhibit or are at risk of exhibiting problem behaviors in early childhood, prevention interventions were applied at early ages before such behaviors became permanent. Thus, young children displayed appropriate behavioral and social skills and moved to the next level of education more happily and safely (MoNE & UNICEF, 2013). In addition, as the problem behaviors of the child turned into positive over time, it paved the way for a peaceful environment and positive social interaction in the family (Sugai & Horner, 2002). Teachers were observed to deal with problems mostly through traditional interventions such as talking to the child individually, interviewing the family, or punishing the child for the problem behavior. Systematic, sharing, evidence-based practices are developed and implemented according to the socio-cultural characteristics and needs of schools with a team of all stakeholders in the process of intervention to problem behaviors, by applying the SWPBIS education model. Studies conducted in recent years emphasize that large-group collaborative practices produce more effective and lasting solutions in responding to problem behaviors (Kincaid et al., 2016; Melekoğlu, 2017).

Purpose of the Study

In line with the information presented above, this study aims to evaluate the effectiveness of the SWPBIS-TR education model developed to support the appropriate social skills acquisition and reduce problem behaviors of 3 to 6-year-old children and to examine the participant views about the education model. For this purpose, the answers to the following questions were sought:

1. Does the SWPBIS-TR education model make a significant difference between children's social skills pre-test, mid-test, and post-test scores?
2. Does the SWPBIS-TR education model make a significant difference between children's pre-test, mid-test, and post-test problem behavior scores?
3. What are the opinions of administrators, assistant staff, teachers and children about the problem behaviors and social skills at school, and the SWPBIS-TR?

4. What are the parents' opinions about their children's social skills and problem behaviors at home and the SWPBIS-TR?
5. What are the teachers' application levels of their SWPBIS-TR knowledge in their classrooms after the research?

METHOD

This section includes the design of the research, participants, data collection, and data analysis.

Research Design

In this study, one of the mixed methods, "the convergent parallel mixed method" was applied (Hacıömeroğlu, 2013). When using this method, qualitative and quantitative data are collected simultaneously throughout all stages of the research. The reason for choosing this method is to collect and analyze data on the same subject using multiple complementary data sources to examine and understand the research problem in depth (Bütün, 2013; Creswell, 2009). Qualitative and quantitative data obtained by this research method provide data at the same level for the research questions (Creswell & Clark, 2007). As seen in Figure 1, the quantitative dimension of the research was designed as a pre-test, mid-test, and post-test research model without the control group. A public kindergarten school volunteering to participate in the study was determined as the experimental group of the study according to the convenient sampling method. For the qualitative part, semi-structured individual and focus group interviews were conducted. Figure 2 shows the "the convergent parallel mixed method design diagram". In this study the convergent parallel mixed method design was formed in four steps (Melekoğlu, 2017); (a) in the first step, the researchers sought answers to the research questions by using multiple data sources, using data techniques in parallel to each other. In the second step, the data were analyzed using qualitative and quantitative techniques. In the third step, the qualitative and quantitative findings obtained were given independently. In the fourth step, the findings were interpreted to determine the intersecting points of the findings obtained with both data types, their relationships. The findings confirmed each other, combined, and synthesized to examine the research questions in depth (Creswell & Clark, 2007).

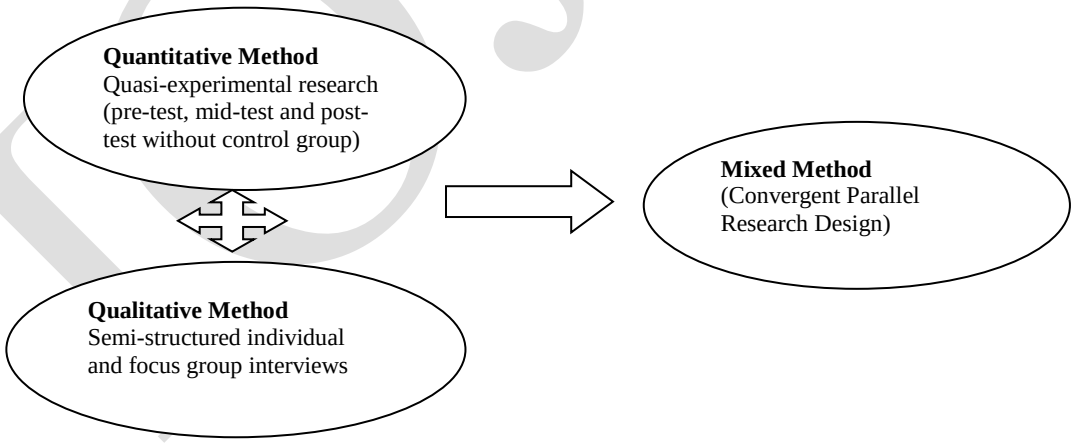

Figure 1. Mixed method research design

Research Setting

The research was carried out in a public kindergarten in a province of Central Anatolia Region of Turkey. Children in the 3-6 years old receive education in this school. In the school, there are five classes in the morning group and seven classes in the afternoon group, and a dual education program is practiced. Research practices were applied in all the classes, but since the teachers of three classes change during the year, four classes from the morning group and five classes from the afternoon group

were included in the study. There are 85 children in the morning group and 161 children in the afternoon group, with inclusive education practiced in all the classes.

Participants

During the research process, the quantitative data were collected from the children and the researcher. The children were administered the scale, and reliability data were collected from the researcher. Qualitative data were collected from teachers, administrators, staff, and parents. Both the ethics committee permission and the consent for voluntary participation from all participants were obtained for the research, and the research data and findings were limited only to the research school and participants.

Children. Since the SWPBIS-TR education model involves the participation of the whole school, all the children in the morning and noon groups participated in the study. For the children to participate in the study, the parents were asked to fill out voluntary participation forms and 152 parents allowed their children to participate in the study. The data of 131 children in total were included in the study because some children dropped out of school or changed their class for various reasons during the research. 84% of the children lived with their parents, and 16% lived with one of their parents. 28% of the children included in the study were girls. There were also children in kindergarten who were officially diagnosed with the need for special education or who only had a doctor's report but whose parents did not want them to be officially diagnosed with disabilities. Most children with disabilities had a diagnosis of autism spectrum disorder (ASD).

Teachers. Nine teachers and two administrators participated in the study. All of the teachers were female and graduates of the pre-school teaching undergraduate program. Most of the teachers were between the ages of 25 and 36 and had 4 to 15 years of experience.

Parents. 25 parents took the pre-test and 16 parents took the post-test. The mothers were on average 30-40 years old and did not work. 42% of the mothers had a secondary school or high school degree, and 58% had an associate degree or advanced degree. 67.4% of the fathers participating in the study were between the ages of 30 and 40, and more than half of them had an associate degree or advanced degree. The parents taking the pre-test and post-test were not all the same. The parents participating in the research were selected using the mixed sampling method. According to the criteria of the mixed sampling method, those (a) easily accessible by researchers, (b) individual applicants for interviews, (c) reaching the researchers with the guidance of the school administration and teachers, and (d) who the researchers randomly met during the entrance and exit hours of the school and agreed to interview were included in the study. Finally, the parents of child with disability and the volunteers of the parents of the students who displayed problem behavior or showed insufficient social skills according to the statements of teachers and parents were given priority.

School staff. Nine staff participated in this study: one cook, two assistant teachers, and six caretakers of them. A semi-structured focus group meeting was held with the school staff during the pre-test and post-test process.

Dependent Variable

The Preschool and Kindergarten Behavior Scale pre-test problem behavior scores, social skill levels, and opinions of teachers/administrators, primary caregivers and school staff in the pre-test period about the problem behaviors and social skill levels of children in the 3-6 age group enrolled in kindergarten.

Independent Variable

The independent variable of this study is the SWPBIS-TR education model. The SWPBIS-TR education model is a set of practices that adopt behavioral, ecological, and positive psychology approaches to reduce problem behaviors of children aged 3-6 and equip them with appropriate behavior and social skills (Stormont et al., 2005a). The SWPBIS-TR education model was developed and applied by researchers based on the school-wide implementations of PBIS in the literature.

The main purpose of the planning, developing, and implementing of the SWPBIS-TR is to equip children with appropriate behavior and social skills and to reduce their problem behaviors. The most important factor in the SWPBIS-TR model is having a good team. A SWPBIS team is composed of administrators, teachers, parents, school staff, and students (Horner & Sugai, 2000). In the SWPBIS-TR team, all administrators, and teachers working at the school and the head of the school family association took part on behalf of the parents. The researchers and the team carried out the planning, development and implementation steps of the SWPBIS-TR education model together. Within the scope of this educational model, school behavioral values were determined as "love, responsibility, sharing, respect, and being safe".

SWPBIS-TR Implementation Steps

The researchers created a draft model based on the literature and implementation examples before implementing the SWPBIS-TR model, because the main elements of the model must be developed with the PBIS team, especially after obtaining the pre-test data (Stormont et al., 2008). Therefore, the school administrators and teachers were informed about the research process. The SWPBIS-TR education model was implemented in one academic year. In the first term, the education model was developed for teacher, family, and staff. The preparation of the necessary materials and the arrangement of the physical environment were completed. In the second term, the model was applied and evaluated.

Before the implementation, the researchers conducted a short-term pilot study that included the stages of collecting data and developing a PBIS model based on the data collected. During the pilot implementation process, not all the stages of the research were performed because applying the SWPBIS takes quite a long time. As part of an SWPBIS education model, appropriate adaptations can be made by intervening in all factors that generally trigger the child's problem behavior. But due to the central governance of education in Turkey and the obligation to follow a single regulation, some adaptations are made at the school based on the central regulations and practices. These are: (a) Instructional adaptations, (b) creating behavioral expectations/rules in the practice school, (c) physical environment adaptations (d) inclusive practices. These regulations usually include primary and secondary level intervention strategies.

According to the literature, SWPBIS practices in early childhood consist of seven steps and three levels of intervention (Fox & Little, 2001; Horner & Sugai, 2000; Stormont et al., 2005a). These seven implementation steps and levels of intervention may vary according to the needs of the specific school. For this reason, the SWPBIS-TR applied in this study consists of four main steps (introduction and development of the education model, implementation, evaluation and monitoring) and 14 sub-steps, and the education model includes tier-1 and tier-2 level interventions (Melekoğlu, 2017; Melekoğlu, Bal, & Diken, 2017). During the development process of the SWPBIS-TR, the draft booklets prepared by the researchers before the application were finalized. The researcher developed three booklets, namely the “application guide, the activities booklet for home and school, and the teacher and family training booklet,” in which all the information about the main steps of implementation, sub-steps of implementation and implementation process of the SWPBIS-TR education model are presented in detail."

The Development of the SWPBIS-TR: The operations performed in this step were completed in 10 sub-steps. The researchers first gathered the pre-test data and formed the school implementation team, during which a needs analysis of the model was made based on the pre-test data on dependent variables. The researchers developed the SWPBIS-TR education model with teachers in 14 weeks. The researchers worked for three hours in a week with the teachers to develop the model. During the process, teachers were informed about the components of the model and the content was created according to the determined need. The researchers organized family training and school staff training on the intervention process in the development of the SWPBIS-TR. In this process, the visuals required for the SWPBIS-TR were prepared and hung in the relevant places, some physical

arrangements were made in the school and the classrooms, and the necessary materials were provided during the implementation (Melekoğlu, 2017).

Application phase of the SWPBIS-TR: SWPBIS-TR includes tier-1 and tier-2 prevention strategies. As the primary intervention strategies, within the scope of the pre-test data, the factors that trigger problem behaviors of children were kept under control. For this, school rules were reviewed and reorganized with the SWPBIS-TR team, the physical environment of the school and classrooms was reorganized according to the MoNE (2012) regulations, (e.g., creating learning centers). Class and school behavior monitoring boards were set up, and the SWPBIS-TR visuals were placed on the appropriate locations. Teacher/family/school staff trainings on the strategies to intervene in children's behaviors according to the PBIS approach were conducted (Melekoğlu, 2017). The matrix related to the target behaviors determined by the pre-test data of the research and forming the dependent variable dimension of the SWPBIS-TR education model is given in Table 1. In this matrix, the positive behaviors and appropriate social skills that children are aimed to gain by replacing their problem behaviors are specified.

Tier-2 prevention includes individual or small group practices that are slightly more concentrated than tier-1intervention strategies for children who still display problem behaviors and tend to show problems despite the implementation of tier-1 intervention strategies. As part of this intervention, the children who continued to exhibit problem behaviors (behaviors determined in the pre-testing period) were taught the rules and instructions by using visuals. The functions of the problem behaviors of these children were determined, and teachers and families changed their behavior and attitude on this issue. Within the scope of this intervention, some revisions were made in the reinforcements and reinforcement schedules given to children.

All the materials and other resources required for the implementation were provided to the practitioners at the beginning. All written and visual materials were placed in the pre-implementation classes and throughout the school. The strategies in the education model were divided into 15-20 days and applied in five sessions in the classrooms. At the end of each session, the administrators, the first researcher and the teachers filled in the implementation reliability forms prepared for them to determine the reliability of the implementation.

Table 1. Kindergarten common behavioral expectation matrix

Behavior	Classroom	Restroom	Dining Room	Indoor & Outdoor Playgrounds	School Bus	School Entrance
Respect	I get in line I raise a hand I use words of courtesy	I ask permission to go to the restroom I wait my turn in the restroom	I stand in line and wait my turn I eat all kind of meals	I stand in line and wait my turn when necessary	I stand in line and wait my turn when necessary I speak with a low voice.	I stand in line and wait my turn when necessary I speak with a low voice.
Love	I listen to people carefully I greet and smile I keep my environment clean	I use toiletries carefully.	I use the items in the cafeteria carefully. I thank the cook.	I share toys and things. I use words of courtesy.	I greet people on the school bus. I use words of courtesy	I greet and smile when entering and leaving school.

Table 1 (Continued). Kindergarten common behavioral expectation matrix

Behavior	Classroom	Restroom	Dining Room	Indoor & Outdoor Playgrounds	School Bus	School Entrance
Being safe	I stand in line and wait my turn I move by walking I put the toys back when I'm done. I go out with my teacher's permission.	I wash my hands with soap and water I stay away from wet ground I stand in line when necessary	I speak in a low voice when necessary. I wash my hands before and after eating. I leave the cafeteria with my teacher.	I wash my hands after playing games. I play where my teacher allows. I stay away from people I don't know. I stay away from dangerous places.	I wear my seat belt. I sit in my own seat.	I wait in my turn under adult supervision. I move on foot when entering and leaving school.
Responsibility	I follow the rules of the learning centers	I do my own work. I use as little water as possible.	I eat my own food.	I use toys carefully and cleanly. I put the toys back after playing with them.	I keep an eye on my personal items.	I dress myself on my way to school and back. I keep an eye on my personal items.
Sharing	I share things in my school and classroom When I want something, I ask for permission	I use toiletries carefully.	I treat my friend sitting next to me nicely.	I share toys and items with my friends.	I'm kind to my friend sitting next to me.	I use school materials carefully.

Data Collection Tools and Process

As part of the research model and questions, the data were collected simultaneously using the qualitative and quantitative data collection tools for the pre-mid-post- test.

Preschool and kindergarten behavior scales [PKBS–2]

This scale was developed to measure the problem behaviors and social skills of 3-6 years old children Alisinanoğlu and Özbey (2009) adapted the scale for the Turkish context with a total of 3317 children aged 3 to 6. The scale consists of two independent parts: Problem Behavior and Social Skills. The Problem Behavior scale consists of four sub-areas: Externalizing, Internalizing, Antisocial and Self-Centered. The Social Skills scale consists of three sub-areas: Social Cooperation Skills, Social Independence and Social Acceptance Skills, and Social Interaction Skills (Alisinanoğlu & Özbey, 2009). It is important that the scale is used by someone who knows the student well, except for the researchers, and that the person administrating the scale has known the student for at least three months. The teachers gave this scale to each student in the pre-mid-post-testing periods.

Social validation forms for teachers and parents

These forms were developed by the researchers and administered in the post-testing to determine the satisfaction of parents and teachers with the SWPBIS-TR. In addition, to determine the social validity of SWPBIS-TR, the data were collected from parents and teachers through individual interviews after the implementation of the SWPBIS-TR was completed.

Implementation reliability form

To evaluate whether the research was conducted by teachers and researchers according to scientific study principles, three different implementation reliability forms were developed: "Researcher and Administrator SWPBIS-TR Implementation Evaluation Form, Researcher Implementation Reliability Form, and Teacher Implementation Reliability Form" (Steed & Webb, 2012; Stormont et al., 2008). The questionnaire items of the implementation reliability forms are evaluated with numbers between one and five as "*Never implemented, Not implemented, Partially implemented, Mostly implemented, and Fully implemented*". The strategies in the model were applied in a total of five sessions at three-

week intervals. The teachers, administrators, and researchers filled the implementation reliability forms after the teachers' related session was completed. The "research implementation reliability form" was filled in by the teacher, the administrators, and the researcher after the research was completed.

SWPBIS-TR follow-up form

The researchers, school staff, and administrators filled the SWPBIS-TR follow-up forms four months after the completion of the SWPBIS-TR to evaluate the effect of the implementation in the school. The teachers evaluated their work and other participants evaluated the work done by the teachers and at the school by making observations in the school.

Semi-structured individual and focus group interviews questions

During the pre-mid-post-test data collection process of the study, semi-structured individual interviews with teachers, administrators, parents, and a semi-structured focus group meeting with school staff were conducted. During the mid-test process, a semi-structured focus group meeting was held with the teachers and administrators. The researchers prepared 10-12 open-ended semi-structured draft interview questions for each participant group to determine the opinions and suggestions of the teachers, school staff, and parents regarding the problem behavior and social skill levels of children. In addition, since the qualitative data were to be analyzed by using the concept of inductive analysis technique, nine draft interview themes were prepared to create the interview coding key in line with the research questions and draft interview questions. Later, this draft semi-structured interview questions and interview coding key were sent to 14 experts to get their opinion. All the experts commented on the draft interview questions and the draft interview coding key. Finally, in line with the feedback from the experts, the interview questions and the interview coding key were finalized.

All of the interviews were carried out by the first researcher, and the interviews were mostly held in the project room allocated for research in the kindergarten. The interviews were held at the appropriate places and times by consulting the participants. The interview began by filling out the ‘Agreement Form" and "Personal Information Forms" and a digital voice recorder were used during the interview. During the focus group interviews, the interviewers were named as "Interviewer 1, Interviewer 2". During the focus group discussion, an expert participated as the report writer.

Data Analysis

Quantitative data analysis procedures

The quantitative data of the study were analyzed through a statistical software program related to social sciences. First of all, the raw data were entered into the statistics program and data entry reliability was ensured. Based on 30% of the data, whether the data were entered correctly in the statistics program was determined and the data entry reliability was found to be 100%. A descriptive analysis was performed to determine the socio-demographic information of the participants, and frequency and percentage calculations were made. After completing the procedures for the data entry, the Shapiro-Wilk test, one of the normal distribution tests, was run to determine the distribution status of the data, and it was decided to use nonparametric tests in the quantitative data analysis.

The differences between problem behaviors and social skills scores on the pre-mid-post-tests of the students participating in the SWPBIS-TR education model were determined by Nonparametric Related Samples Friedman Two-Way Analysis of Variance. In cases where a significant difference in problem behaviors total score was detected, a Post-Hoc analysis was conducted to determine the situations in which these differences exist. The effect sizes were determined by Cohen's r analysis. The range of .10-.30 was evaluated as "small", .30-.50 as "medium", .50-.70 as "large", and .70 and above as "very large" (Cohen, 1988). The same analyses were applied to all the quantitative data.

Qualitative data analysis procedures

The concept of inductive analysis was used in the analysis of the qualitative data because the data on the dependent variable was collected from three different groups of participants, both individual and focus group interviews were held, the interview questions consisted of various probes.

The qualitative data were edited before being analyzed, for which, first of all, the codes were created and the audio recordings of the interviews were transcribed. Next, on 30% of the data, an external researcher checked the reliability of the data transcripts and determined that the reliability was 100%. Participating teachers were named as T1, T2…, the administrators as A1, A2; the parents as P1, P2… and school staff as S1, S2… ". Thus, a pseudonym is used instead of the actual person and place names in the data.

After the qualitative data were put into the interview forms, all the qualitative data were recorded in the code key. The sub-domains of the PKBS-2 scale were taken as a basis for the creation of the main and sub-themes of the concept of inductive analysis data on the problem behavior and social skill levels of the students included in the code key (Alisinanoğlu & Özbey, 2009). The reason why the sub-domains of this scale were taken as basis in the coding process of qualitative data was that the quantitative and qualitative data, whose behavioral indicators in the scale show similarities with the concept of the inductive analysis data, could be better synthesized and interpreted. For the data coding reliability, 30% of each data group (teachers, parents, and focus groups) were randomly selected and given to four experts. The researchers informed the experts about how they carried out the concept of inductive analysis process. Miles and Huberman (1994) state that qualitative data should have a reliability percentage of at least 70% to ensure analysis reliability. The qualitative data coding reliability of this study was decided to be a minimum of 80%. The coding reliability percentage between the four experts and the researchers was found to be 89.78, 80.91, 90.57, and 93.87.

Implementation Reliability

In the study, the research implementation reliability and the reliability of the independent variable were determined. Miles and Huberman (1994) stated that the implementation reliability in scientific studies must be at least 70%. During this study, the scientific study steps were traced from the beginning to the end of the research and the research implementation reliability was calculated as 100%. The data was collected and the average of the total scores for the implementation reliability was calculated. According to the teachers' statement, the implementation reliability of the independent variable was 74.51%, and according to the researcher, it was 71.52% (Melekoğlu, 2017).

Social Validity

All of the teachers marked the options (I agree and I strongly agree) to indicate their satisfaction with the social validity form. When the satisfaction levels of the parents regarding the SWPBIS-TR education model were examined, it was observed that the families who meticulously followed the home activities of their children were quite satisfied with the SWPBIS-TR practices. Within the scope of the SWPBIS-TR education model, 91% of the parents found (a) the type of activities sent home, (b) the arrangements and activities at school, (c) the level of home activities that they can easily implement with their children, and (d) the SWPBIS-TR family education program very useful. 41% of the parents followed all of the SWPBIS-TR family participation and 47% followed some.

Follow-up

After the SWPBIS-TR model was completed, it was a summer vacation. For this reason, research follow-up data were collected two months after the schools opened in September. The preparations at the beginning of the academic year are very important for the SWPBIS-TR education model. During the follow-up data collection, it was observed that the physical arrangements and visuals made within the scope of the SWPBIS-TR education model were still used in the school environments and classrooms. Although the teachers changed their classes, it was observed that they exchanged materials with each other to apply the SWPBIS-TR, which they needed for their own learner groups. In calculating the scores of the research follow-up form, only the items that the participants marked as "Yes" were taken into account. The research follow-up scores were calculated by dividing the total number of "Yes" into the total number of items, and the research follow-up data was found to be 100%. Except for T6, the teachers are observed to have continued to apply the knowledge they acquired during the implementation of the SWPBIS-TR education model.

RESULTS

Since this is a mixed method research, quantitative and qualitative findings are given separately and interpreted by analyzing and synthesizing all the findings in the discussion section.

Quantitative Results

This section includes quantitative findings about the effect of the SWPBIS-TR on children's problem behavior and social skill scores. Results were given in Table 2.

The effect of SWPBIS-TR on children's problem behavior and social skill scores

When Table 2 is examined, a significant difference is observed between the pre-, mid-, and post-test scores for the total *Social Skills* of the children (Chi-Square: 71.694, p<.05), its first subdomain, *Social Cooperation* (Chi-Square: 19.805, p<.05), its second subdomain *Social Independence and Social Acceptance Skills* (Chi-Square: 77.738, p<.05), and *Social Interaction Skills* (Chi-Square: 46.758, p<.05), which is its third subdomain.

Table 2. Pre-Mid-Post-Test Friedman analysis results related to children's social skills levels

Dependent Variable	N	Mean	Standard deviation (Std.Dev.)	Average Rank	Chi-Square (X)	Degree of Freedom (Df)	Significance Value (p)
SST**-Pre	131	78.56	13.15	1.46			
SST-Mid	131	82.53	12.64	2.11	71.694	2	.000*
SST-S Post	131	85.10	11.33	3.43			
SSF1***-Pre	131	40.25	6.12	1.78			
SSF1-Mid	131	41.51	5.55	2.04	19.805	2	.000*
SSF1-Post	131	42.08	4.60	2.18			
SSF2****-Pre	131	25.78	5.26	1.45			
SSF2-Mid	131	27.92	5.24	2.14	77.738	2	.000*
SSF2-Post	131	28.72	4.96	2.41			
SSF3*****-Pre	131	12.53	4.28	1.73			
SSF3-Mid	131	13.09	4.24	1.97	46.758	2	.000*
SSF3-Post	131	14.30	3.17	2.30			

*p<.05, **Social Skills Total Score, *** Social Cooperation (Factor 1), **** Social independence and acceptance (Factor 2). ***** Social Interaction (Factor 3)

The nonparametric Post-Hoc analysis results revealed significant differences between the total *Social Skills* scores on the pre and mid test (z: -5.251, p<.05), mid and post-test (z: -2.564, p<.05), and the pre and post-test (z: -7.815, p<.05). In the effect size analysis, the total *Social Skills* pre and mid test scores of the children were found to be "medium" (.45); mid and final test scores were found to be "small" (.22), and the pre-test and post-test scores were found to be "large" (.68). In other words, the *Social Skills* scores of the children increased significantly compared to the research post-test score, the research pre-test and mid-test scores. Likewise, it was observed that the *Social Skills* mid-test scores of the children increased significantly compared to the pre-test scores.

In the nonparametric Post-Hoc analysis, the increase between the social skills first sub-domain *Social Cooperation* pre-test and post-test scores (z: -3.182, p<.05) was significant, and the increases in the pre-test and mid- test (z: -2.101, p>.05), mid- and post-test (z: -1.081, p<.05) scores were not significant. In the effect size analysis, the social skills first sub-domain *Social Cooperation* pre- and post-test scores of the children were calculated as “small” (.28). In other words, while the *Social Cooperation* score of the children increased significantly after the application compared to the pre-application, it was observed that the increase in the children's *Social Cooperation* score was not significant in the middle of the implementation compared to before, and after the implementation compared to the middle.

According to the nonparametric Post-Hoc analysis results, while the difference between the pre- and post-test (z: -7.723, p<.05) and the pre- and mid-test (z: -5.529, p<.05) scores for the *Social Independence and Social Acceptance Skills* was significant, the difference between mid- and post-test (z: -2.193, p> .05) scores was not significant. In terms of the effect size, the pre- and post-test scores for the second sub-domain *Social Independence and Social Acceptance Skills* were calculated as "large" (.67) and pre- and mid-test scores as "medium" (.48). In other words, the *Social Independence and Social Acceptance Skills* score of the children increased significantly after and in the middle of the implementation compared to before the implementation, and it was observed that the increase in the children's *Social Independence and Social Acceptance Skills* after the application was not significant compared to the middle.

Finally, according to the nonparametric Post-Hoc analysis, the increase from the *Social Interaction Skills* pre- and post-test (z: -4.603, p<.05) and to the mid- and post-test (z: -2.718, p<.05) was significant. However, it was observed that the increase from the pre-test to the mid-test (z: -1.884, p>.05) was not significant. The effect size analysis showed that children's *Social Interaction Skills* pre- and post-test scores had "medium" (.40) effect, and the mid- and post- test scores had a "small" (.24) one. In other words, while the increase in the *Social Interaction Skills* score was significant at the end of the study compared to the beginning and the middle of the study, it was not significant in the middle of the study compared to the beginning.

Table 3. Pre-Mid-Post-Test Friedman analysis results regarding children's problem behavior levels

Dependent variable	N	Mean	Standard deviation (Std.Dev.)	Rank Average	Chi-Square (X)	Degree of Freedom (Df)	Significance (p)
PBT**-Pre	131	38.46	12.85	2.51			
PBT-Mid	131	34.67	11.60	1.95	70.765	2	.000*
PBT-Post	131	33.14	10.86	1.54			
PBF1***-Pre	131	22.72	9.55	2.32	39.934	2	.000*
PBF1-Mid	131	21.12	8.50	2.01			
PBF1-Post	131	20.12	8.00	1.67			
PBF2****-Pre	131	7.42	3.44	2.29	34.479	2	.000*
PBF2-Mid	131	6.49	2.80	1.93			
PBF2-Post	131	6.21	2.68	1.78			
PBF3*****-Pre	131	3.69	1.25	2.26	43.819	2	.000*
PBF3-Mid	131	3.38	1.1	1.92			
PBF3-Post	131	3.25	.92	1.82			
PBF4******-Pre	131	4.64	2.23	2.37	48.704	2	.000*
PBF4-Mid	131	3.68	1.43	1.82			
PBF4-Post	131	3.57	1.36	1.81			

* p <.05, **Problem Behavior Total, ***Externalizing (Factor 1), ****Internalizing (Factor 2), ***** Antisocial (Factor 3), ****** Egocentric (Factor 4)

When Table 3 is examined, it can be observed that the differences between the pre-test, mid-test and post-test scores for the problem behavior of children total (Chi-Square: 70.765, p<.05), the problem behavior first sub-domain *Externalizing* (Chi-Square: 39.934, p<.05), the second sub-domain *Internalizing* (Chi-Square: 34.479, p<.05), the third sub-domain *Antisocial Behaviors* (Chi-Square: 43.819, p<.05), and the fourth sub-domain *Egocentric* (Chi-Square: 48.704, p<.05) are quite significant.

According to the nonparametric Post-Hoc analyses, the difference between the *Problem behavior* pre and mid-test (z: 4.572, p<.05), mid- and post-test (z: 3.274, p<.05), and the pre- and post-test total scores (z: 7.846, p<.05) were significant. In the effect size analyses, the total problem behavior pre- and mid-test scores of the children were found to be "medium" (.40); mid- and post-test scores "small" (.29), and the pre- and post-test scores were calculated to be "large" (.69). In other words, it was

observed that the problem behaviors of the children decreased significantly after the research compared to the pre- and mid-tests. Similarly, the problem behaviors of the children dropped significantly in the middle of the study compared to the beginning of the study.

In the nonparametric Post-Hoc analysis, the differences between the children's Externalizing pre- and mid-test (z: 2.533, p<.05), mid- and post-test (z: 2.718, p<.05) and pre- and post-test scores (z: 5.251, p<.05) were found to be quite significant. In the effect size analysis, the Externalizing total pre- and mid-test scores of the children were found to be "small" (.22), the mid- and post-test scores "small" (.24), and the pre- and post-test scores were found to be "medium" (.46). In other words, *Externalizing* sub-domain significantly decreased compared to the pre- and mid-test scores compared to the posttest. Similarly, the *Externalizing* sub-domain significantly decreased in the middle of the study compared to the pre-study.

The nonparametric Post-Hoc analysis showed that regarding children's Internalizing, the differences between the mid- and post-test (z: 1.205, p<.05), pre- and mid-test (z: 2.265, p<.05), and pre- and post- test scores (z: 4.170, p<.05) were significant. The effect size analysis results indicated that the effect size of the Internalizing pre- and mid-test was "small" (.26), and the effect size of the pre- and post-tests was "medium" (.36). In other words, the mid-test and post-test scores of the Internalizing sub-domain decreased significantly compared to the pre-test scores, and the post-test scores of the children in the Internalizing sub-domain decreased compared to the mid-test scores, but this decrease was not significant.

According to the nonparametric Post-Hoc analysis, the children's Antisocial Behaviors, except the mid- and post-test (z: .803, p>.05), the pre- and mid-test (z: 2.749, p<.05), pre- and post-test scores (z: 3.552), p<.05) was significant. The effect size analysis revealed that the effect size of the Antisocial Behaviors pre- and mid-test scores was "small" (.24) and the effect size of the pre- and post-test scores was "medium" (.31). In other words, Antisocial Behavior sub-domain mid-test and post-test scores decreased significantly compared to the pre-test, but the children's Antisocial Behavior sub-domain post-test scores decreased compared to the mid-test, but this decrease was not significant.

Nonparametric Post-Hoc analysis revealed that the difference between pre- and mid- test (z: 4.386, p<.05), pre- and post-test scores (z: 4.510, p<.05) was significant for the Egocentric subdomain, except for the mid- and post-test (z: .124, p>.05). In the effect size analysis, the children's Egocentric pre- and mid-test scores were calculated to had "medium" (.38) effect, and the pre- and post- test scores to have a "medium" (.39) effect as well. In other words, the Egocentric sub-domain mid-test and post-test scores decreased significantly compared to the pre-test, and the decrease in the children's Egocentric sub-domain score did not decrease significantly compared to the post-test.

Qualitative Results

This section includes findings about opinions of the administrators, teachers, parents, and staff about the problem behaviors and social skills level of children before and after the SWPBIS-TR implementation. Pre- mid- and pos-test findings were given in order.

Opinions of the administrators and teachers about the problem behaviors of children at school before the SWPBIS-TR implementation

The administrators and teachers expressed similar views about the problem behaviors of children at school and in classrooms. The sub-themes of the concept of inductive analysis data on the problem behaviors based on the sub-domains of the PKBS-2 scale were grouped as externalizing, internalizing, antisocial and egocentric behaviors, and the sub-themes data on social skills were categorized as the social cooperation skills, social adaptation and acceptance skills, and social interaction skills. For the data that did not fit into these categories, the sub-theme labeled as "other" was used.

Table 4 shows five sub-themes formed under the main theme labeled "problems encountered," and the opinions except the dependent variable are included in the "other" theme. These sub-themes are "*externalizing behaviors*, *internalizing behaviors*, *egocentric behaviors*, and *antisocial behaviors*". The administrators and teachers stated that children generally show externalizing (12) and egocentric behavior (8).

Table 4. Children's problem behavior definitions according to administrators and teachers

Problem Behaviors Encountered	**N**
Externalizing Behaviors	12
Egocentric Behaviors	8
Antisocial Behaviors	2
Internalizing Behaviors	2
Other	12
Other Problems	
Falling behind in academic skills	4
Falling behind in self-care skills	4
Lack of attention	3
Language, speech and communication problems	3

The sub-theme of exhibiting egocentric behaviors comprises "*always expecting attention and affection, having a mood disorder, trying to get requests done by crying"*. The sub-theme of exhibiting externalizing behaviors includes "*not wanting to obey the rules, avoiding group activities, talking loudly, struggling, harming things and friends, not sharing, yelling, and refusing to tidy up the classroom, not showing respect, and spitting*.". The sub-theme of exhibiting antisocial behavior includes problem behaviors such as "*not wanting to go to school or kindergarten and being restless*". A few teachers reported the problem behaviors they observed as follows:

> I have 22 students. If we consider 3 of them really problematic, 19 others remain. All of the 19 are positive; they do not have any problem behaviors... But these 3 children's problem behaviors are severe, and this disrupts the whole order... The student shouts, shows no violence, does not apply violence in any way to his friends, but he shouts (T9).
>
> I don't want violence; this has been the issue that I had the most difficulty with. Yes, they do this violence. The point I feel most sorry for is that even when playing games, children do it when they are free (T10). That is, we want them to obey the school rules, not to hurt each other, to be respectful, to wait for their turn,… but from time to time, we see them hit each other, I do not know, generally they do not follow the rules (A1).

Table 5. Causes of problem behaviors according to administrators and teachers

Causes of Problem behavior	**N**
Child-related causes	11
School-related causes	9
Family-related causes	6

In the relevant literature, the causes of problem behaviors are classified as home- and school-related (Melekoğlu, 2017). According to Table 5, the main theme of "causes of problem behaviors" is examined under three sub-themes as *"child-related causes, school-related causes, and family-related causes"*. According to the teachers, the biggest reason behind the problem behaviors is the different developmental characteristics observed in children. Thus, the reasons for problem behaviors related to the child include *"their first encounter with the school environment, acting instinctively, being selfish, being ahead or behind in some developmental areas, being too young or old, and having special needs"*.

According to teachers, children do not always exhibit problem behaviors for the same reason. Another most important reason for problem behaviors is school-related. As such, the reasons related to the school include reasons related to *"the poor physical structure of the school and classrooms (overcrowded classes, lack of assistant teachers in classrooms, disorganized classroom environment) and reasons related to classroom practices"*.

Another factor that increases the child's problem behaviors is the "*family-related reasons*". The reasons listed under this sub-theme include the following: "*Families do not offer enough opportunities to their children, lack of rules in the family and at home, doing everything the child wants at home, parents' being too busy, lack of love, raising children in a way to make them oversensitive, family's lack of knowledge about raising children,*

parents being separated." While some teachers clearly stated the reasons for the problem behaviors, some stated the following:

> Can is autistic, so my mainstreaming student certainly didn't eat anything if there was something he didn't like, and I told his mother to put something he liked into his lunchbox, so she began putting milk or cake there (T12). Is it instinctive, is the behaviors at home, or what is happening at school. I cannot figure that out. I mean, what is the basis of all this, the child tries to explain something, maybe he has a problem there, or he could not find a way to express himself (T4).

Opinions of teachers and administrators about social skill levels of children before the SWPBIS-TR implementation

When Table 6 is examined, three sub-themes can be seen under the main theme of "social skill levels of children".

Table 6. Social skill levels of children according to administrators and teachers

Children's Social Skill Levels	N
Inadequate social independence and social acceptance skills	7
Inadequate social communication and interaction skills	6
Inadequate social collaboration skills	4

The "social independence and social acceptance skills" of children are observed to be insufficient. The subtheme of social independence and social acceptance skills observed in children includes the *"Inability to do their work themselves, lack of self-confidence, lack of full trust, inability to defend their rights, not eating food by themselves, not being able to dress and undress by themselves, having difficulty in recognizing their own belongings, fear of different social environments, difficulty in adapting to different environments, not acting in accordance with group rules, fear of separation, and an excessive attachment to parents."*

The sub-theme of social communication and interaction skills includes outcomes such as *"being afraid of communicating and talking, not making eye contact, not being able to empathize, and not greeting"*. Social communication and interaction problems were generally observed in CLDs. The sub-theme of social cooperation skills includes outcomes such as *"not waiting when you need to wait, not wanting to share, not taking turns appropriately before speaking, not obeying the rules, etc."* A teacher explained it as follows:

> For example, I have children who are very successful and very advanced, there are also those in the middle, but there are also those who have no social communication with their friends, I sometimes suspect whether they are special education children, for example. They do not answer my questions, when they speak they give no answers to me (T2).

Table 7. Mainstreaming / inclusion practices at schools according to administrators and teachers

Mainstreaming / inclusion practices	N
Teachers and other staff need information about mainstreaming /inclusion practices	12
Problems with mainstreaming / inclusion practices	12
Children with Learning Difficulties (CLDs) are welcomed by their teachers and friends	7
CLD's having insufficient social skills	4
Assistant teacher support is provided	3
CLD's having behavioral problems	3
Inadequate academic skills	3
Inadequate self-care skills	2

As shown in Table 7, eight sub-themes are formed under the main theme of "Mainstreaming/Inclusion practices". While two of these sub-themes are positive themes, others contain negative situations about *mainstreaming/inclusion practices*. In the kindergarten where the research was conducted, the social

acceptance rate of the CLDs is quite high. However, all of the administrators and teachers emphasized that they need to observe and application examples about special education and mainstreaming, especially at the practice level.

The difficulties with mainstreaming /inclusion practices involve *"The class sizes are not being in line with the legal requirement, the number of both diagnosed and undiagnosed CLDs in the classroom being high, having no cooperation with other institutions where CLDs receive education and the Counseling Research Center (CRC) where they are diagnosed"*. CLDs come to school at different times compared to their peers. They arrive at school 1-1.5 hours late and leave early. In addition, CLDs' families either hire an assistant teacher with their financial means or they wait for their children at school themselves. Some teachers stated the following about mainstreaming:

> At school, we only learned one thing about special education; intellectual disability and the hearing impaired. Now, the students with autism spectrum disorder, which have learned about only. We did not see a Down syndrome, it was not that frequent then, maybe there was no Down case, or maybe they stayed at home so we did not see them… I sat down, searched the internet, and bought books (about these disorders). For example, I had a hyperactive student for the first time this year, (I didn't know) how to approach this child (T11).
>
> …We have a special education student in our classes. It is a beautiful thing for my children, for me, and for my own children, in fact, for them, a different child is necessary. But I think I am inadequate in this regard (teaching them) (T2).
>
> …We are one of the schools with the highest number of mainstreaming students… They (CRC) send a report without any question about how many classes we have, do they have quotas or not, we have to take the child whose report came to us. We call the parent and find out that the parent is unaware of the report (A1).

Opinions of the school staff about the problem behaviors and social skills of children before the SWPBIS-TR implementation

The school staff have views similar to those of the school administrators and teachers about the problem behaviors of children at school. School staff, like the other participants, stated that children behave negatively in the washrooms, common areas, and cafeterias. Some school staff explained the problem behavior of children as follows:

> I think the age group of five has the most active children…A child bumped into me so hard last week that I was out of breath and gasped for a second. I cannot even imagine what would happen if that child hit a little boy (SS2).

According to the assistant staff, children experience serious deficiencies in social skill acquisitions such as getting in a line, using the appropriate tone of voice, and communicating with their friends within the school and classroom. Most of the children do not follow the rules and the school staff find it very difficult to deal with their problem behavior. According to SS4,

According to the school staff, children experience the most inadequate self-care skills especially in the cafeteria. The school staff stated that the children do not want to do their work independently. Children experience inadequacy in identifying their belongings, eating, dressing, and undressing skills. According to AS2,

> The children don't recognize their shoes. Families can instruct them on this and then send them to school; otherwise, the child cannot find his shoes because they send him in a different pair every day. The child forgets where he or she put it. They must put on the shoes themselves. I don't think the adults should put their shoes on for them.

Opinions of the parents about children's problem behaviors and social skill levels before implementation of the SWPBIS-TR

As can be seen in Table 8, three sub-themes were formed under the main theme of *problem behaviors of children at home*.

Table 8. Children's behavior definitions according to parents

Children's Problem behavior at Home	N
Displaying externalizing behaviors	24
Displaying egocentric behaviors	21
Displaying antisocial behaviors	9

Many parents stated that their children generally display egocentric and externalizing behaviors at home, and nine parents stated that their children display antisocial behaviors. The sub-theme of showing externalizing behaviors includes such behaviors as "*not doing their own work by themselves, sibling jealousy, aggression, harming the environment, hitting the primary caregiver, stubbornness, non-obedience, not following the rules, not knowing how to play together, not eating properly, sleeping irregularly, and throwing objects when angry.*" The sub-theme of *showing egocentric behavior* includes "*getting bored quickly, expressing wishes by crying, intervention in the private life of family members.*" The sub-theme of *showing antisocial behavior* includes behaviors such as "*unwillingness to prepare for school, stubbornness, insistence, constantly objecting, crying and running away from school/home*". Some parents explained the problem behaviors they observed in their children as follows:

> Let me tell you the behaviors I don't like. He is extremely stubborn. If he says something will happen, he cries until he gets it done. He screams a lot, I don't know, he throws things around, he has such a habit (P14)". For example, if anything, he hits us to get whatever he wants (P11)".
>
> First of all …he wants a hug from me everywhere, maybe because of his brother who is very keen on me right now. You know, he says mom, take me in your arms, okay, I'll take it, I always do a show of affection, so maybe I do it too much sometimes, but whatever he wants, even the smallest thing, he throws himself on the ground until he gets it. He's already doing it at school (P23)".
>
> It would be a lie if I said I found a solution to this. No, so he's playing (with his phone), but I gave up on that completely and I told myself that he would definitely get bored because we got this (phone) recently. The previous one was broken, could not be fixed for a while. But this time he wants to use our phones, he is constantly trying to install this game on his father's phone. He spends at least 3-4 hours with technological games. He's been playing them for about two years (P7).

Among the parents participating in the study, there are also four parents have a child with CLD. In the interviews, these parents expressed their opinions about "what CLDs generally do at home or at school, the type of disability of these children, where they received the education, the diagnosis steps, and the problems they experienced at school".

Findings of mid-test focus group interview conducted in the middle of the study

Since the implementation of the study was carried out between February and May, a semi-structured focus group meeting was held with the participation of teachers and administrators in parallel with the quantitative data collection, to control possible side effects that may affect the independent variable. The findings obtained from this interview are presented below.

During the mid-test, when the participants were asked about the effect of the SWPBIS-TR education model on their children's behaviors, all of them stated that the problem behaviors they observed in their children started to decrease after the application of the SWPBIS-TR education model and the children started to display appropriate behaviors. They stated that after the SWPBIS-TR

implementation started, children's externalizing behaviors such as "making noise, not picking up their toys, harming toys and friends" decreased.

The findings of the concept of the inductive analysis of the mid-test focus group interview were classified into three sub-themes under the main theme of the effect of the SWPBIS-TR education model on children's behavior. These sub-themes are "*The effectiveness of intervention techniques, the absence of problem behaviors with the start of the implementation, and the decrease of problem behaviors with the implementation*". These sub-themes contain statements like "*I received positive feedback from parents about the intervention* (T12, T10), *center practices were successful, classroom rules were firmly set in place over time, the most challenging student in the class started to exhibit appropriate behavior, and I can control all students with the behavior board application*." (T10). One teacher expressed the effect of the SWPBIS-TR as follows:

> Before the implementation started, there were a lot of problem behaviors among our students. Some of these were family-related, and some were related to the personal characteristics of the child. However, I observed that the activities we did as part of this educational model, the assignments we sent, the behavior boards we used, and the expectations we set by our school… all helped make our children improve, and our parents also reinforced them with their observed feedback (T12).

Findings obtained from the administrator and teacher interviews after the SWPBIS-TR implementation

Table 9. The effect of SWPBIS-TR on the problem behaviors of children

Its Effects on the Problem behavior Levels	N
Discontinuation of problem behaviors with the start of the implementation	11
Continuation of problem behavior	2

As can be seen in Table 9, two sub-themes of SWPBIS-TR were formed within the scope of the main theme of "Effect on the problem behavior levels of children": "the continuation of problem behaviors after the implementation has started". These sub themes are *"Harming their friends decreased, they learned to get along with their friends (T5, T9, T12), bringing students to the administrative room decreased (Y2), many students' behaviors improved, their students were positively affected (T1, T10, T2, T6, T9, T11), they learned the rules (T2, T11, T10, T3, T7, T9), children express themselves better (T2), materials and centers were suitable for the children, and they liked the center practices (T2, T3)".* Some participants explained this as follows:

> **Administrator2:** If we compare before and after the research, there was a lot of confusion in the classes I attended before the project, that is, it was too common for the children to throw toys, throw toys, and hurt each other while playing. After the centers were established, the children were more conscious, calmer, their fidgety movements decreased, I can say that their mobility also decreased. While playing games, they were more respectful towards each other, and they no longer have behaviors like hitting or throwing toys.

Table 10. The effect of SWPBIS-TR on children's social skills

The Effect of SWPBIS-TR on Children's Social Skills	N
Developing social cooperation skills	7
Improvement in social communication and interaction skills	5
Improvement in social independence and adaptation skills	3

As shown in Table 10, the concept of inductive analysis findings of the main theme of SWPBIS-TR's "effect on children's social skill levels" are categorized under three sub-themes: development of social co-operation skills, increase in social communication and interaction skills, and an increase in social independence and adaptation skills. Some the concept of the inductive analysis findings of these sub-themes is "*The ability to make choices developed (T2, T4, T12), the skill of being a queue developed (T5, T9, T10), they learned the determined values (T5), they learned how to behave in different environments (T11), the child learned the*

terms related to social development (T6), sharing and respect increased (T5) and their responsibilities increased (T10) etc." According to the teachers, the best development occurred in the social collaboration skills, thanks to the implementation.

> So, it had a positive effect. We focused more on seeing positive behaviors rather than the problems with social behaviors. We tried not to see the problem behaviors, we tried not to attract attention, actually, they were things we knew but they did not practice (T6).

When the concept of inductive analysis findings obtained regarding the main theme of "the strongest dimension" of the SWPBIS-TR are examined, the sub-themes of "(a) *providing effective behavior and social skills teaching*, (b) *creating a positive physical environment*, (c) *supporting the professional development of administrators and teachers*, and (d) *developing cooperation between school, family and teachers*" emerge. Some participants expressed the positive contributions of the SWPBIS-TR as follows:

> The strongest aspect of the SWPBIS-TR is that it is systematic. In other words, the child perceives the (appropriate) behavior and repeats the same behavior all the time, and also our visuals are in front of his eyes, for example, he sees when he is going to get in a line and not cut in the line to get ahead of his friend, so these are the strong points (T4).

When the effect of SWPBIS-TR on inclusion practices is examined, it can be observed that the teachers developed more positive attitudes towards CLDs, learned new strategies to cope with the problem behaviors of CLDs, and increased their cooperation with the parents. Some findings on this subject are as follows: *"We conducted studies appropriate to the level of the child (T3), learned how to approach children with special needs (Y2), the environmental arrangement of the classroom relaxed the student with special needs (T9), the problem behavior of children with special needs decreased (T10), and the center practices enabled the child to act consciously in the classroom and supported the selection skill (T12)".*

Findings obtained from the interview with school staff after the SWPBIS-TR implementation

It was observed that the school staff agreed with the administrators and teachers about the contribution of the SWPBIS-TR to the improvement of the problem behaviors and to increasing the social skill levels of children. Some findings of the school staff indicated that "*children started putting on shoes and clothes independently, loud speaking and yelling decreased, there was a big difference compared to last year, the display of affection increased, and greeting is going well*".

All of the assistant staff stated that with the SWPBIS-TR education model, especially the achievements of "*social cooperation and social independence*" of children developed very well. Therefore, it was reported that children performed better in skills such as "*forming a line, speaking with a low voice, picking things up themselves*, and *doing their work independently*".

Findings obtained from the interview with parents after the SWPBIS-TR implementation

All of the participants stated that their children especially exhibited externalizing behaviors before the implementation; but that these behaviors were no longer present in their children or that there was a serious decrease in their rate. They stated that children behaved themselves and followed the rules better thanks to the SWPBIS-TR education model.

Table 11. The effect of SWPBIS-TR on children's problem behavior and social skills

Its effects on problem behavior	**N**
Problem behavior stops after implementation	16
Reduction in problem behavior	4
Its effects on social skill level	
Developing social cooperation skills	15
Developing social communication and interaction skills	10
Development of social independence and adaptation skills	7
Continued lack of some social skills	2

Four sub-themes were formed under the main theme of "the effect of the SWPBIS-TR education model on social skill level". These sub-themes include some findings such as *"He has been following the rules more at home for three months, I have been chalking the developments in the child up to the work done at the school, there are improvements in food and sleep time, there were some rules that he did not obey, the problem of eating continues, my child is satisfied with the center arrangement in the classroom,... he never tidied up his room, but now he does*" Some parental views on these findings are as follows:

> For example, after you have told us, he always puts on his shoes himself now, for example he always eats his own food… While he was trying to eat it, I sometimes shoved food into his mouth or something. Thank God now he is now self-confident. He says leave my coat, he says I will put it on (P3). When asked this parent (P3) about the possible reason for this behavior change in his child, she said.
>
> Of course, after I listened to you, I got more information about the project. So let me tell you here too, for example, I was thinking that I was helping the children by putting their shoes on, but now they do it themselves. Slowly, the children have been building self-confidence, and my child has built such self-confidence as well (P3).

As a result, when parents were asked about their opinions about the SWPBIS-TR education model, they stated that the SWPBIS-TR had many effective aspects, which were (a) providing effective behavior and social skills teaching (75%), (b) increasing school-family cooperation (50%), (c) creating a positive physical environment in the school and classrooms (31%), and (d) contributing to inclusive practices (12%). The SWPBIS-TR education model applied during the research process is the first of its kind in the national literature, in whose implementation process multiple participants, methods and tools were included. Melekoğlu (2017) reports many significant findings about the SWPBIS, especially regarding the dependent and independent variables, are included in the current study.

DISCUSSION and CONCLUSION

Some significant findings were obtained with the quantitative and qualitative data collection technique of this study, in which the effectiveness of the SWPBIS-TR education model, which was applied to reduce the problem behaviors of younger age group (3-6 years) children and increase their social skill levels, was tested. This study demonstrates that PBIS is highly effective in early childhood, especially in the intervention of problem behaviors of children and in developing their social skills, as in all age groups. The obtained quantitative and qualitative findings are compared and discussed in light of the literature.

With the implementation of the SWPBIS-TR education model, a significant decrease was observed in the problem behaviors of children. In other words, with the SWPBIS-TR, while children's levels of internalizing, externalizing, egocentric, and antisocial behaviors declined, their positive behaviors increased. Thus, these research results are similar to those reported in the literature (Benedict, Horner, & Squires, 2007; Smith, Lewis, & Strormont, 2011). The "Positive Behavioral Interventions and Support" approach is an evidence-based intervention that is widely applied in many countries, especially in the context of intervention to problem behaviors. However, the studies on the PBIS in Turkey are limited (Melekoğlu, 2017; Ünlü et al., 2013). Also, traditional methods that are applied in schools are ineffective and inadequate for the intervention to problem behaviors (Melekoğlu, 2017; Öğülmüş & Vuran, 2016). The SWPBIS-TR is an evidence-based model that meets an urgent need for intervention in problem behaviors in Turkey.

The qualitative findings obtained during the pre-test, mid-test, and post-test process of the research support the quantitative findings of the research. With this study, behavioral and social skills characteristics of young children were analyzed in-depth by collecting data from multiple sources and types with multiple data collection tools, producing an evidence-based practice example for the national literature. When the qualitative data of the study were examined, the teachers participating in the study, except for the teachers coded as T6 and T11, stated that they did not have any children who showed problem behaviors after the SWPBIS-TR education model was implemented. However, these two teachers stated that the behaviors of children who showed problem behaviors decreased to a

certain extent after the implementation. However, when the research implementation reliability data of the teachers were re-examined, it was found that T6's reliability score was much lower than the research criterion. Similarly, it was observed that the teacher T11 had some weaknesses in following the research steps. The data obtained from school staff also confirm these findings. As such, SWPBIS-TR is an evidence-based set of interventions consisting of data-based decisions and practices. According to the literature, it is critical to perform data-based planning and decision-making both in the development of the PBIS education model and in all other stages (Nelen, Blonk, Scholte, & Denessen, 2020; Stormont et al., 2008). Therefore, the reason why SWPBIS-TR was not effective at the desired level in the classrooms of these two teachers may be due to the failure of these teachers in following the implementation steps appropriately.

When the findings of the study based on quantitative data are examined, it is observed that with the application of the SWPBIS-TR, overall, the problem behaviors of children decreased, and children acquired appropriate behaviors. Similarly, it was observed that there was a significant increase in children's social skill acquisition. In addition, the PKBS-2 scale (Alisinanoğlu, Özbey, & Kesicioğlu, 2012) was taken as a basis informing the sub-themes of the qualitative findings of the study, and the qualitative and quantitative findings were observed to overlap. To create a positive learning environment in schools and classrooms, it is necessary to control the problem behaviors of children and have them gain appropriate behaviors. Similarly, the literature emphasizes that teaching appropriate behaviors and social skills in schools, especially in younger age groups, is as important as teaching academic skills (Algozzine, Daunic, & Smith, 2010). In this sense, the SWPBIS-TR meets a great need for children to gain the appropriate behaviors and social skills.

When the findings of the development of the appropriate social skills of children, one of the dependent variables of this study, were examined, it was seen that children were behind in many social skills such as self-confidence, sharing, and respect, and the need to support their development in these social skills was emphasized. According to Carr et al., (2002) and Sugai et al. (2000), the PBIS approach tries to create positive outcomes for children, based on the child's environment, to help them gain positive behaviors and enable them to acquire appropriate social skills. In other words, PBIS enables the child to develop positive behaviors by making changes in the attitudes and behaviors of the people responsible for education, by making physical adaptations in school and home environments, and by improving the living standards of the child. In the current study, according to the decision on the learning centers included in the MoNE (2013) Preschool Regulation, and within the scope of the SWPBIS-TR practices, the necessary adjustments were made in all variables that negatively affect education quality based on the pre-test findings, by reorganizing the physical environment of the research school, deciding on the learning center activities, training the teachers, and training the parents. For this reason, in addition to contributing to the achievements of the children, the SWPBIS-TR made positive contributions to the professional development of the teachers, parents, and the school in general. In fact, according to the research follow-up data, the teachers applied the PBIS strategies they learned during the SWPBIS-TR implementation in their classes after the research. The SWPBIS-TR helped achieve the desired behavior change in children by making changes in the stakeholders or environments in the children's lives instead of 'repairing' the children, who were viewed by the participants as the primary source of problems in the school and home environment. This shows that the real source of the problems that children exhibit is other people, environments, systems, and practices. The literature states that 80-85% of children exhibit desired behaviors with the tier-1 intervention practices of PBIS (Walker et al., 1996).

In this study, interventions were made to reduce especially problem behaviors of children and improve their social skills, but according to the pre-test findings of the study, children also show a delay in the self-care, academic and communication skills according to their age and have difficulty concentrating on activities. The average time for children to focus and maintain an activity is 15 minutes. In addition, children do not want to participate in group activities that require academic work. As a result of these behaviors, children experience communication problems with their teachers. When the qualitative data of the study were examined in-depth, it was found that teachers used ineffective methods in the teaching of these activities, and individual

differences and children's levels were not taken into account in the implementation of literacy preparation activities. Therefore, when the lessons are not taught effectively and in a planned way, it is inevitable that especially three years old children display problem behaviors. It is very important to eliminate these problems in classrooms. When the MoNE (2013) PEP was analyzed in terms of these problems, the education, planning and implementation procedures were found not to comply with the regulations, and as part of the SWPBIS-TR, teachers made various arrangements such as creating learning centers in their classrooms, in line with the regulation.

Another important finding of the study is that the reason for the problem behaviors of children is stated by the parents as "related to the child, family and immediate environment", and the participants at the school stated that "the family and teachers have more influence on the development of problem behaviors". Similarly, the ecological approach explains the factors that trigger problem behaviors of children like school, home, society, and systems (Yurtal & Yaşar, 2008). Therefore, it is vital to plan the problem behavior intervention in a way that it includes the home and school environment. This study revealed that the main source of problem behaviors is the attitudes of teachers and families and systemic problems. Therefore, it is very important to analyze the root of the problem in the intervention into children's problem behavior.

When the opinions of the participants about the SWPBIS-TR are examined in general, it is clear that the behavioral expectations show similarities with the values education detailed in the MoNE (2013) curriculum. Therefore, with this education model, the process of determining the behavior for children, and planning and teaching the behavior was easy for the teachers. However, the teachers and administrators stated that the preparation and implementation process of the SWPBIS-TR education model requires a more systematic study and planning. In the SWPBIS-TR practices, different behavioral expectations/rules are determined for each age group and these behaviors are matched with certain concepts/values, and children are equipped with them through education, as in values education (Cihan, 2014). However, values education and the SWPBIS-TR education model are different from each other in many respects. For example, decisions taken in the SWPBIS-TR are specific to the school and the children, but the values education is implemented in all Turkish schools in the same way. The values in the SWPBIS-TR are determined especially in light of the pre-test data (Melekoğlu, 2017). When the values education in Turkey was examined in-depth, it was found that workshops related to 12 values such as empathy, tolerance, and friendship were carried out in MoNE schools during the 2015-2016 academic year. However, the concept of value is an intangible concept and it is difficult for children to understand and internalize them. Behavioral expectations/rules and values determined for preschool age children should be concretized in teaching so that children of this age can easily understand them since they are in the pre-operational period, and values that children can identify with their daily lives should be selected according to their age. Thus, the behavioral principles to be adopted by children through the SWPBIS-TR model were determined as "responsibility, respect, safety/trust, love, and sharing" based on the pre-test data. Similarly, it is stated in the literature that three to five concepts should be determined by considering the developmental characteristics of the pre-school children and that the practices planned for these children should include the concepts of "responsibility, sharing, and safety" (Stormant et al., 2008).

The SWPBIS-TR education model was implemented with all children in the school with and without special education diagnosis. It was not found strange by the teachers that there were some children with disabilities in their classrooms. However, teachers cannot plan and implement education by taking into account the individual differences and needs of children (Hundert, 2007). Children diagnosed with disabilities at school cannot benefit from and participate in activities in the school and classroom as much as their peers. In the teacher education part of the SWPBIS-TR, in addition to the content related to PBIS, detailed training was provided on inclusive practices, and the individual characteristics and educational needs of children with disabilities to require special education. However, the SWPBIS-TR education model could not provide the perfect solution to the special education problems of the school. For the purpose of this study, analyses on the problem behaviors and social skills of children with disabilities were conducted and positive results were obtained.

Looking at the post test data of the participants related to the SWPBIS-TR, the teachers and administrators reported that other teachers in many kindergartens in Turkey deal with similar problems, so such SWPBIS-TR practices are needed by other kindergarten teachers and they stated that SWPBIS-TR can be implemented with older age groups. Likewise, school staff and parents emphasized the importance of school-family cooperation and planned and disciplined work in the implementation of this educational model. As indicated by the research findings, positive results can be obtained when systematic and planned studies are carried out in schools.

To sum up, before the implementation of the SWPBIS-TR education model, there were no specific rules followed in schools and classrooms, and all the teachers in the research school generally tried to cope with the problem behaviors by themselves. There was no collaborative work in the school performed by all the teachers to address this issue. The teachers even thought that if they brought up the problems in their classrooms, they would be viewed as incompetent. There were scarcely any joint projects conducted throughout the school or in the same age groups to equip children with the appropriate behavior and social skills. However, in PBIS practices, it is important to determine the behaviors that children should exhibit according to their ages, based on data, and to teach these behaviors in tangible ways.

The number of studies on PBIS in the national literature is quite limited. In the international literature, PBIS education model is an evidence-based practice that is widely applied in the intervention of problem behaviors. The reason why this approach is widely accepted in the international literature is that PBIS can be applied according to the socio-cultural characteristics and needs of schools without requiring scientific adaptation studies and the creation of a positive classroom atmosphere in schools after the implementation. The researchers prepared three booklets, namely the SWPBIS-TR application module, the SWPBIS-TR teacher training module, and the SWPBIS-TR activities module, which were developed and used during the research. However, these are not sufficient. There are many prints or online resources about PBIS, and further research can be conducted on this subject.

The related literature suggests that PBIS can be applied at all grade levels in seven stages (Fox & Little, 2001; Stormont et al., 2008). However, since the present study was the first scientific study in which PBIS was implemented throughout the school and teachers had not taken part in studies related to PBIS, the implementation steps were carried out in 14 steps. Therefore, researchers planning to work on the PBIS approach can contribute to the determination of the most appropriate SWPBIS implementation steps by conducting new research based on the current study.

Limitations and Directions for Future Research

As regards the pre-test data of the study, a total of five main behavioral values, namely "love, sharing, respect, responsibility and trust", were identified and the children were taught these values. In the international literature, there are behavioral values such as "respect, safety, responsibility, diligence and kindness", but for the 3 to 6-year-old children, "being safety /secure, being kind and responsible" are the behavioral values that are commonly required (Stormont et al., 2008; Stormont et al., 2005b). In this study, children in the 3-6 age groups were studied, but researchers can work with children in the younger age groups as well as with older age groups of children.

The participation of many stakeholders in the research is very important, especially in school-wide applications of PBIS. This study had practices both in the school and home environment, but the majority of the work was carried out in the school environment and only the data obtained at the school were included in the study. Therefore, further research can be planned to focus on the home environment. Since the school-wide applications of PBIS require a significant amount of financial resources and multiple researchers, making such studies project-based is highly recommended as well.

Ethics and Conflict of Interest

This study contains main findings of the doctoral dissertation of first author “The Effectiveness of School Wide Positive Behavior Support Model in Early Childhood”. The dissertation was supported by TUBITAK 2214-A program and by BAP project numbered 1409E382 and was accepted by Anadolu University Research Commission. The research was conducted with ethical principles of the

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A VALIDITY AND RELIABILITY STUDY OF THE CREATIVITY-SUPPORTING HOME ENVIRONMENT SCALE

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Abstract

In this study, it is aimed to improve the "Creativity-Supporting Home Environment Scale" for the purpose of determining the level of creativity in the home environment of parents with children aged 3-6 years old. Research study groups were composed of 500 parents across various provinces of Turkey. The scale items written in the context of the literature were presented to field experts for their opinion in accordance with the scale's purpose, and the content validity index was calculated as proof of the scale's content validity (.89). A pretest application of the scale was conducted in accordance with the expert opinion, and the items were examined for their distinctiveness. A test application was conducted for the purpose of demonstrating the factor structure of the scale, and whether or not the data was appropriate for factor analysis by using KMO and Bartlett statistics. Factor analysis based upon principal component analysis was performed with the optimum application of parallel analysis, and according to both parallel analysis and scree plot, it was decided that the structure was four-dimensional. The percentage of the factors explaining the total variance was established as 49.9%. The item test correlation values of the items in each factor were found to be above .30 in accordance with the item analysis results. Two items that did not fulfill the criteria were removed from the scale by performing a confirmatory factor analysis to verify the structure. Factor loadings for 28 items in the scale were found to be higher than .30 and with error variances below .90. It was found that the McDonald's omega coefficients were between .71 and .88, and the Composite reliability coefficients were between .70 and .84 in the calculation of the reliability of the scale scores for each of the scale's four dimensions. For the whole scale, the stratified alpha reliability coefficient was calculated as .87. The obtained findings demonstrate that the "Creativity-Supporting Home Environment Scale" is a valid and reliable scale.

Keywords: Home environment, creativity, preschool children, scale development.

INTRODUCTION

Creativity is not only a thought formed in the mind of the individual, but also the success that emerges based on a synergy of different resources. In this respect, it is insufficient to only train the individual, resources should also be improved in order to develop creativity (Sak, 2014). In this context, creativity has been handled from a systemic perspective from the last century to the present and it has been defined as a continuous dynamic process as a result of both individual and environmental factors **(**Csikszentmihalyi, 2014; Gong, Zhang, & Tsang, 2020; Guo, Zhang, & Pang, 2021; Martínez, 2007; Nakano & Wechsler, 2012; Özer & Polat, 2019; Robinson, 2013; Sawyer, 2012; Simonton, 2008).

It is quite difficult to say what actually makes a child creative. According to Ellermeyer (1993), a creative child may arrive at many different, unusual, original, or detailed solutions. Taneri (2012) stated that creative thinking is a skill needed to adapt to the world of today and the future. According to Kaufman and Sternberg (2007), creative people solve problems in a convenient, advanced, and high-quality way. Problem-solving helps children feel in control, become aware of changes, and cope with difficulties. The process of becoming creative involves solving problems. Problem solvers are capable of recognizing problems and engaging their conscious and unconscious minds in order to realize an effective solution. Individuals with advanced problem-solving skills value the ideas of others as much as they value their own when it comes to solving problems (Herget, 2016).

It has been accepted by many researchers that in early childhood, the family, which is the closest context of children, has an important impact as it represents a starting point in their learning (Koslinski & Bartholo, 2020; Koslinski, Gomes, Rodrigues, Andrade, & Bartholo, 2022; Rodrigues & Muanis, 2020). The first and most crucial social group in the development of children's creativity is undoubtedly the family environment into which they are born. A child's first teachers are therefore its parents, whilst members of the wider family may also help a child's creativity to flourish. Research has shown that parents shape their children's creative abilities in various ways (Esquivel & Hodes, 2003; Greenspan, Solomon, & Gardner, 2004; Uçar, 2021). Parents effectively act as gatekeepers for their children. According to Berk (2001, p. 28), parents open or close many learning paths depending on the experiences that each offers to their children. This includes toys, books, watching television, having access to a computer, weekend trips, tutoring, spending time with grandparents and other extended family members, as well as the quality of childcare and school education. Children are deeply influenced by their parents, and in providing their children with additional opportunities, parents actively support their child's development and give a clear message that they care. Berk (2001, p. 246) explained this by saying that parental warmth combined with sound, consistent, rational, and appropriate expectations for mature behavior can be said to support child development. However, both Taneri (2012) and Zimmerman (2009) underlined that most parents are not fully aware of the meaning of creative thinking as a skill; therefore, the awareness of these skills needs to be increased among both parents and teachers. Parents have emphasized that it would be very beneficial for them to know how to apply this awareness in order to encourage their children's skills in both problem solving and creative thinking.

When it comes to exploring children's skills in creative thinking, it is considered both important and beneficial for parents to create a safe and supportive home environment. Gardner (1991) stated that exposing children to different materials within the family environment will help to improve their problem-solving skills, and therefore help children find their strengths, passions, and interests. According to Taneri (2012), parents should give more responsibility to children in order to facilitate the development of the children's self-confidence and risk-taking. In order to encourage learning in children and to help support their problem-solving skills acquisition, it should be ensured that the environment is appropriately comfortable so as to entice children to participate (Caroll & Tucker, 2007). However, parents are required to pose several questions when children are attempting to solve problems or think creatively. This helps to stimulate the children's thinking and for them to perceive organizational structures, as well as to mechanize the internal control necessary for success in life. Bresler, Thompson, Chapman, and Ayers (2002) stated that children who participate in activities along with their parents, students, and their peers can learn a significant number of cognitive and physical skills.

Creativity in the parent-child relationship covers behaviors that help parents to acquire an appropriate mindset and attitude, as well as the personal qualities and skills necessary for their child's creativity to flourish (Kwasniewska, Gralewski, Witkowska, Kostrzewska, & Lebuda, 2018, p. 14). In the parent-child relationship, there is a requirement to encourage the acquisition of new and diverse experiences, to support some incompatible attitudes and independence, to strengthen perseverance in the fulfillment of creative tasks, and to encourage and support imagination in order to develop creativity within the

parent-child relationship (Kwasniewska et al., 2018; Kwasniewska & Lebuda, 2017). All these factors have a reinforcing effect on the integrative development of children, with a particular focus on creativity development. Gaining new and varied experiences, and encouraging new ideas and interests enhances a child's sense of creativity and enriches their cultural capital (Gute, Gute, Nakamura, & Csikszentmihalyi, 2008; Soller, 2004). Studies in this field have increased gradually in line with the growing necessity to understand the actual nature of creativity (Craft, McConnon, & Matthews, 2012; Kucirkova & Sakr, 2015; Runco, 2003; Sumiyati, Indriasih, & Sumaji, 2020). These studies have also indicated that the golden age of creativity is early childhood (Alfonso-Benlliure, Meléndez, & García-Ballesteros, 2013; Alfuhaigi, 2015). On the other hand, although many studies have indicated how schooling affects creativity (Elibol, 2021; Pugsley & Acar, 2020; Runco, 2003; Torrance, 1968), it is also understood that the effect of the parents and the family environment on creativity has not yet been studied to a sufficient level (Pugsley & Acar, 2020). Emphasis has been made that such studies are required in order to provide opportunities to establish solutions to problems concerning creativity (Puccio, 1999), to conduct activities such as brainstorming, to follow clues and complete stories (Tulumello, 2009), and to create environments that enable children to learn the value of their own creativity (Gayret, 2021; Vygotsky, 2004). Doing so would support the creativity development of parents and also their children in research studies conducted both nationally and internationally. In the context of such research, a child should be able to express their ideas freely within the environment in which they live and should not feel that they may be admonished for having such ideas. When the literature is examined, there are very few studies that have examined the relationship between the home environment and children's creativity. Considering the research undertaken outside of Turkey, Pugsley and Acar (2020) examined the effect of parenting style and the home environment on children's creativity, Jankowska and Gralewski (2020) examined the effect of a creative home environment on parenting styles in the child-family relationship, whilst Oh and Choi (2006) developed the Creativity-Supporting Home Environment Scale for Preschool Children. When the studies conducted within Turkey were analyzed, it was found that Can Yaşar and Aral (2011) examined the effect of parental education level on 6-year-old children's creative thinking skills, whilst Erbay and Çağdaş (2007) examined whether the education levels of mothers and their behavior towards their children had any effect on their children's creative thinking levels, and Özyürek and Bedge (2016) examined the effect of teacher and parent attitudes on the problem-solving skills of preschool children.

In terms of the emergence and development of creativity, when children are supported by qualified stimuli and activities within the family environment into which they were born, this makes it easier for thinking skills to be acquired such as learning to establish relationships between different situations and events, asking appropriate questions, reasoning, discussing, deep thinking, discovering, and also evaluating and testing can play an important role in their future lives. However, parallel to this, it is also possible for children to reach their highest potential at the end of their school education when activities are presented or made available to them that support creativity in the home as well as at school (Elibol, 2021; Gino & Wiltermuth, 2014; Khaleque, 2013). In this context, it is thought that the development of a culture-specific measurement tool that aims to assess the creativity level of children aged 3-6 years old would contribute to the existing studies published in this field. The aim of the current study is, therefore, to assess the validity and reliability of the "Creativity-Supporting Home Environment Scale" (CSHES), which was created to determine the level of creativity within the home environment of children aged 3-6 years old. As can be seen from previous studies conducted within Turkey, no other measurement tool exists that can be used to determine the creativity level of children within the familial environment. In accordance with this purpose, the current study seeks to answer the following research questions:

1. Is the Creativity-Supporting Home Environment Scale a valid measurement tool?
2. Is the Creativity-Supporting Home Environment Scale a reliable measurement tool?

For this purpose, data gathered using the Creativity Supporting Home Environment Scale were limited to 500 parents of children aged between 3 and 6 years old, who reside in various provinces across

Turkey, and were collected through face-to-face and online means, taking into account the conditions in place due to the COVID-19 pandemic at the point when the study was undertaken.

METHOD

This research is a scale development study that aims to develop the "Creativity-Supporting Home Environment Scale" for parents with children aged 3-6 years old. Survey method was used in the development process of this scale. Survey studies applied to a whole population, or to a group of examples or samples taken from it, may consist of many elements in order to make a generalized judgment about the population (Karasar, 2002). In the current study, answers to questions regarding the home environment of children, and how the home environment is considered creative were sought, with each situation attempted to be defined as they are.

Study Group

The current research was conducted during the Fall and Spring semesters of the 2019-2020 Academic Year with three different study groups, each consisting of parents with children aged 3-6 years old. The convenient sampling method was used to form the study groups of the research. A pretest application was conducted with the first study group which consisted of 40 mothers (80%) and 10 (20%) fathers. A pilot study was applied to the second study group, which consisted of 220 (88%) mothers and 30 (12%) fathers in order to assess the dimensionality of the scale. Data were then collected from the third study group which consisted of 184 (92%) mothers and 16 (8%) fathers in order to confirm the factor structure of the scale.

According to Ferguson and Cox (1993), and Gorsuch (1983), at least 100 participants are required to be reached in order for factor analysis results to be deemed reliable, whilst Kline (1994) stated that a sample of 200 people would be sufficient for factor analysis results reliability. From the research of Cattell (1978), participants totaling 3-6 times the number of items in a scale should be included in the study group in studies looking to perform factor analysis. Based on these guidelines, it may be said that the study group in the current research reached a sufficient number of participants.

The Development Process: Creativity-Supporting Home Environment Scale

The stages set out by DeVellis (2016) were followed in the development of the "Creativity-Supporting Home Environment Scale," which aims to determine the level of creativity in the home environment in accordance with the opinions of parents with children aged 3-6 years old.

The content of home environments with children was determined in terms of creativity in the development process of the scale. As a result of the literature review, it was determined that the social and psychological environment as well as the physical environment can affect the creative thinking skills of children (Oh & Choi, 2006; Özerbaş, 2011). In this context, the physical, social, and psychological attributes of the environments were also taken into consideration whilst preparing the media content. Additionally, five dimensions were determined in the scale according to a review of the literature whilst preparing the scale: Respect, Rich Learning Environment, Play, Encouragement, and Communication.

After defining the attributes to be measured and having established the boundaries, the process of creating an item pool took place. A total of 55 items were included in the item pool: eight items for the Respect factor (e.g., "I listen to the questions my child asks," "I always respect my child's thoughts," etc.), 13 items for the Rich Learning Environment factor (e.g., "I often exhibit my child's products at home," "I always recommend new activities to my child," etc.), 11 items for the Play factor (e.g., "We decide together with my child when choosing what to play," "I don't always let my child win while playing," etc.), 11 items for the Encouragement factor (e.g., "When my child doesn't know what to do, I give them time to figure it out, talk about my child's dreams," etc.), and 12 items for the Communication factor (e.g., "I ask my child open-ended questions, tell my child how to behave in certain situations," etc.).

The draft item pool was submitted for expert opinion in order to determine the content validity of the pretest form, which consisted of all 55 items. Expert opinion was sought from 11 faculty members in total; from the subject area (n = 8), from Measurement and Evaluation in Education (n = 2), and from Turkish language (n = 1). The experts were each asked to express their opinion as to whether or not the items proposed for the scale were "appropriate," "partially appropriate," or "inappropriate," and to state any suggestions they may have where they expressed an opinion as partially appropriate or inappropriate. In accordance with the expert opinions received, the content validity ratios (CVR), developed by Lawshe (1975), and were calculated for each item. Whether the CVR values obtained were significant at the α = .05 level for each dimension was examined in accordance with the content validity criterion. Accordingly, two items with low content validity ratios (CVR = .27 and .45) were removed from the scale. The Content Validity Index (CVI) of the 53-item scale was calculated as .89. Lawshe CVRs calculated according to expert feedback are presented in Table 1.

Table 1. Lawshe content validity ratios for each items

Item Number	Lawshe CVR	Item Number	Lawshe CVR
1	.27*	29	.81
2	1	30	.81
3	1	31	1
4	.82	32	1
5	.64	33	1
6	1	34	.81
7	.81	35	.81
8	1	36	1
9	.81	37	1
10	1	38	1
11	.81	39	1
12	1	40	1
13	.45*	41	1
14	1	42	.81
15	1	43	1
16	1	44	1
17	1	45	.81
18	1	46	1
19	.81	47	.64
20	.81	48	1
21	.81	49	1
22	.81	50	1
23	.81	51	.64
24	1	52	1
25	1	53	.81
26	.64	54	1
27	.81	55	.81
28	.81		

*Items removed from the scale due to low CVR

Certain language changes were applied as suggested by the experts. The pretest (i.e., second version) scale consisted of five dimensions and 53 items in line with the expert opinions received. These dimensions were "Caring for Ideas" (7 items), "Rich Learning Environment" (12 items), "Play" (11 items), "Encouraging Independence" (11 items), and "Communication" (12 items). It was then decided to rank the scale as a 4-point, Likert-type instrument, scale items were ranked from "1" (*never*) to "4" (*always*). A directive containing the purpose of the scale, its practitioner, and their personal information was then added to the scale form.

Data Collection

The scale was applied to parents who wanted to participate in the study by filling out the Volunteer Participation Form on a voluntary basis. Each parent participating in the application was informed about the subject, purpose, and importance of the research. In preparation for the data collection phase, an application in paper-and-pencil form was applied to 25 parents with children between the ages of 3-

6 years old by the researchers in order to determine whether any problem existed in terms of the comprehensibility of the scales. No problems were identified in terms of clarity as a result of the application. Later, the pretest form of the scale was applied to the first study group in paper-and-pencil form and the necessary adjustments were conducted in accordance with the performance of the item examined. The test and actual applications of the scale could not be applied in paper-and-pencil form due to the pandemic, and were instead carried out electronically by creating an online form. No erroneous or missing data was detected in the applied scales. All participants answered the scale items completely. How to complete the scale in face-to-face applications was explained by the practitioner; whereas, for online applications, information instructions were presented on how to apply the scale.

Data Analysis

Analyses were conducted using the parallel analysis technique, confirmatory factor analysis (CFA), correlation coefficients, and reliability coefficient calculations in order to examine the statistical validity and reliability of the developed Creativity-Supporting Home Environment Scale. The item discrimination power of the scale items was examined through corrected item-total score correlation and upper-lower group analysis. The suitability of the scale data for factor analysis was examined by calculating KMO (Kaiser-Meyer-Olkin) and Bartlett statistics using IBM's SPSS Version 25.0 package program. According to Timmerman & Lorenzo-Seva (2011), factor analysis was conducted based on principal components analysis with the FACTOR 10.10.01 program with the optimum application of parallel analysis in order to examine the factor structure of the scale. Confirmatory factor analysis was performed with LISREL 8.8 in order to confirm the determined factor structure of the scale. The reliability of each dimension of the scale was analyzed by calculating the McDonald's omega coefficients, Composite reliability coefficients and for the whole test Stratified Cronbach's alpha was calculated using SPSS Version 25 and R software.

RESULTS

Validity Proofs

In order to answer the first research question of the study, item analyses were conducted, and parallel analysis and Confirmatory factor analysis were performed in order to obtain evidence of the measurements' construct validity. A total of 53 items were written under the titles of Caring about Children's Ideas, Creating a Rich Learning Environment, Play, Environments that Encourage Independence, and Communication for the "Creativity-Supporting Home Environment Scale" which was developed within the scope of the current research. The items were initially applied to a pretest group of 50 participants, the item discrimination was examined by calculating the corrected item-total score correlations over the obtained dataset, and the results are presented in Table 2.

Table 2. Corrected item-total score correlations of Creativity-Supporting Home Environment Scale

Corrected item-total score correlation		Corrected item-total score correlation	
m1	.638	m28	.545
m2	.621	m29	.340
m3	.588	m30	.348
m4	.631	m31	.609
m5	.672	m32	.522
m6	.543	m33	.354
m7	.589	m34	.624
m8	.495	m35	.355
m9	.594	m36	.573
m10	.314	m37	.625
m11	.462	m38	.451
m12	.431	m39	.348

Table 2 (Continued)**.** Corrected item-total score correlations of Creativity-Supporting Home Environment Scale

Corrected item-total score correlation		Corrected item-total score correlation	
m13	.467	m40	.559
m14	.470	m41	.652
m15	.483	m42	.581
m16	.581	m43	.585
m17	.541	m44	.466
m18	.547	m45	.517
m19	.380	m46	.601
m20	.497	m47	.606
m21	.102	m48	.541
m22	.041	m49	.408
m23	.166	m50	.421
m24	.284	m51	.525
m25	.139	m52	.569
m26	.469	m53	.463
m27	.392		

According to Table 2, it is understood that the corrected item total score correlation of all but five of the scale's items (Items 21-25) was greater than .30. As such, it can be said that the five items have low discrimination power and are therefore insufficient for measuring the relevant attribute in the scale as they have a factor loading value of less than .30 (Hair, Black, Babin, & Anderson, 2010**)**. Therefore, it was decided to remove these five items from the scale.

Within the scope of the research, factor analysis based on principal component analysis was performed with the optimum application of parallel analysis (Timmerman & Lorenzo-Seva, 2011) in order to examine the structure of the scale with data collected from 250 participants. During the factor analysis, items with a factor loading less than .30 and also overlapping items were excluded from the analysis. In this context, 18 items (Items: 10, 11, 13, 14, 16, 17, 19, 26, 30, 32, 33, 36, 37, 38, 39, 40, 43, 44) were excluded and the analysis was repeated after each exclusion. Finally, the calculated KMO (Kaiser-Meyer-Olkin) and Bartlett statistics values (KMO = .90; Bartlett's statistic = 2742.0, *SD* = 435, *p* = .000) were examined prior to the factor analysis. With a KMO value greater than .60 and the Bartlett test results showing a statistically significant difference, this indicated that the data and sample size was considered suitable for factor analysis (Tabachnick & Fidell, 2012). The eigenvalues and explained variance ratios are presented in Table 3.

Table 3. Eigenvalues & explained variance ratios of Creativity-Supporting Home Environment Scale factors

Item	Eigenvalue	Explained variance ratio	Cumulative Explained Variance ratio
1	9.838	.328	.328
2	1.977	.066	.394
3	1.622	.054	.448
4	1.524	.051	.499
5	1.129	.038	
6	1.052	.035	
7	1.006	.034	
8	.926	.031	
9	.878	.029	
10	.862	.029	
11	.777	.026	
12	.751	.025	
13	.694	.023	

Table 3 (Continued)**.** Eigenvalues & explained variance ratios of Creativity-Supporting Home Environment Scale factors

Item	Eigenvalue	Explained variance ratio
14	.659	.022
15	.620	.021
16	.591	.020
17	.573	.019
18	.526	.018
19	.508	.017
20	.437	.015
21	.421	.014
22	.362	.012
23	.349	.012
24	.335	.011
25	.330	.011
26	.319	.011
27	.276	.009
28	.233	.008
29	.219	.007
30	.205	.007

The variance ratio explained by the first factor of the Creativity-Supporting Home Environment Scale was 32.8%, for the second factor it was 6.6%, the third factor was 5.4%, whilst the variance ratio explained by the fourth factor was 5.1%. Together, the four factors explained 49.9% of the variance in the Creativity-Supporting Home Environment Scale. As can be seen from Table 3, there were seven factors with eigenvalues above 1. On the other hand, the recommended number of dimensions is four in accordance with the parallel analysis performed based on a 500 (Timmerman & Lorenzo-Seva, 2011) random correlation matrix. In addition, in the scree-plot of Figure 1, it can be seen that a flattening begins following the fourth factor. Therefore, it was decided that a four-factor structure best fits the data.

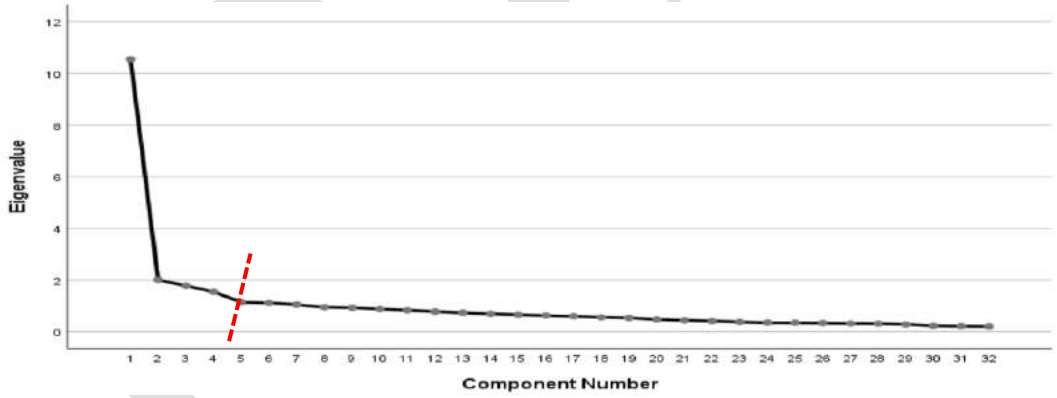

Figure 1. Creativity-Supporting Home Environment Scale scree-plot

Factor loadings of the Creativity-Supporting Home Environment Scale are presented in Table 4.

The loading of Factor 1 was seen to vary between .481 and .830, whereas for Factor 2 it varied between .487 and .756, for Factor 3 it was between .467 and .791, and for Factor 4 the loading varied between .43 and .786. It can therefore be said that the items serve their purpose within the dimension that they reside as the factor loading for each item was higher at .30. When the items were examined under their factors, the first factor was named "Caring for Ideas," the second factor "Rich Learning Environment," the third factor "Play and Encouraging Independence," and the fourth factor "Communication."

Table 4. Factor structure of the Creativity-Supporting Home Environment Scale

Item	Factor 1	Factor 2	Factor 3	Factor 4
1	**.730**	-.038	.053	.008
2	**.481**	-.074	.157	.025
3	**.561**	-.007	.15	.074
4	**.663**	.128	-.003	-.105
5	**.775**	-.068	.046	.049
6	**.830**	-.092	-.109	.018
7	**.820**	-.006	-.146	.056
8	**.698**	.19	-.112	-.051
9	**.592**	0	.079	-.005
12	.204	**.487**	.116	.023
15	.126	**.664**	.051	.045
18	.111	**.756**	-.034	-.051
35	-.118	**.654**	.031	.100
20	.163	.215	**.467**	-.150
27	-.091	-.11	**.739**	.074
28	.044	.006	**.791**	-.08
29	-.127	.189	**.680**	-.006
34	-.049	.049	**.615**	.099
31	.201	-.106	.204	**.430**
41	-.079	.129	.151	**.543**
42	.021	.008	.061	**.611**
45	.102	.187	-.213	**.664**
46	.155	-.078	.064	**.656**
47	-.002	.12	.071	**.651**
48	-.095	-.129	.05	**.786**
49	-.075	.014	-.168	**.769**
50	-.149	.351	-.365	**.715**
51	.123	-.059	-.108	**.758**
52	.08	-.012	.049	**.643**
53	-.124	.291	-.058	**.588**

In order to examine the item discrimination power of the scale items, the scale scores were ordered from the highest to the lowest, with those in the top 27% as the upper group and those in the lowest 27% as the lower group. The significance of the difference between the upper and lower 27% groupings was examined with *t*-test, and the results are presented in Table 5.

Table 5. Item analysis of Creativity-Supporting Home Environment Scale

Factor	Item	Item-Total Score Correlation	Corrected Item-Total Score Correlation	Upper Group		Lower Group		
				Mean	Std.Dev.	Mean	Std.Dev.	t
Caring for Ideas	1	.745*	.660	3.60	.55	2.41	.81	9.992*
	2	.595*	.479	2.85	.83	2.18	.77	4.912*
	3	.727*	.627	3.19	.72	2.13	.81	8.075*
	4	.661*	.554	3.15	.72	2.31	.72	6.809*
	5	.794*	.728	3.46	.58	2.49	.68	8.927*
	6	.715*	.624	3.34	.70	2.38	.75	7.642*
	7	.739*	.661	3.69	.50	2.65	.89	8.421*
	8	.670*	.570	3.35	.66	2.54	.87	6.089*
	9	.663*	.550	3.43	.63	2.49	.97	6.711*
Rich Learning Environment	12	.714*	.471	3.53	.66	1.96	.53	15.361*
	15	.784*	.588	3.57	.58	1.91	.45	18.668*
	18	.749*	.514	3.68	.61	1.91	.59	17.130*
	35	.674*	.409	3.65	.54	2.09	.59	16.046*
Play and Encouraging Independence	20	.610*	.382	3.62	.57	2.25	.76	11.838*
	27	.668*	.461	3.71	.52	2.22	.77	13.186*
	28	.777*	.605	3.85	.36	2.01	.68	19.738*
	29	.672*	.470	3.59	.63	2.07	.53	15.224*
	34	.709*	.490	3.71	.60	2.00	.77	14.380*

Table 5 (Continued)**.** Item analysis of Creativity-Supporting Home Environment Scale

Factor	Item	Item-Total Score Correlation	Corrected Item-Total Score Correlation	Upper Group Mean	Upper Group Std.Dev.	Lower Group Mean	Lower Group Std.Dev.	t
Communication	31	.625*	.536	3.54	.66	2.13	.69	12.233*
	41	.643*	.560	3.81	.43	2.41	.80	12.717*
	42	.667*	.590	3.72	.57	2.37	.71	12.258*
	45	.701*	.628	3.75	.47	2.29	.73	13.778*
	46	.743*	.683	3.84	.37	2.37	.64	16.312*
	47	.733*	.671	3.72	.51	2.32	.66	13.818*
	48	.681*	.607	3.79	.48	2.32	.70	14.327*
	49	.627*	.544	3.63	.69	2.41	.60	1.982*
	50	.575*	.471	3.44	.85	2.18	.57	1.156*
	51	.736*	.673	3.91	.29	2.43	.68	16.685*
	52	.705*	.635	3.87	.34	2.43	.72	14.932*
	53	.630*	.539	3.54	.72	2.16	.59	12.242*

*p<.05

As can be seen from Table 5, the corrected item-total score correlation values for the Caring for Ideas factor were found to be between .479 and .728, whilst for the Rich Learning Environment factor they were between .409 and .588, for the Play and Encouraging Independence factor they were between .382 and .605, and the corrected item-total score correlation values for the Communication factor were found to be between .536 and .683. When the item-total score correlations were examined, it was determined that they were between .595 and .794 for the Caring for Ideas factor, between .674 and .784 for the Rich Learning Environment factor, between .610 and .777 for the Play and Encouraging Independence factor, and between .625 and .743 for the Communication factor. As a result, it may be stated that the items each serve their purpose. As a result of the *t*-test between the upper and lower groups, a significant difference was found to exist for all of the prepared items ($p < .05$). In accordance with this, it may be said that the items in the Creativity-Supporting Home Environment Scale are successful in distinguishing individuals in the lower and upper groupings.

Confirmatory Factor Analysis Results of the Creativity-Supporting Home Environment Scale

A four-dimensional structure consisting of 30 items was obtained as a result of the parallel factor analysis for the Creativity-Supporting Home Environment Scale developed within the scope of the research. The first factor, "Caring for Ideas," consists of nine items (Items 1-9), the second factor, "Rich Learning Environment," consists of four items (Items 10-13), the third factor, "Play and Encouraging Independence," consists of five items (Items 14-18), whilst the fourth factor, "Communication," consists of 12 items (Items 19-30).

Confirmatory factor analysis was performed by collecting data from 200 parents again in order to confirm the structure determined by parallel analysis. While confirmatory factor analysis was performed, model-data fit was evaluated by examining model-fit indices, factor loadings, and also error variances. In the first confirmatory factor analysis, it was determined that there were two items (Item 50 and Item 53) with a factor loading below .30. Item 50, with the lowest factor loading (.14) and the highest error variance (.98) was removed from the scale and the analysis was then repeated. After Item 50's exclusion from the analysis, Item 53 was also excluded since the factor loading of the item was still below .30 (factor loading = .26; error variance = .90). After these two items were excluded, the subsequent confirmatory factor analysis revealed that the factor loadings for all items were shown to be higher than .30. The obtained factor loadings and significance values are presented in Table 6.

Table 6. Factor loadings and error variances obtained as a result of confirmatory factor analysis

Item	Caring for Ideas	Rich Learning Environment	Play and Encouraging Independence	Communication	Error Variance	*t*	*p*
1	.57				.68	-	-
2	.47				.78	4.95	< .05
3	.67				.54	7.84	< .05
4	.64				.59	6.59	< .05
5	.70				.51	8.21	< .05
6	.63				.60	9.49	< .05
7	.63				.61	7.55	< .05
8	.55				.70	7.14	< .05
9	.51				.74	6.30	< .05
10		.43			.82	-	
11		.46			.79	2.94	< .05
12		.55			.70	2.54	< .05
13		.62			.62	2.64	< .05
14			.46		.79	-	
15			.47		.78	5.83	< .05
16			.57		.68	6.33	< .05
17			.52		.73	5.79	< .05
18			.38		.85	4.07	< .05
19				.41	.83	-	
20				.50	.75	4.66	< .05
21				.49	.76	4.77	< .05
22				.52	.73	4.97	< .05
23				.58	.66	5.39	< .05
24				.45	.80	4.18	< .05
25				.51	.74	4.96	< .05
26				.32	.90	4.16	< .05
28				.58	.67	5.42	< .05
29				.41	.84	4.68	< .05

As can be seen from Table 6, the factor loadings for all items were found to be higher than .30, and the error variances .90 or below. In addition, all of the items were found to be statistically significant ($p < .05$). In accordance with these results, it may be interpreted that the items serve to measure the structure of their factor. The model-fit indices obtained as a result of the confirmatory factor analysis are presented in Table 7. In addition, the measurement model obtained as a result of the analysis is illustrated in Figure 2.

Table 7. Results of confirmatory factor analysis model-fit index of the Creativity-Supporting Home Environment Scale

	χ^2	χ^2/sd	*p*	CFI	GFI	NFI	RMSEA
Scale	668.54	1.94	.00	.89	.92	.81	.069
Recommended		≤ 3		≥ 90	≥ 90	≥ 90	≤ .080

According to the findings of the confirmatory factor analysis, it can be seen that the χ^2/SD value is lower than 3, hence it may be said that the model fits well with the data. The CFI value was found to be .89, which is very close to .90 as the acceptable level of fit. The GFI value was found to be .92, and since this value is greater than .90, it may be said that the model fits well with the data. The NFI value was found to be .80. Since this value was found to be lower than .90, it may be said that the model data fit was not achieved according to this index value. However, according to Forza and Filippini (1998), an NFI value greater than .80 may be considered to indicate a good fit. When evaluated in terms of the RMSEA index, this index value was found to be .069, and therefore it may be said that the model fits the data in accordance with this index. The path diagram and factor loadings of the model obtained are presented in Figure 2.

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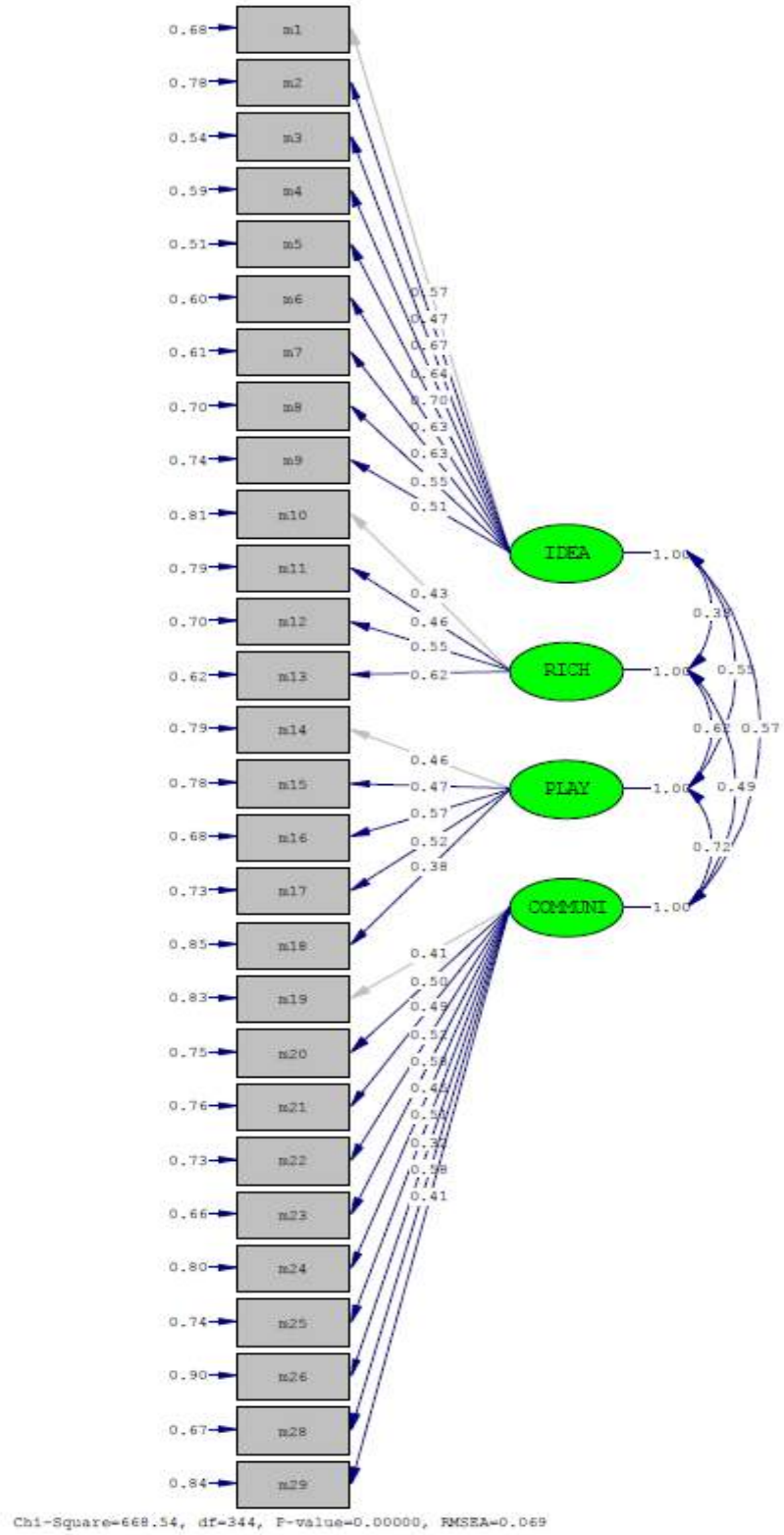

Figure 2. Creativity-Supporting Home Environment Scale measurement model

As can be seen from the path diagram illustrated in Figure 2, the determination coefficients (r^2) for the scale items were found to vary between .32 and .70. Accordingly, it may be said that the four-dimensional model fits with the data.

Reliability Proofs

In order to answer the second research question regarding the reliability of the measurements, the McDonald's omega (McDonald, 1999) and Composite reliability (Lord & Novick, 1968) coefficients for each factor, as well as the Stratified-alpha (α) reliability coefficient (Cronbach, Schonemann, & Brennan, 1965) were examined so as to assess the overall reliability of the scale. Since the examined scale is multidimensional, the reliability coefficient of the whole scale was also calculated using Stratified-alpha (Gignac, Reynolds, & Kovacs, 2019). The statistics obtained in line with the analyses are presented in Table 8.

Table 8. Creativity-Supporting Home Environment Scale McDonald's ω, Composite Reliability (CR) and Stratified Alpha Values

	McDonald's ω	CR	Stratified-α
Caring for Ideas	.88	.84	
Rich Learning Environment	.71	.70	.87
Play and Encouraging Independence	.73	.71	
Communication	.81	.75	

The McDonald's ω value for the "Caring for Ideas" factor was found to be .88, whilst for "Rich Learning Environment" it was .71, for "Play and Encouraging Independence" it was .73, and for the "Communication" factor it was found to be .81. The CR coefficient for "Caring for Ideas" was established as being .84, whereas for the "Rich Learning Environment" factor it was .70, for "Play and Encouraging Independence" it was .71, and for the "Communication" factor was found to be .75. In evaluating the calculated reliability coefficients, values below .50 were considered "low," whereas values between .50 and .80 were considered "medium," and values above .80 were accepted as "high" in terms of their reliability (Salvucci, Walter, Conley, Fink, & Saba, 1997). Therefore, when the calculated reliability coefficients are examined, it may be said that the scale scores obtained from the four factors can be considered reliable since the coefficients were each established as being greater than the value of .70. The Stratified-α coefficient calculated for the whole scale was found to be .87, and according to this value, it was decided that the scale could be said to be reliable.

DISCUSSION and CONCLUSION

In this study, the aim was to improve the "Creativity-Supporting Home Environment Scale" for the purpose of determining the level of creativity of the home environments in accordance with the opinions of parents with children aged 3-6 years old. The developed scale is a 4-point, Likert type instrument which consists of 28 items within four dimensions. Content validity of the scale was examined using the Lawshe (1975) technique. Factor analysis and item discrimination coefficients were presented as proof of validity, whilst internal consistency coefficients were calculated as proof of reliability.

The pretest form of the scale consisted of 53 items and was examined in terms of item performance based on data from the first study group. The item discrimination index was examined by calculating the corrected item-total correlation. Five items with a correlation value of less than .30 were removed from the scale as they were found to be insufficient to assess the relevant attribute. In this context, the testing form of the scale consisted of 48 items.

The testing form was applied to the second study group, and a parallel analysis was conducted in order to identify the factor structure of the scale. KMO and Bartlett's statistics were calculated and it was determined that the data was appropriate for factor analysis. In total, 18 items with a factor loading below .30 and with overlapping item attributes were removed from the scale. When the parallel analysis findings and the scree-plot of eigenvalues were examined, it was decided that the structure was composed of 30 items within four dimensions.

Within the scope of item analysis, the significance of the difference between the upper and lower 27% groups was tested with *t*-test in order to examine the item performance of all 30 items, and whether or

not items differed between the upper and lower groups. A significant difference was found between the lower and upper groups for all items. In accordance with the results of the analysis, it was concluded that the scale items were successful in distinguishing the individuals who make up the lower and upper groups.

Confirmatory factor analysis was performed according to the data of the third study group in order to confirm the revealed factor structure. While examining whether or not the model fits the data, model-data fit indices, factor loadings, and error variances were examined. During the CFA, two items with factor loadings below .30 and a high error variance were removed, and the model-fit indices were calculated for the 28-item scale in which all items had factor load values higher than .30 and error variances below .90. According to the indices, it was determined that the model fits with the data.

The reliability of the scale scores was examined by calculating the McDonald's omega, Composite reliability, and Stratified alpha coefficients. The McDonald's omega coefficients calculated for the four factors of the scale varied between .71 and .88, whilst the Composite reliability coefficients varied between .70 and .84. The stratified alpha coefficient for the whole scale was calculated as .87.

When the existing literature was examined, it could be seen that only one similar scale to the one examined in the current study was found, which was the "Creative Home Environment Scale for Preschool Children," developed by Oh and Choi (2006). In their research, Oh and Choi (2006) revealed a four-factor structure, and similar to the current study's Creativity-Supporting Home Environment Scale, the explained variance was found to exceed 40% for each of the four factors. In the social sciences, explained variance ratios should ideally be between 40% and 60% (Scherer, Luther, Wiebe, & Adams, 1988). Whilst Oh and Choi (2006) did not present confirmatory factor analysis as a proof of construct validity at the stage of examining factor structure, Cronbach's alpha coefficient was calculated for each dimension as proof of reliability for the four factors, and the coefficients ranged from .75 to .86. It should be added that the Cronbach alpha has assumptions that are considered difficult to satisfy, such as unidimensionality and equal factor loadings, and is also affected by the number of items. As such, McDonald's omega, Composite reliability, and Stratified-alpha coefficients were used as alternatives to Cronbach's alpha in the current study (Hayes & Coutts, 2020; Hult, Ringle, & Sarstedt, 2014; Osburn, 2000; Revelle & Zinbarg, 2009; Zinbarg, Revelle, Yovel, & Li, 2005). By using other coefficients instead of Cronbach's alpha, which is frequently used in scale development studies, the analyses results indicated that the "Creativity-Supporting Home Environment Scale" may be considered a valid and reliable scale.

In order to contribute to the healthy development of individual family members, a home environment consists of all kinds of moral and ethical values, as well as an emotional, social, and intellectual climate (Sharma, 2011). Stimuli presented to children that encourage reasoning, discussion, questioning, and the development of their thinking skills, such as establishing a cause and effect relationship between events, should also be provided as part of a healthy home environment (Elibol, 2021; Gino & Wiltermuth, 2014; Guo et al., 2021; Khaleque, 2013).

Research has indicated that a supportive and stimulating home environment provided by parents, as the first teachers, to their children during their early childhood years holds a unique importance in the development of their creative abilities (Esquivel & Hodes, 2003; Gong et al., 2020; Greenspan et al., 2004; Sak, 2014). However, considering that children learn mostly during the preschool period by modeling the adults around them, parents can help guide their children to become original, independent, and creative through their behavior in the home, such as by asking questions and producing different solutions to problems whilst undertaking activities with their children (Çetin & Ata, 2020; Dahmen-Wassenberg, Kammerle, Unterrainer, & Fink, 2016; Guo et al., 2021).

In this context, the parents' approach that encourages their child to gain new and different experiences, tolerates some level of incompatible attitudes, encourages and supports their independence, and values their determination and imagination is a milestone in the emergence and development of a child's creativity (Glaveanu, Karwowski, Jankowska, & de Saint-Laurent, 2017;

Gute et al., 2008; Kwaśniewska et al., 2018; Kwasniewska & Lebuda, 2017). When the research published in the field to date is examined, it can be seen that very few studies have examined the child's familial home environment and how it affects the creative skills of the child (Esquivel & Hodes, 2003; Janskowska & Gralewski, 2020; Pugsley & Acar, 2020). At this point, there is a requirement to improve the measurement tools available that include the attributes of the home environment according to creative attributes. Oh and Choi (2006) took the first step in this area by improving the Creativity-Supporting Home Environment Scale for Preschool Children. However, no evidence of any scale improvement in this field was published for Turkey. Therefore, the current study offers an improvement to this culture-specific, valid and reliable measurement tool that can be employed in order to assess the creativity level of the home environment for preschool children in Turkey, which presents a contribution to the field.

The current study was conducted using data obtained from the parents of preschool children. In cases where the scale is applied in different types of samples, it is recommended that proof of validity and reliability be reexamined. Future studies may consider how children reflect upon their creative skills both within the school and home environments. Additionally, the current study may be repeated using a larger sample group and from different cities in light of the data obtained in this research. Also, research that examines the creative home environment for preschool children could be planned to include various variables in line with the results of the current research.

Ethics and Conflict of Interest

Ethical permission has been granted by Gazi University Ethical Committee, approval number E-77082166-604.01.02-222661, approval date 23.11.2021 and the meeting 18. Research Code No: 2021-1031. The authors have no conflicts of interest to declare.

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MISCONCEPTION INTERVENTIONS AND PUPILS' CONCEPTUAL CHANGE IN SELECTED CONCEPTS IN BASIC SCIENCE IN ABEOKUTA

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Abstract

This study determined the effect of misconceptions intervention on students' conceptual change in the concepts of density and floatation in basic science. The moderating effects of gender and school types on students' conceptual change in the selected concepts were also determined. The misconception interventions in this study are hands-on activities that allow students who engage in them to observe evidence that contradict their misconceptions in density and floatation. Students in the upper basic three were the population of the study. A two-tier multiple-choice test was used to measure the conceptual change. The result revealed that exposing upper basic three students to the misconception intervention is significantly effective in facilitating conceptual change in the selected concept in basic science.

Keywords: Misconceptions, basic science, learning outcome.

INTRODUCTION

A concept can be considered an idea, an object or an event that helps us understand the world around us (Eggen & Kauchak, 2004; Kampourakis, 2018). Teaching and learning science at any level involves changing learners' conceptions about certain phenomena to the conception of the scientific community about the idea or phenomenon (Yagbasan, 2003). However, it is unfortunate to realize that student misconceptions about different phenomena often stand in the way of instructions that could bring about conceptual change. Various studies have shown that the first step in conceptual change is diagnosing and challenging students' misconceptions. Unfortunately, the conventional lecture method of instruction has been found incapable when it comes to remediation of students' misconceptions (Brandriet & Bretz, 2014).

Several studies have attempted various misconception interventions to remediate students' misconceptions in various concepts in science. For example, Allen (2010) used misconception intervention to promote conceptual change of the concept of floatation and gravity among primary school students. Other examples include the studies of Ruth (1985) which determined the effect of science text on students' misconception in science; Zeidler and Mcintosh (1989), which revealed that using the laserdisc generated models on college students resulted in conceptual change; Chang and Barufaldi (2010) also determined

the effect of the problem-solving-based instructional model in changing alternative framework of learners in earth science. Misconception intervention is profoundly effective in almost all educational experiments because it terminates self-doubt and brings about absolute cognitive resolution of the cognitive conflict the learner may have about the concept (Gooding & Metz, 2011).

It is known that after the conceptual change occurs, students do not restructure, replace, or abandon their misconceptions even though students happen to produce accurate answers (Potvin, 2013). This is because research in neuroeducation affirms that old ideas (misconception) and new ideas about the phenomenon coexist. The intervention only makes the learner correct cognitive decisions when confronted with a new situation about the phenomenon (Chi, 1991; Diut & Treagust, 2003; de Boer, Donker, & van der Werf, 2014).

Basic Science is the major science subject at the basic level of education in Nigeria; to make students: to be interested in science; take advantage of the numerous career opportunities offered by the study of science and technology, apply the basic scientific and technology skills and knowledge in meeting societal needs and; become prepared for further studies in science and technology (FRN, 2014). Therefore, the basic science and technology curriculum can be considered the foundation of science in Nigeria at the basic level (Danjuma, 2015). The basic science curriculum is one of the themes in nature with the following themes: you and environment, living and non-living things, you and technology and you and energy. The theme "you and energy" is a theme that involves physical science concepts such as weight, density, energy, to mention a few. This area has been established as a difficult area for many students (Martinez-Borreguero, Naranjo-Correa, Canada, Gomez, & Martins, 2018).

Research in basic science in Nigeria has been frequently directed towards determining the effect of various innovative strategies on students' learning outcomes. Examples of such innovative strategies include; Guided inquiry and Expository lectures (Adewale, Effiong, & Ekpo, 2015), Collaborative and Competitive learning strategies (Danjuma, 2015) and Computer simulation instruction (Ojo, 2020). Most of these experiments showed that the strategies improved students' achievement, interest, and attitude in basic science. Unfortunately, irrespective of the positive impact of research at this level and the excellent performance of students in basic science, students' performance in the senior secondary science subjects (biology, chemistry and physics) is very poor. Scholars like Adesoji (1994) have attributed this to poor science background in basic science, which ordinarily should be the foundation for secondary science. The shift in the focus of research on the teaching and learning of the subject has been limited to achievement because evidence has shown that students' achievement may improve even when their misconceptions persist (Taber, 2009; Omilani, 2015).

Perhaps, the unchallenged misconceptions in primary science that students carry over to senior secondary schools are responsible for poor performance in senior science. Also, misconceptions often defeat students' new thinking model from most novel teaching strategies (Potvin, 2013). This often results in the learners being unable to utilize the model as they fade away with time; because the misconceptions can resurrect even when they are presumed to be defeated if the right cognitive strategy is not employed to facilitate conceptual change (Potvin, 2013; Hewson & Hewson,1984).

Misconception intervention makes the learner see empirical evidence, which will remediate the learner's misconception. This intervention comes in various forms such as activation activity, think sheet, discussion strategies, to mention a few (Guzzeti, Synder, Glass, & Gamas, 1993). For example, Allen (2010) employed misconceptions interventions to correct learners' misconceptions due to expectation-related observation. According to Allen, expectation related observation is the biased collection or interpretation of data influenced by a desire to reach a predetermined conclusion. The misconception intervention of Allen (2010) adopted many of the elements of the White and Gunstone (1992)

Predict-Observe-Explain, which involves: finding out students' initial ideas, providing teachers with information about students' thinking, generating discussion, motivating students to want to explore the concept and generating investigation (Joyce, 2006). Misconception intervention in this current study is not deviating from the approach of POE and the misconception intervention of Allen (2010). The only minor deviation is that this study is not only interested in errors that make learners deliberately collect data that fits their expectations during practicals (Pine *et al.*, 2001). Most especially as it relates to learners reporting and interpreting data based on their bias, this study also used pupils' ideas as the starting point for the experiment designed to correct their misconceptions (Pine *et al.*, 2001). This study's additional focus is to guide pupils to desist from using the limited decision rules or faulty decision rules to interpret observation they make out of an experiment related to density and floatation.

According to Talanquer (2013), in the process of cognition, students will first create a mental representation, followed by associative thinking, analogical reasoning, and metaphorical linking, which invariably help us classify the entity or phenomenon as belonging to a specific category within or across knowledge domains. Talanquer (2013) further reiterates that decision rules are formed and help learners predict an object's behaviour when the object is involved in different processes or events. However, some learners often use only one decision rule for a specific task in a predetermined context, where they are supposed to use more than one decision rule. For example, the researcher found out in a study that is currently ongoing that many students in the primary school science class assume that when an object is divided into two, the object's mass, volume and density are reduced by half (Omilani, 2017). This assumption is based on a decision rule of the fraction. For example, half of the orange is half, which is the same for bread. This rule provides an accurate answer to mass and volume. However, the decision rule does not help learners provide accurate answers for density. Density is derived from the relationship between two fundamental concepts (mass and volume); hence, it is not reduced but remains constant irrespective of reducing an object size by half. Misconception interventions in the context of this study are practical activities deliberately designed to make students recognize the weaknesses and inadequacies of the decision rules they have been using. So as to make them adjust and adopt misconception free decision rules.

Theoretical Rationale

The theoretical framework that anchors this study is the conceptual change theory of learning science concepts propounded by Chi, Slotta and de Leeuw in 1994 (Chi, Slotta, & de Leeuw, 1994). This theory considers learning as the process of comprehending and accepting ideas because they are seen as intelligible and rational. Learning is thus a kind of inquiry. Therefore, the students must make a judgment based on the available evidence. Also, the theory posits that learning is concerned with ideas, their structure and evidence of them (Lee & Law, 2001). The theory is based on epistemological, metaphysical and psychological suppositions. The epistemological supposition is about the nature of ontological categories, which the learners use to categorize events. The metaphysical supposition stresses the nature of science concepts. The last one is the psychological one based on the nature of misconceptions. Based on this theory, when the learners are faced with evidence during science inquiry, they are likely to infer from their current knowledge structure. Allowing them to make such mistakes as well as making them see the inadequacies of the inferences through science activities will cause them to restructure their decision rules This study adapted the Model of Misconception Intervention as stated by Allen (2010).

Furthermore, efforts have been made in Nigeria to diagnose students' misconceptions in the past. Still, most of the diagnoses are restricted to secondary and higher education. For example, Ahiakwo & Isiguzo (2015) diagnosed students' misconception in chemical kinetics, Fatokun (2016), on the other hand, employed concept mapping to correct students' misconceptions of chemical bonding at the secondary school level, Ezenduka, Okafor, and Akusoba (2014) determined the impact of teacher error on students

understanding of respiration. However, very little is done on conceptual change among Nigeria's primary and junior secondary schools.

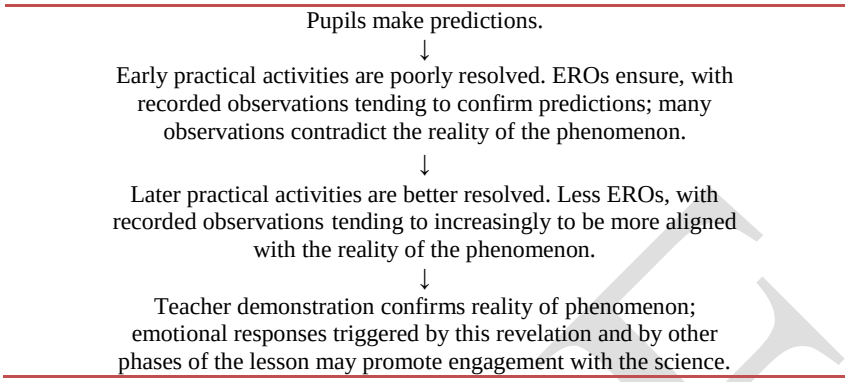


Figure 1. Rationale for Misconception Intervention Source: Allen (2010)

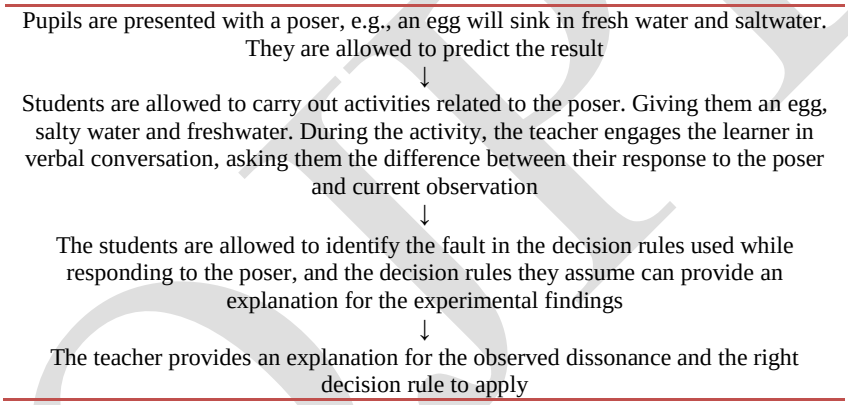


Figure 2. Adapted framework for misconception Intervention

Internationally, studies on students' misconceptions in elementary and junior secondary science are numerous. Studies like Wandersee et al. (1994) on electricity, Ferstl and Schneider (2007) Archimedes principle; Hardy, Jonen, Moller, and Stern (2006) floating; Libarkin, Crockett, and Sadler (2003); Roach (2001). In elementary science, students' misconceptions of the concept of floatation and sinking objects appear to have gained several researchers' attention more than any other concept. Studies of Thompson and Logue (2006) and Unal (2008) has separately diagnosed and facilitated conceptual change in floatation through a hands-on activity. Several scholars have attributed the misconceptions of primary students in floatation to their inability to integrate two (weight and volume) variables (Kohn, 1993). Kohn (1993) further established that students in primary have misconceptions because they cannot understand that weight and volume are separate concepts. However, they often fail to integrate them when it comes to a decision making on the concepts of floatation (Kohn, 1993). Also, Pine, Messer and St John (2001) surveyed primary science teachers rating of difficult concepts in primary science in England. The result showed that pupils' find it most challenging to learn that heavy and light objects of identical shape fall at the same speed because they believe that a larger object is heavier and a small object is lighter. Pupils' difficulty follows this to learn that large and small objects weigh the same because they believe that larger is heavier and smaller is lighter.

Furthermore, Potvin, Sauriol, and Riopel (2015) facilitated conceptual change in students' conception of weight, density, and floatation using the prevalence model; Allen (2010) determined the effect of misconception intervention on learner conceptual change in the same concept. The attention this concept has gained among other science concepts internationally indicates that if the misconceptions of students in this concept are not properly attended, there could be grievous implications to the teaching and learning of science both at the primary and higher levels of science education. However, this study does not believe that students' misconception in the concept of weight, density and floatation is solely responsible for students' poor performance in basic science. Nevertheless, solving the problem of misconceptions in the identified concepts will go a long way in reducing the failure in basic science. In addition, when pupils have the correct conception of these concepts, they will be equipped with adequate decision-making tools because understanding them is required for day-to-day activities. More importantly, these concepts are foundational for learners who will study science at the senior secondary school level. Hence, resolving students' misconceptions as mentioned above will make them learn the concepts at the senior secondary school level with no difficulty.

This study, therefore, determined the effect of misconception intervention in the form of hands-on activity on students learning outcomes in the three major concepts: weight, density, and floatation; learning outcome in this study is limited to conceptual change. This present study also considered the moderating effect of gender and school type on students' learning outcomes. The number of studies that determined the influence of school type and gender on primary pupils' conceptual change in science is rare. These two variables were considered in this study because it has been established that apart from teaching strategy, students and school variable moderates the effect of teaching strategy on students' learning outcomes (Schneider & Preckel, 2017).

The type of school in terms of ownership may inform the classroom practice of the primary science teachers, activities students are exposed to, and the quality of their learning in basic science. This may, in turn, influence the misconceptions of learners. In addition to this, several studies have determined the moderating effect of these two constructs on primary pupils' achievement in science (Sotayo et al., 2016; Oludipe, 2012). Specifically, Dalaklioglu, Demirci and Sekercioglu (2015) found no significant difference in eleventh-grade students' conception of momentum and energy according to their gender. On the other hand, students' misconceptions girls exhibited a given type of misconception more than boys in the concept of solution after a frequency count was done on the qualitative result of total misconceptions found in the students' script (Awan, Khan, & Aslam, 2009). Hence, the moderating effect of gender and school type was determined.

The following hypotheses were tested in this study.

Hypotheses

Ho1 The treatment effect on the conceptual change of students in selected concepts in basic science is not significant.

Ho2 The gender effect on the conceptual change of students in selected concepts in basic science is not significant.

Ho3 The school type effect on the conceptual change of students in selected concepts in basic science is not significant.

Ho4 The treatment effect on the conceptual change of students in selected concepts in basic science does not significantly interact with gender.

Ho5 The treatment effect on the conceptual change of students in selected concepts in basic science does not significantly interact with school type.

Ho6 The gender effect on the conceptual change of students in selected concepts in basic science does not significantly interact with school type.

Ho7 The interaction of treatment, gender and school type on students' conceptual change in selected concepts in basic science is of no significance.

METHOD

This study adopted the pretest-posttest quasi-experimental research design. The population for the study is Basic Nine students in urban parts of Odeda local government area of Ogun state who had already learnt the concepts of density and flotation in Basic Science in School. Another characteristic of this population is that the students are taught using the Ogun state basic science scheme for basic science by a qualified basic science teacher. According to the national policy of education, a basic science teacher is qualified if he has a minimum of Nigerian Certificate of Education (NCE) in Integrated Science. In addition, the same teacher must be certified by the Teacher's Registration Council of Nigeria. Basic nine pupils selected from four co-educational junior secondary schools (two privately owned and two publicly owned) formed the study sample. A school was randomly assigned to the treatment and control groups in each school type. A total of hundred students completed the study, which lasted seven weeks.

Table 1. Research timeline

Week	Activity
Week one	Administration of pretest
Week two to six	Exposing students to the appropriate treatment
Week seven	Administration of posttest

Instrument

The instrument used for data collection is the Basic Science Two-Tier Multiple-Choice Test (**BSTTMCT**) BSTTMCT is four items with two-tier responses. The first tier is the typical response to the multiple choices item. The second tier was for pupils to indicate why they chose the option chosen in the first tier. The instrument was administered to 20 students who were not part of the study. The reliability coefficient BSTTMCT is .86 using Kuder Richardson Formulae 20. The stimulus instrument used for this study is the Misconception Intervention Guide (MIG), a practical guide indicating the experiments and the teacher activity, student activity, materials, and procedure. The details of the MIG is reported in the treatment procedure

Treatment Procedure

Step I: The students are presented with the objective of the lesson

Step II: Students are presented with the definition and explanation of floatation and density concepts, to mention a few.

Step III: Students are requested to document what will happen given a particular situation. For example, putting raw eggs in salty water and ordinary water.

Step IV: Students are presented with activities at the same time, for example

Aim: An experiment to show that density determines floatation and sinking.
Materials: Table salt, two containers like a beaker, tablespoon tap water, two raw eggs, and Graduated cylinder.

Procedure: Labelled the two containers A and B where container A contains tap water and container B contains tap water plus water. Make sure the two containers contain the same volume of water of about 100ml each. N.B, 1 Cl = 10 ml, ml = cm^3.

1. Add about six (6) tablespoons of salt in container B that contains salt and stir thoroughly with a tablespoon until the salt dissolves completely in the water.
2. Then place one egg in each container and observe which one floats in the container and which one sinks.

Step IV: The teacher asks the students to report their observations and state the reasons why it is so

Step V : The teacher corrects the wrong answers and explains elaborately

Data Analysis

The data collected was analysed using Analysis of Covariance (ANCOVA). The pre-conceptual changes score was used as covariate named pretest and the initial disparity was partial out and statistical effect of the misconception intervention along with main effect of the moderating variable were also determined. Also, the interaction effects of treatment (misconception intervention) and the moderating variable were also determined by the ANCOVA. Where there are main effects, estimated marginal means was used to determine where the main effect lies. For the interaction effects, line graphs and estimated marginal means were used to determine the direction of interaction. The significance level was taken as .05 in the study.

FINDINGS

The following is the first hypotheses question:

Ho1: The treatment effect on the conceptual change of students in selected concepts in basic science is not significant.

As is seen in Table 2 reveals students conceptual change in the selected concepts in basic science responded significantly to the treatment ($F_{(8, 99)}$=26,11; p<.05; η^2=.223) with an effect size 22.3%. Hence, it is inferred that misconception intervention significantly reduced students' misconceptions in the selected concepts in basic science because they scored higher in the post-test.

Table 2. Analysis of covariance result using pre-conceptual change score

	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	179.119[a]	8	22.390	6.308	.000	.357
Intercept	212.609	1	212.609	59.901	.000	.397
Pretest	16.825	1	16.825	4.740	.032	.050
Treatment	**92.686**	**1**	**92.686**	**26.113**	**.000**	**.223**
Schooltype	.171	1	.171	.048	.827	.001
Gender	6.009	1	6.009	1.693	.197	.018
Treatment * Schooltype	.926	1	.926	.261	.611	.003
Treatment * Gender	4.895	1	4.895	1.379	.243	.015
Schooltype * Gender	20.890	1	20.890	5.885	.017	.061
Treatment * Schooltype * Gender	15.972	1	15.972	4.500	.037	.047
Error	322.991	91	3.549			
Total	2835.000	100				
Corrected Total	502.110	99				

a. R Squared = .357 (Adjusted R Squared = .300)

Table 3 below shows that students exposed to misconception intervention were better in terms of their mean score 5.9 than those in the control group 3.9. This also means that the misconception intervention is

accountable for the 22.3% of the total variance of students' conceptual change in the selected concept in basic science and technology.

Table 3. Estimated marginal mean of treatment effect

1. treatment Dependent Variable: postest

Treatment	Mean	Std. Error	95% Confidence Interval	
	Lower Bound	Upper Bound	Lower Bound	Upper Bound
Intervention	5.901(a)	.273	5.358	6.444
Control	3.904(a)	.278	3.351	4.457

a Covariates appearing in the model are evaluated at the following values: pretest = 2.4900

This means that students exposed to the intervention could use correct decision rule(s) for their decision making in the post-test. This means that their reasoning and conception while solving problems in the post test showed that there is a change in their conception of density and floatation. Unlike the control group who were unable to solve more problems

The following is the second hypotheses question:

Ho2: The treatment effect on the conceptual change of students in selected concept in basic science is not significant.

Table 2 above reveals that gender affects students' conceptual change in the selected concept in basic science is not significant ($F_{(8, 99)}$=1.63; p>.05). Therefore, it is deduced that gender did not significantly affect students' conceptual change in selected concepts in basic science and their misconceptions.

The following is the third hypotheses question:

Ho3: The effect of school type on students' conceptual change in the selected concept in basic science is not significant.

Table 2 above reveals that the effect of school on students' conceptual change in the selected concept in basic science is not significant ($F_{(8, 99)}$=.048; p>.05). This means that the conceptual change of basic nine students in the density and floatation concept is not affected significantly by the type of school they attended.

The following is the fourth hypotheses question:

Ho4: The effect of treatment on students' conceptual change in the selected concept in basic science does not interact with gender significantly.

As shown in Table 2, the treatment and the gender interaction effect is insignificant on the conceptual change of basic nine students ($F_{(1,91)}$=1.379; p>.05). Therefore, the effect of treatment on students' conceptual change is insensitive to their gender.

The following is the fifth hypotheses question:

Ho5: The effect of the interaction of treatment and school type on students' conceptual change in basic science is not significant.

It is deduced from Table 2 that the effect of treatment on the conceptual change of students in basic science does not interact with the type of school they attend significantly, and hypothesis Ho5 is rejected. Overall the effect of treatment on conceptual change is not sensitive to school type.

The following is the sixth hypotheses question:

Ho6: The effect of gender on students' conceptual change in the selected concept in basic science basic science does not interact with school type significantly

Table 2.0 reveals that the gender and school type has a significant interaction effect on students conceptual change in basic science ($F_{(1,91)}$=5.88;p<.05; η2=.061) with an effect size of 6.1%. This implies that students' gender and the type of school they attend taken together have a significant effect on conceptual change.

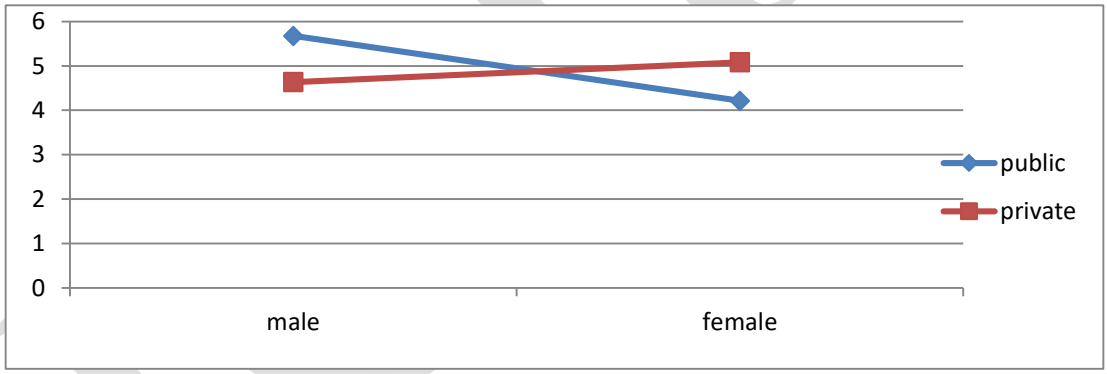
Table 4. Estimated marginal mean of the interaction effect of gender and school type according to the post-test conceptual change in selected concept in basic science.

Dependent Variable: posttest

		Mean	Std. Error	95% Confidence Interval	
Gender	**Schooltype**			**Lower Bound**	**Upper Bound**
Male	Public	5.677[a]	.451	4.781	6.574
	Private	4.635[a]	.426	3.789	5.482
Female	Public	4.215[a]	.333	3.553	4.876
	Private	5.083[a]	.345	4.397	5.768

Table 4 reveals that the significant interaction effect of gender favoured males in public school conceptual change because they have the highest post-test mean score. However, the females in private schools are next to the males in public schools in terms of the mean. This interaction is disordinal. Figure 3 below presents the interaction of gender and school type graph.

Figure 3. Graph of Interaction of gender and school type on conceptual change.



This implies that male students in public school used the correct decision rule to solve problems related to weight, floatation and density during the post-test.

The following is the seventh hypotheses question:

Ho7: The effect of treatment on students' learning outcomes in selected concepts in basic science does not significantly interact with gender and school type.

Table 2 above reveals that three-way treatment, gender, and type of school which students attend affect students' conceptual change in the selected concepts in basic science significantly ($F_{(8,99)}$=4.5; p<.05; η^2=.047) with an effect size 4.71%. Therefore, in the upper basic nine basic science, the method of teaching, gender and type of school determines the conceptual change in the selected concepts.

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Table 5. Estimated marginal means of interaction treatment, gender and school-type

Treatment	Gender	Schooltype	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound	Lower Bound	Upper Bound
intervention	Male	Public	6.130(a)	.628	4.882	7.377
		Private	5.721(a)	.570	4.590	6.853
	Female	Public	5.959(a)	.471	5.023	6.895
		Private	5.795(a)	.504	4.793	6.797
Control	Male	Public	5.225(a)	.647	3.940	6.509
		Private	3.549(a)	.630	2.297	4.801
	Female	Public	2.470(a)	.471	1.534	3.406
		Private	4.371(a)	.471	3.435	5.306

a Covariates appearing in the model are evaluated at the following values: pretest = 2.4900

Table 5 above shows the estimated marginal of the three-way interactions treatment, gender and school type and estimated marginal means. The table above shows that male students exposed to misconception intervention in public school ($\bar{x}$=6.13) and private schools ($\bar{x}$=5.72) have a higher mean compared to their counterparts in the control groups public school ($\bar{x}$=5.22) and private school ($\bar{x}$=3.55). Also, females exposed to misconception intervention in public school ($\bar{x}$=5.96) and private schools ($\bar{x}$=5.72) have a higher post-test mean score than their counterparts in the control group public school ($\bar{x}$=2.47) and private schools ($\bar{x}$=4.37). Overall the three-way interaction was found to favour students who are male in public schools profoundly because based on their mean score; students in this group were able to answer 3 (assuming they obtained the correct answer for 3 items; the question and the tier) or 5 (assuming 5 questions and their tier).

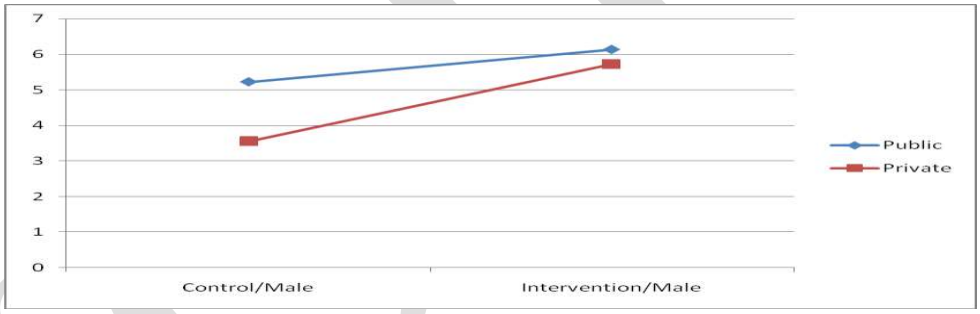

Figure 4. Line graph of interaction of treatment, school type and gender for male

The graph is ordinal and indicates that the male students exposed to the misconception intervention and control in public school are better than males in the private schools in the two treatment groups.

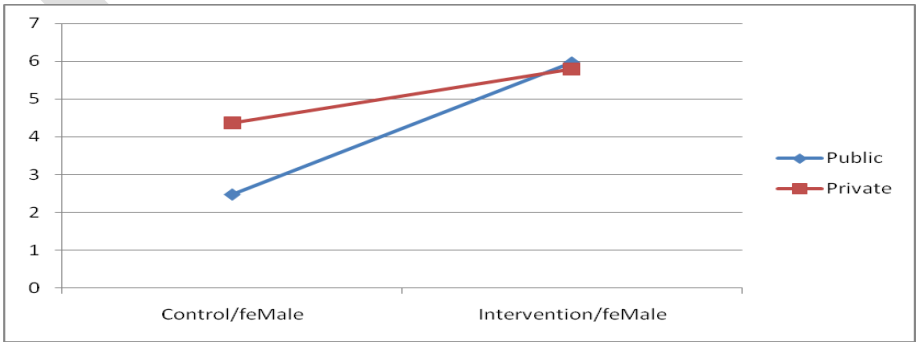

Figure 5. Graph of interaction treatment, gender, and school type on conceptual change for female

DISCUSSION, CONCLUSION, and RECOMMENDATIONS

This study revealed that the misconception intervention in the form of activity the students carried out significantly facilitated their conceptual change with respect to their gender and school type. Although the result indicated that the three-way interaction of treatment, school type and gender was most profound among males in public, the post-test mean scores of females (public and private) and males (private) exposed to misconception intervention were better. The findings may be attributed to the fact that male students in public schools were very excited to participate in the activity and probably dominated the activity. Overall, conceptual change is better facilitated when students are exposed to activities that challenge their misconception intervention in this study than the didactic approach.

Although the three-way interaction effect subsumes the main effect of treatment, it is important to underscore the treatment effectively facilitated the conceptual change of the learners compared to the control group given the large effect size. This is in line with the findings of Ajlouni & Jaradat (2020) which showed that Jordanian primary school pupils who were exposed to pedagogical hypermedia acquired scientific concepts more than those in the control. The study found out that the treatment accounted for 70% of total variance of the conceptual change score. The effect of the treatment may be traced to the claim of (Duckworth, 2011) that students need to be given many opportunities to investigate both volumes independent of mass and mass-independent of volume to gain a thorough understanding of floatation and density. Misconception intervention in this study offered students such an opportunity. The findings of this study is also in line with that of Unal (2008), which shows that students exposed to hands-on activity have a significant positive effect on floatation concepts and rules. Also, the finding of this present study aligns with that of Woldeamanuel et al (2020) that Ethiopian grade eight students taught using concept mapping instructional method exhibited better conceptual understanding of the concept of photosynthesis than those treated with lecture method. It can be deduced that conceptual change will most likely take place in classroom which science concepts are taught using any method that will ensure that students are confronted with their own errors. And lecture method hardly does this.

Unlike most studies on conceptual change, that do not give attention possible moderating effect of variable different from teaching methodology, this study indicates that male and female students exposed to the misconception intervention in the public had a better conceptual change score than their counter in private schools. This finding may be attributed to many factors: students in the public schools were observed to show interest in the activity more than their counterparts in private schools. The finding of this study established that misconception intervention can be used to bridge the little gap that existed in terms of achievement in science between public and private school students.

Conclusion

The findings of this study point at many things among them is that misconception interventions in the form of hands-on activity is an effective instructional approach that can facilitate conceptual change among both the male and female public primary school students and also bridge the prior achievement gap which existed between the private and public-school students.

Recommendations

Based on this finding, the following recommendations were made

1. To improve the performance of male and female students, especially in public primary schools, science teachers should adopt the misconceptions intervention instructional approach. The conceptual change in basic science depends mainly on the activities which expose the fault lines in the misconceptions of basic nine students.
2. There is a need to develop similar misconception intervention activities for other basic science concepts using materials that the basic nine students interact with daily. In addition, the materials

used for the misconception activities are readily available in the home, kitchen and environment of learners. This provides the students' opportunities to repeat the misconception intervention activities.

3. Teachers should diagnose the misconceptions the students may have in the concepts they intend to teach in basic science.
4. Primary science teachers should also replace the common mode of assessment such as multiple-choice, essay and matching items when they want to measure the conception of learners with alternative assessment tools such as two-tier multiple-choice and interviews. This will provide information on students' misconceptions
5. Researchers should carryout research that will develop misconception interventions for other concepts in basic science. This study could be replicated at the senior secondary physics in correcting misconceptions of the concept of floatation.

The findings of this study are not without limitations. The activities used as misconception intervention in this study are activities that appeal to the pupil's cultural outlook. Replicating the study in environment with different cultural outlook may not lead to similar findings.

Ethics and Conflict of Interest

The authors acted in accordance with the ethical rules in the research and there is no conflict of interest between the authors.

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AN INVESTIGATION ON PRIMARY SCHOOL STUDENTS' 3D GEOMETRIC THINKING

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Abstract

This study aims to investigate how primary school students' three-dimensional geometric thinking changes across grades. The survey model was used, and the study group was comprising of 520 primary school students in a large city of Turkey. In the study, the Three-Dimensional Geometric Thinking Test, which is a paper and pencil test, was used to collect data. The scores taken from the test were compared across the grades and the relationships between the components of three-dimensional geometric thinking were examined. The findings showed that as the grades increased, students' scores taken from the Three-Dimensional Thinking Test also increased significantly. Moreover, a medium and positive correlation was found between the components of three-dimensional geometric thinking. The results of the study revealed that grade level is a significant variable on three-dimensional geometric thinking, yet some important three-dimensional geometric thinking skills can be developed independent from the grade level. The current study intends to shed light on the development of three-dimensional geometric thinking starting from early grades, and to provide important information for organizing the three-dimensional geometric content in the curriculum and its implementation.

Keywords: Geometric thinking, three-dimensional geometric thinking (3DGT), geometry teaching, primary school students.

INTRODUCTION

3D geometry basically includes 3D geometric objects, their properties, and movements. 3D geometric thinking (3DGT) can be defined as the perception and interpretation of geometric objects, their movements, and properties using spatial ability (Gutiérrez, 1992; Yeh & Nason, 2004). When it is about teaching and learning 3D geometry, the skills of recognizing 3D objects, understanding their structures and elements, classifying, measuring, and solving problems related to these objects come to the forefront (Gutiérrez, 1992; Ministry of National Education [MoNE], 2018; National Council of Teachers of Mathematics [NCTM], 2000). These skills, which are necessary for students to understand mathematics and other disciplines in school, are also important for the students to have make sense of external world's natural objects such as tree, mountain, and seashell, etc. and ideal objects such as circle, triangle, prism, etc. (Yeh & Nason, 2004). In addition, these skills are critical for many professions such as engineering, architecture, carpentry, health, art, cinema, and television. While the mathematics curricula is being prepared, those skills are determined by considering the grades, and different skills are expected from students at each grade. However, it had been observed that the research on 3D geometry has yielded some results which require questioning this approach of curricula. Studies show that four years old children are able to use pictorial information in geometric object tests, eight year olds are able to draw geometric objects without looking at the picture (Murph & Wood, 1981), five years olds start drawing a house by taking its volume into account, six year olds are able to separate a circle from a sphere with the colors they use in their drawings (Wolf, 1988), six

and seven year olds begin to notice the relationships between 3D objects and their nets, nine to eleven year olds can correctly form the net of a 3D object with all its parts (Piaget & Inhelder, 1956), five and a half year olds can fold the shapes drawn on paper in their minds (Harris, Newscombe, & Hirsh-Pasek, 2013), ten year olds begin considering the structures produced using identical cubes, both represented in drawing and concrete forms (Olkun, 1999); 8 to 9 year olds, as a result of their experience, begin to notice the components of the polyhedral (Ambrose & Kenehan, 2009). Furthermore, the first-grade kids can also reason about two-dimensional representations of three-dimensional objects (Hallowell, Okamoto, Romo, & La Joy, 2015) and as a result of collective discussions, they can begin to associate three-dimensional objects with their two-dimensional representations and make the transition from physical models to mental models (Conceição, & Rodrigues, 2020). On the other hand, there are studies showing that some between the age of 11 and 15 cannot fully perceive prism drawings (Ben-Chaim, Lappan, & Houang, 1985), some have significant difficulties in finding the number of identical cubes in structures before they are 11 (Battista & Clements, 1996), some 13 to 17 year olds confuse the concepts 'volume' and 'surface area' (Hirstein, 1981), some 14 to 16 year olds draw 3D objects without depth (Mitchelmore, 1980), 14 years olds have difficulties in counting the identical cubes forming a prism (Olkun, 2003a), 13 year olds are not successful in relating 3D objects to their nets (Wright & Smith, 2017), and in drawing two-dimensional views of 3D structures on paper from different directions (Yolcu & Kurtuluş; 2010). Moreover, eighth grades still have difficulties in associating the properties of a cube (e.g., understanding the properties of a triangle drawn inside a cube, comparing the length of a diagonal on an edge or on a face) (Fujita, Kondo, Kumakura, Kunimune, & Jones, 2020) and they prefer to use formulas without attempting spatial solutions while solving questions about 3D objects (Ibili, Çat, Resnyansky, Şahin, & Billinghurst, 2020). Correspondingly, those studies indicate that young pupils do not bear some 3DGT related essential skills, which may also not be developed properly even at older ages. Within that context, studies are needed to explain how 3DGT skills develop at primary school level. On the other hand, given that 3DGT includes many objects and properties perceived in early childhood, it can be argued that investigating 3DGT of young students is of critical importance. In particular, it is envisaged that examining 3DGT according to grades will provide important data both for the organizing of the curricula according to grades and for the studies to be conducted on different age groups regarding the issue.

Components of 3DGT

The geometric thinking model determined by Van Hiele (Van Hiele, 1986) provides powerful explanations on the levels of geometric thinking and had been an important resource for various researches in the geometry teaching. Questioning whether Van Hiele's study was sufficient or not to illuminate other areas of geometry such as 3D geometry, Gutiérrez (1992) examined the relationship between Van Hiele's geometric thinking levels and 3DGT; and determined the levels of 3DGT, independent from the age. Level 1 (Recognition) is the level where 3D objects can be compared visually by taking into account some particular elements such as vertices, edges, faces, etc. Level 2 (Analysis) is the level where 3D objects can be compared according to their features, such as angle size, edge length, parallelism, etc. Individuals at this level can recognize the properties of objects by observing them or based on their names; and can determine the results of the movements of the objects by looking at their positions before and after the movement. Level 3 (Informal deduction) is the level where 3D objects and their properties can be analyzed based on their representations or mathematical structures. Individuals at this level can relate the elements (faces, edges, vertices) of 3D objects compared with their initial and last positions. Level 4 (Deduction) is the level where high visualization skills are required, and the mathematical structures, properties, and movements of objects can only be analyzed based on formal definitions or some properties of objects. When the skills required for those four hierarchical levels, determined by Gutiérrez, are examined, it is evident that recognizing, comparing, distinguishing the properties of, analyzing, and understanding the movements of 3D objects improve as the level increases; and that such improvements take place through the visualization skills developed in time (Gutiérrez, 1992).

NCTM (2000) determines the skills expected from students according to their grades and explains the skills of 3DGT at four different levels; namely preschool-2nd grade, 3rd-5th grades, 6th-8th grades, and 9th-12th grades. The standards set by NCTM consist of skills such as recognizing, constructing drawing, comparing, and defining 3D objects between preschool and 3rd grade. At the 3rd to 5th grades, skills like classification of 3D objects according to their properties, dividing-integration, recognition of identical and similar objects, making assumptions and inferences according to the properties of geometric objects, constructing 3D objects, comparing objects with their drawings, and determining the surface areas and volumes of 3D objects in standard and non-standard units are included. It can be said that as the grade increases, the targeted skills are enriched and deepened, and these skills include more spatial visualization and mental operations. Therefore, it had been seen that 3DGT, which can improve independently from the grades according to Gutiérrez, is addressed in NCTM standards according to grades, and despite it is not explicitly stated, a relationship is established between the improvement of these skills and the student age or academic level.

In their study conducted considering the standards determined by NCTM, Pittalis and Christou (2010) defined the 3DGT skills of 5th to 9th grades under the following five categories; (i) the ability to manipulate different representational modes of 3D objects, (ii) the ability to recognize and construct nets, (iii) the ability to structure 3D arrays of cubes, (iv) the ability to recognize 3D shapes' properties and compare 3D shapes, and (v) the ability to calculate the volume and the area of solids.

In this study, the following path is pursued to determine the components of 3DGT: Before all the skills determined by Gutiérrez (1992) for the levels of 3DGT, the skills included in the NCTM standards (2000), and the skills determined by Pittalis and Christou (2010) were comparatively analyzed in detail. Then, the literature on the subject was reviewed extensively and associated with the above-mentioned skills. As a result, considering the target audience of this study, it had been seen that two new components could be added to the components determined by Pittalis and Christou (2010) (Determining the Positions of 3D Objects Relative to Each Other, Recognizing 3D Objects) and with some changes the components of 3DGT were defined as follows (Akkurt-Denizli, 2016).

1. Determining positions of 3D objects relative to each other

Young students learn to use concepts such as above, behind, beside, between, etc. to express the relations between the positions of objects, while determining the positions of the objects (NCTM, 2000). Children aged 3-4 can show 3D objects which are usually shown as targets and whose positions are marked; but the position of an object can often be precisely encoded in the period of mid-childhood (Piaget, İnhelder, & Szeminska, 1960). This skill, on the other hand, is related to spatial ability (Yeh, 2013). It is observed that the skill of determining the positions of the objects those are relative to each other, has not developed sufficiently in students with lack of experience; and such students cannot perceive the different views of the objects in the space and their positions such as right-left, front-back (Kol, 2010). Given that this skill is essential for other skills, such as understanding the appearance of 3D objects from different directions and recognizing the nets of 3D objects, it is evident that this is one of the basic skills of 3DGT.

2. Recognizing 3D objects

Students who distinguish 3D objects visually and by considering only their simple elements (including square, triangle, etc.) at first can analyze 3D objects and distinguish them with all their properties as their geometric thinking level improves (Gutiérrez, 1992). While students are expected to name 3D objects and recognize some of their basic properties during the period between pre-school and 2nd grade, from 3rd to 5th grade, they are expected to be able to analyze a 3D object, recognize all the elements that make up a 3D object, and consider these elements when naming these objects (NCTM, 2000). Recognizing a 3D object with all its properties, regardless of its shape, color and position, requires the use of advanced spatial relations (Gutiérrez, 1996). Therefore, it is concluded that recognizing 3D objects is a basic component of 3DGT, especially for young students.

3. Using different representations of 3D objects

Perception of mathematical objects is possible only through the use of their representations (Duval, 1993). 3D geometric objects are generally represented by actual physical objects, objects in the computer environment and drawings on paper (Gutiérrez, 1992). In order to understand the representations on paper, which are most commonly used in schools, the depth in the drawing and the elements of the object must be recognized, and the object must be visualized as a whole (Deregowski, & Bentley, 1987). Therefore, it can be said that the representation that requires the utmost mental processing is the representation through drawing. Parzyzs (1988), examining the representations of 2D and 3D geometric objects, stated that the representation through drawing is the distant representation of a 3D object. In addition, the representation of 3D objects in two dimensions requires the visualization of the objects through drawings and improves the spatial abilities of students (Olkun, 2003b). Although the representation through drawing, including different mental operations, is difficult to understand, particularly for young students, and thus it can be considered as a distinctive component of 3DGT skills.

4. Recognizing properties of 3D objects and comparing them

Elements of 3D objects, such as vertices, edges and faces make it possible to distinguish and analyze this object. For instance, a triangular pyramid is distinguished and named by means of a number of triangular faces that make it up. Understanding the category, in which a 3D object belongs, to is only possible by distinguishing its invariant properties (Pittalis & Christou, 2010). Comparison of 3D objects according to their properties is an important skill that requires analyzing the properties of objects and classifying them according to such properties (Gutiérrez, 1992). Since the relationship between a geometric object and its representation is generally more complex and ambiguous for 3D objects (Parzysz, 1988), it is more difficult for young students to distinguish 3D objects from two-dimensional ones by the means of representation through drawing and to distinguish the properties of 3D objects (Clements, 2004). For this reason, distinguishing the properties of 3D objects by the means of representation through drawing, which is commonly used in schools, and comparing 3D objects is seen as a basic component of 3DGT.

5. Establishing relationship of 2D - 3D

Transition between 2D and 3D involves the acts of unfolding and folding. Since these acts require an object to be transformed into a different object through visualization in mind, the ability to establish the 2D-3D relationship requires a more advanced visualization, apart from recognizing objects (Cohen, 2003; Potari & Spiliotopoulou, 2001). The ability to establish the 2D-3D relationship, which is also related to the processes of constructing and rotating 3D objects (Piaget & Inhelder, 1956), is an ability that can be improved through experience, awareness, and special activities (Cohen, 2003). Piaget's statement that *students who can perform the acts of unfolding and folding are two or three years ahead of others*, addresses the importance of this component in the development of 3DGT skills in children.

6. Recognizing 3D structures made up of identical objects

Recognizing structures made up of identical objects involves analyzing those objects, visualizing their views from different directions, and constructing their abstract components in the mind. Counting cubes in a structure made up of identical cubes requires important cognitive operations, such as coordination, construction, and combination (Battista & Clements, 1996). Such operations, which require the identification and organization of components in a structure (Battista, 2004), help primary school students to construct the volume formula (Battista & Clements, 1998). For example, rows or columns consisting of 16 cubes can be identified and used to count cubes in a rectangular prism-shaped structure consisting of 64 identical cubes. Students have difficulties especially in counting the identical objects in the structures presented to them as drawings (Ben-Chaim et al., 1985; Olkun, 1999) and in drawing the structures consisting of identical objects (Yolcu & Kurtuluş, 2010). In this context, recognizing 3D structures made up of identical objects is seen as a component of 3DGT for young students.

7. Calculating area and volume of 3D objects

Calculating the areas and volumes of 3D objects by the means of units plays an important role in structuring the numerical operations in these measurements and in associating the formula with the structure. Understanding and visualizing the internal dynamics of the structure is necessary for this association (Battista & Clements, 1996). The size and shape of the surface, which the area of will be measured, and the shape of the units to be used in the measurement (triangle/square) are among the variables that determine the difficulty of area measurement (Owens & Outhred, 2006).

Volume measurement, which is more difficult for students compared with area measurement, requires more detailed construction of the object and more spatial visualization. Operations such as calculating the number of identical objects required to fill a box without leaving any space, finding the number of cubes in a structure consisted of identical cubes, and calculating the number of cubes required to complete a structure consisted of identical cubes, help configure the volume formula, as they allow the use of different strategies (Batista, 2004). It can be said that the area and volume measurements made with non-standard units form the basis for the development of this skill in young children.

The seven components described above do not mean that there will be no other components related to 3DGT or that the classification will only be done this way. For example, the ability to classify objects hierarchically, which develops, according to Van Hiele (1999), at the level of informal deduction, can be considered as another component of 3DGT. Since the components of geometric thinking are determined for younger students in the study group, this component is not included in our study.

When the components of 3DGT are examined, it is understood that each one of them require different tasks, and such tasks may contain particular difficulties for different age groups. Therefore, it is thought that determining students' 3DGT would be possible through tasks related to as many components of 3DGT as possible. The fact that many components of 3DGT are handled together, brings up the issue *which representations will be used to measure students' 3DGT skills*. When working on three-dimensional geometry, actual physical objects, objects in the computer environment, and objects on paper can be used. Concrete models, drawings, figures, diagrams, and representations in the computer environment are generally preferred in daily mathematical activities in the classroom. It is stated that concrete materials are the models that should be used in the first place for the development of students' abstract mathematical thinking skills (Erbaş, Kertil, Çetinkaya, Çakıroğlu, Alacalı, & Baş, 2014; Sarama & Clements, 2016). But as concrete models seem not to have an important effect on students' 3DGT after the age of 5, representations such as drawings and symbols should be preferred from this age onwards (Sarama & Clements, 2016). When curricula are examined, it is seen that teachers have been encouraged for the use of technology, and studies have emphasized that technology-supported activities have positive effects on students' learning (Altun, 2011; Olkun & Altun, 2003; Yeh & Nason, 2004; Erdoğan, Özdemir Erdoğan, Galan, & Güler, 2012; Ibili et al., 2020). However, it is also known that representations on paper, which require more mental processing than others, are being used quite frequently. It is only possible to include three-dimensional objects in books by using their two-dimensional representations on paper. Furthermore, representations on paper are generally included in assessment tools for three-dimensional geometry. Although it is not easy to understand the properties of three-dimensional objects from their representations on paper and to determine the rules of the transition from 3D to 2D, representations on paper are important for students to develop mental processes while learning objects (Sarama & Clements, 2016). For those reasons, it can be said that drawings, which are the most frequently used but also most complex representations for students as they require important mental operations, constitute an adequate tool to investigate students' three-dimensional geometric thinking.

In this context, the purpose of our study is to examine the evolution of primary school students' 3DGT geometric thinking according to grade and the relationships between the components of 3DGT. In the study, the Three-Dimensional Geometric Thinking Test (3DGTT), which includes five of the above-mentioned components of 3DGT and prepared by using the representation through drawing, was used (Akkurt-Denizli, 2016).

Answers were sought for the following questions concerning these five components:

1. Does primary school students' state of 3DGT vary significantly depending on grade?

   a. Do primary school students' scores taken for the component of recognizing 3D geometric objects vary significantly depending on grade?

   b. Do primary school students' scores taken for the component of recognizing properties of 3D objects and comparing them vary significantly depending on grade?

   c. Do primary school students' scores taken for the component of establishing relationship of 2D - 3D vary significantly depending on grade?

   d. Do primary school students' scores taken for the component of recognizing 3D structures made up of identical objects vary significantly depending on grade?

   e. Do primary school students' scores taken for the component of calculating the area and volume of 3D objects vary significantly depending on grade?

2. Is there a significant correlation between the scores taken by primary school students for the sub-components of 3DGTT?

The literature review showed that a limited number of research has been done on 3DGT skills of primary school students and that students' 3DGT has not been examined according to their grades. It is seen that studies conducted on primary school students generally give information about students' thinking about only one component of 3DGT. The study conducted by Pittalis and Christou (2010) on 5th to 9th grade students by defining the components of 3DGT, and the study conducted by Ibili et al. (2020) on 8th grade students by creating a geometric thinking test on the basis of the components defined by Pittalis and Christou are considered to be important as they included several components of 3DGT. However, no study in which the components of 3DGT of primary school students are addressed as related to each other, is found. This study is important as it addresses the evolution of 3DGT of primary school students across the grade levels, and it is thought that the study can contribute to the improvement of curriculum, prepared by considering the characteristics of students in each grade level. In the current study, examining the relationships between the components of 3DGT requiring different skills may give information about which of these components develop in a related way, while also shedding light on how they should be handled in the teaching process. For this reason, it is thought that the study can provide important insights into the 3DGT of primary school students and 3D geometry teaching at primary school level and beyond.

METHOD

Research Model

The current study aims at determining primary school students' state of 3DGT as accurately as possible, without making any effort to change anything is a descriptive study designed in the survey model (Karasar, 2009; Büyüköztük, Çakmak Kılıç, Akgün, Karadeniz, & Demirel, 2010). This model allows forming generalizable results and making comparisons between different groups (Büyüköztürk et al., 2010; Creswell, 2002).

Study Group

Typical case sampling, one of the purposive sampling methods, was used in the current study (Büyüköztürk et al., 2010). The study had been conducted in six state schools (three primary schools and three middle schools) having students among medium socio-economic level, in a big city of Turkey. The schools selected in the sampling process were determined according to the information obtained directly from the Ministry of National Education.

The study group was comprised of 2nd to 5th graders in the fall term of 2015-2016 education year. The ages of these students varied between 7 to 11. The middle schools with 5th graders were the schools

with the majority of the students graduating from the three selected primary schools. Thus, it was ensured that the students in the study group were at a similar socioeconomic level. The reason for the selection of 2nd to 5th graders, instead of 1st-4th grades, was that this group of students can best reflect the primary school level. First grade students are not at a level to read and answer any pencil and paper tests at the beginning or in the middle of the term. Furthermore, 3D geometry subjects are included in the curriculum of each class at different times during the academic year, and this might affect the results of a test to be applied during the year. By applying the test to students of 2nd to 5th grades simultaneously at the beginning of the semester, it was thought that the way 3DGT of primary school students varies across the grades could be best reflected. As a result, the study represents 3DGT of primary school students (1st- 4th grades) even if the study group consists of the students who were at the beginning of the grades from 2nd to 5th. The distribution of the students in the study group across the grade levels is given in Table 1.

Table 1. Distribution of the students in the study group across the grade levels

Grade Level	Gender		
	Female	Male	Total
1st grade	63	65	128
2nd grade	62	61	123
3rd grade	61	69	130
4th grade	56	83	139
Total	242	278	520

As can be seen in Table 1, of the 520 students making up the study group, 46.5% are females and 53.5% are males. The study was carried out in the classes of the teachers who accepted to participate in the study in the selected schools and with the participation of all the students who were in the classroom during the test application.

Data Collection Tool and Its Implementation

The Three-Dimensional Geometric Thinking Test (3DGTT), which was developed by Akkurt-Denizli (2016) to determine the 3DGT of primary school students, was used as the data collection tool in the study. The 3DGTT is a paper-pencil test that includes questions on the five components of 3DGT and has 45 questions in total. This test was prepared by seeking expert opinions according to the determined components of three-dimensional geometric thinking, without considering a hierarchical structure. The distribution of the questions in the test across the components of 3DGT is given in Table 2.

Table 2. Distribution of the questions in the 3DGTT across the components of 3DGT

Components of 3DGT	The number of questions	The total number of questions (sub-items included)
Recognizing 3D geometric objects	4	4
Recognizing properties of 3D objects and comparing them	7	18
Establishing relationship of the 2D and 3D	4	4
Recognizing 3D structures made up of identical objects	3	8
Calculating area and volume of 3D objects	4	11
Total	22	45

The 3DGTT consists of multiple choice and short answer open-ended questions (Examples in Figure 1 and Figure 2).The highest score to be taken from this mixed test, which is scored as true (1)-false (0), is 45. In order to establish the content validity, the test was submitted to the review of 13 experts, and the KR-20 reliability coefficient of the test was found to be 0.87 (Akkurt Denizli, 2016; Akkurt-Denizli & Erdoğan, 2018).

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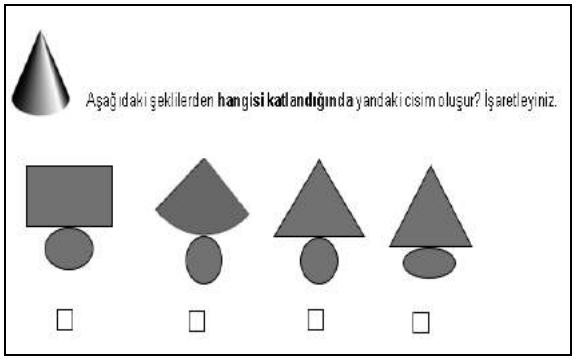

Figure 1. Establishing relationship of the two-dimensional and 3D

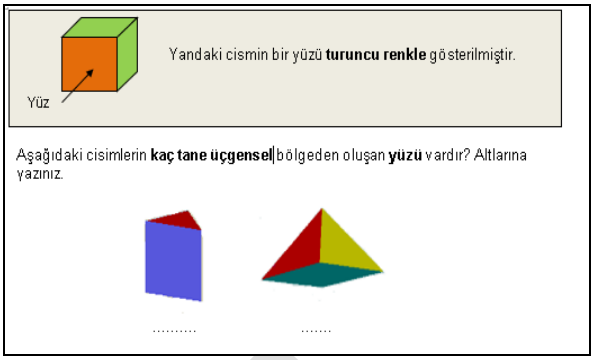

Figure 2. Recognizing properties of 3D objects and comparing them

The question in Figure 1 is that: "Which of the following shapes should be folded to obtain the next object? Mark it." The question in Figure 2 is that: "One face of the next object is shown in orange. How many faces of the objects below are made up of triangular areas? Write under them."

The application of the test was carried out by the researcher in the students' own classes and during the class hours. The students were told that this test would not affect their math scores at school and that they should take the test without any help. The students were informed that they would have a maximum of 50 minutes to complete the test, and they were given detailed information on the basis of the instruction of the test about how they would answer the test questions (Akkurt-Denizli, 2016). The sheets of the students who completed the test were checked quickly by the researcher, and the students were asked to read and answer the questions/ pages they had forgotten. After 50 minutes, all students' tests were collected.

Since this study was conducted in schools with similar socio-economic levels, and the data of the students with any diagnosed special needs were excluded, we can argue that the study group's features imposed no challenges against our study. In all classes, data were collected by the researcher. When collecting data, no events, which might had affect the students' answers, occurred. Since the data collection tool 3DGT is valid and reliable (Akkurt-Denizli, 2016), this test imposed no challenge to this study.

Data Analysis and Statistical Techniques

The answers given by each student to the questions in the test were coded as true (1)-false (0), and the scores for each component and for the test were calculated.

One-Way Variance Analysis (ANOVA) was used to compare the total test scores of students from different grades. MANOVA (Multivariate ANOVA) was used to examine how the scores of the students for the different components of 3DGT vary depending on grade level.

First of all, ANOVA and MANOVA analyses were performed to test whether the data satisfy the assumptions. Missing data were examined, and no missing data were found in the data set. In the examination of Q-Q graphs for the evaluation of univariate normality, it was found that the normal distribution was protected, and the skewness coefficients of the variables remained within ±1 limits. So, the scores did not show a significant deviation from the normal distribution (Çokluk, Şekercioğlu, & Büyüköztürk, 2010). In the process of examining multivariate normality and linearity, Mahalanobis distances were calculated for all dependent variables first. The values obtained were compared with the value of $X^2_{(p=.001,\ df=4)}=18.467$ specified in the X^2 table, and it was determined that there was no outlier since the critical value of 18.467 was not exceeded. Then, the Scatter Plot Matrix was examined, and it had been seen that the scatter plots of all binary relations of the dependent variables were close to an elliptical shape, that is, multivariate linearity was attained (Tabachnick & Fidell, 2007). As a result of the Levene Test, performed to test the homogeneity of the variance matrices between the groups, the assumption of homogeneity of the variance matrices was satisfied since the

p>.05 condition was met for the difference scores of the variables. According to the results of the Box's M Test, performed to test the homogeneity of the covariance matrices, the p>.05 (p=.559) condition was met. The results of these analyses showed that the research data were suitable for ANOVA and MANOVA analyses and satisfied the assumptions of these analyses.

For the interpretation of the effect size in both analyses, the criteria determined by Cohen (1988) were used. Cohen (1988) interprets the η2 value calculated as follows: .01: small effect, .06: medium effect, .14: large effect.

Pearson Correlation Coefficient was calculated to examine the relationships between the components of 3DGT. The degree of correlation was calculated as follows: between ± .70 and ± 1: strong correlation, between ± .30 and ± .70: medium correlation, and ± .00 and ± .30: small correlation, .00: no correlation (Büyüköztürk, 2007). Data from this study were analyzed using SPSS 15.0.

RESULTS

First of all it had been examined how the 3DGT of students varies depending on their grades. Then, it was determined how the scores obtained for each component of 3DGT vary depending on grade level. Finally, the relationships between the components of 3DGT were examined.

How 3DGTT Scores Vary depending on Grade Level

The mean scores, the highest and lowest scores are presented in Table 3.

Table 3. Students' 3DGTT scores

Grade Level	The Number of Students	3DGTT Scores			
		Mean	Std. Deviation	Lowest score	Highest score
1st grade	128	21.04	7.56	5	40
2nd grade	123	23.64	7.96	5	42
3rd grade	130	24.17	8.27	6	43
4th grade	139	27.94	8.24	5	44
Total	520	24.28	8.38	5	44

Table 3 shows that the 1st grade students got the lowest mean score with 21.04 while the 4th grade students got the highest mean score with 27.94, followed by the 3rd graders with 24.17 and 2nd graders with 23.64. This finding shows that as the grades increase, the mean score taken from the test also increases. Regarding the highest and lowest scores, it had been seen that with increasing grade, only small increases occur in the highest score while the lowest score does not vary depending on grade. The lowest score is 6 among the 3rd graders and it is 5 among other grades.

One-way Variance Analysis (ANOVA) was run to determine whether there is a significant difference among the scores taken from the 3DGTT and grade level. The findings are presented in Table 4.

Table 4. ANOVA scores

Source of the Variance	Sum of Squares	Degree of Freedom	Mean Square	F	p	Significant Difference	η2
Between-Groups	3261.174	3	1087.058	16.885	.000*	1-3. 1-4. 2-4. 3-4	.089
Within-Groups	33219.557	516	64.379				
Total	36480.731	519					

* p<.01

Table 4 shows that the 3DGTT scores vary significantly depending on grades [$F_{(3\text{-}516)}$=16.885, p<.01]. In addition, η2 value, calculated for the effect size, was found to be .089. Thus, it was concluded that the grade variable has a medium effect on the scores taken from the 3DGTT (Cohen, 1988). The results of the Scheffe Test conducted for paired group comparisons showed that this significant

difference between different grades from the significant differences between the 1st and 3rd graders, between the 1st and 4th graders, between the 2nd and 4th graders and between the 3rd and 4th graders. These significant differences seem to be in favor of upper grade levels in all the paired comparisons. This finding shows that the test score taken at the 4th grade level is significantly higher than the scores taken at all the other grade levels. Although mean scores increase as the grade increases, the score differences between the 1st and 2nd graders and between the 2nd and 3rd graders were not found to be significant.

How the Scores Taken for the Components of 3DGTT Vary Depending on Grades

The mean scores taken by the students for the components of 3DGTT were compared in a graph (Figure 3). As the numbers of questions regarding the components in the test are different (e.i. the highest scores taken for the components), the scores taken by the students for the components in the 3DGTT were converted into t scores.

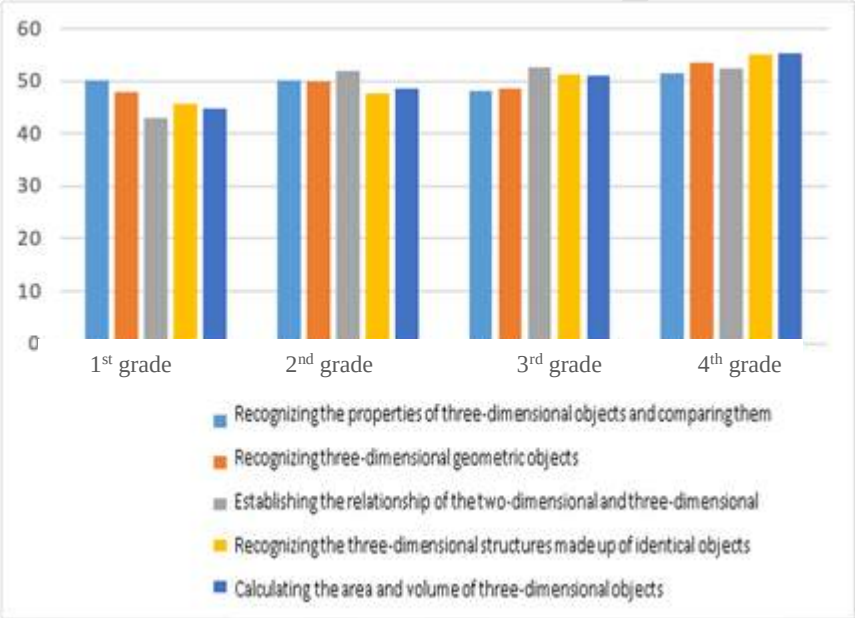

Figure 3. Students' t scores for the components of 3DGTT

Figure 3 shows that the scores taken by the students for all the components of 3DGTT increase, except for the component of recognizing the properties of 3D objects and comparing them between 2nd graders' scores and 1st graders' scores. On the other hand, while the lowest mean score was obtained for the component of establishing the relationship of the 2D and 3D by the 1st graders, the 2nd graders got the highest mean score for this component. It can be said that a small decrease occurred in the mean score taken for the component of recognizing the properties of 3D objects and comparing them (50.22 versus 50.14). At the 3rd grade, the mean score taken for the component of establishing relationship of the 2D and 3D increased, and it became the component with the highest mean score as at the 2nd grade. It can also be said that there are decreases in the mean scores taken for the components of recognizing 3D geometric objects and recognizing the properties of 3D objects and comparing them while there are increases in the mean scores taken for the other components at the 3rd grade. At the 4th grade level, all the mean scores except for the mean score taken for the component of establishing relationship of 2D and 3D are higher than the scores taken for these components in the other three grades.

The results showed that the highest mean score for the component of establishing relationship of 2D and 3D relationship was obtained in the 3rd grade (42.95- 51.89-52.61- 52.37 for the 1st, 2nd, 3rd, 4th grade levels, respectively) while the highest mean scores for all the other components were obtained in the 4th grade. With increasing grades, the mean scores taken for the components of recognizing the 3D

structures made up of identical objects and calculating the area and volume of 3D objects increased. While the lowest mean score for the component of recognizing the properties of 3D objects and comparing them was taken in the 3rd grade, the lowest mean scores for the other components were taken in the 1st grade.

MANOVA was used to investigate how the scores taken by the students for the components of 3DGT in the 3DGTT vary across the grades**.** MANOVA assumptions are examined under the heading of "Data Analysis and Statistical Techniques". Statistics for this analysis are given in Table 5.

Table 5. Statistics of the MANOVA analyses

Source of the Variance	Wilks' λ	F	Hypothesis df	Error df	p	η2
Grade level	.624	17.57	15.00	1413.808	.000*	.146

* p<.01

As a result of the analysis, significant differences were found between the grades in terms of the components of 3DGT [Wilk's Lambda (λ)= .624, $F_{(3\text{-}516)}$=17.57, p<.01]. The calculated η2 value was found .146, which shows that the effect of the grade variable on the scores taken for the components is large (Cohen, 1988). In other words, the grade variable explains 14% of the variance in the dependent variable, and this variable has a great effect on the dependent variable. The results showing how the scores taken for each component vary across the grades are presented in Table 6.

Table 6. Means and standard deviations and ANOVA results

Component	Grade	n	Mean	Std.Dev.	Df	F	p	Significant Difference	Possible maximum scores
Recognizing 3D geometric objects	1	128	1.12	1.10	3-516	8.82	.000*	1-4, 2-4, 3-4	4
	2	123	1.38	1.18					
	3	130	1.22	1.16					
	4	139	1.81	1.28					
Recognizing properties of 3D objects and comparing them	1	128	10.39	4.01	3-516	2.38	.069		18
	2	123	10.35	4.08					
	3	130	9.54	4.33					
	4	139	10.87	3.99					
Establishing relationship of 2D and 3D	1	128	1.32	0.95	3-516	33.47	.000*	1-2, 1-3, 1-4	4
	2	123	2.34	1.16					
	3	130	2.42	1.06					
	4	139	2.39	.97					
Recognizing 3D structures made up of identical objects	1	128	4.06	2.10	3-516	26.20	.000*	1-3, 1-4, 2-3, 2-4, 3-4	8
	2	123	4.50	1.92					
	3	130	5.26	2.08					
	4	139	6.07	1.86					
Calculating area and volume of 3D objects	1	128	4.11	2.18	3-516	29.95	.000*	1-2, 1-3, 1-4, 2-4, 3-4	11
	2	123	5.05	2.39					
	3	130	5.72	2.29					
	4	139	6.79	2.58					

* p<.01

Table 6 shows that regarding the component of *recognizing 3D geometric objects* there are increases in the scores taken with increasing grades, except for 2nd and 3rd grades (1st grade:1.12; 2nd grade:1.38; 3rd grade:1.22; 4th grade:1.81). Thus, a significant correlation was found between the mean scores taken for this component and grade [$F_{(3\text{-}516)}$=8.82, p<.01]. The calculated η2 value was found .048, indicating that the effect size is medium (Cohen, 1988). The significant difference found as a result of Scheffe Test seems to stem from the significant differences between the 1st and 4th grades, between the 2nd and 4th grades and between the 3rd and 4th grades in favor of the 4th grade. In other words, the 4th grade students got a significantly higher mean score for the component of recognizing 3D objects than the

students from the other grades. Moreover, the highest score (4) and the lowest score (0) to be taken for this component were taken in all the grades.

Regarding the component of *recognizing properties of 3D objects and comparing them* (1st grade: 10.39; 2nd grade: 10.35; 3rd grade: 9.54 and 4th grade: 10.87), the lowest mean score was taken in the 3rd grade. The highest mean score was taken in the 4th grade, followed by 1st and 2nd grades. It is seen that there is no significant correlation between the scores taken for this component and grade level [$F_{(3-516)}$=2.380, p>.01]. The highest score for this component (18) was taken in the 3rd grade. The highest score taken in the other grades is 17. The lowest score taken in the 2nd, 3rd and 4th grades is 1, and it is 2 in the 1st grade level.

For the component of *establishing relationship of 2D and 3D* (1st grade: 1.32; 2nd grade: 2.34; 3rd grade: 2.42 and 4th grade: 2.39), the highest mean score was taken in the 3rd grade and the lowest mean score was taken in the 1st grade. A significant correlation was found between the scores taken for this component and grade level [$F_{(3-516)}$=33.47, p<.01]. The results of Scheffe Test showed that this significant difference between the grades stemmed from the significant differences between the 1st and 2nd grades, between the 1st and 3rd grades and 1st and 4th grades in favor of the 4th grade. The highest score (4) and the lowest score (0) to be taken for this component had been taken in all the grades.

For the component of *recognizing 3D structures made up of identical objects*, the mean scores increase as the grade increased (1st grade: 4.06; 2nd grade: 4.50; 3rd grade: 5.26; 4th grade: 6.07). A significant correlation was found between the scores taken for this component and grade [$F_{(3-516)}$=26.20, p<.01]. The effect size of the grade variable on the scores taken for this component was found to be medium ($\eta 2$=.13), but closer to large effect size (Cohen, 1988). The results of Scheffe Test showed that this significant difference stemmed from the significant differences between the 1st and 3rdgrades, between the 1st and 4th grades, between the 2nd and 3rd grades, between the 2nd and 4th grades, and between the 3rd and 4th grades in favor of the 4th grade. These results show that there are no significant differences only among the 1st and 2nd grades. The highest score to be taken for this component (8) had been taken in all the grades. The lowest score taken for this component is 1 in the 4th grade and 0 in all the other grades.

The mean scores taken for the component of *calculating the area and volume of 3D objects* increased as the grade increased. The mean scores taken for this component in the 1st, 2nd, 3rd and 4th grades are 4.11, 5.05, 5.72 and 6.79, respectively. A significant correlation was found between the scores taken for this component and grade [$F_{(3-516)}$=29.95, p<.01]. The calculated effect size was $\eta 2$=.14, showing that the significant difference has a large effect (Cohen, 1988). As a result of Scheffe Test, it was found that this significant difference stemmed from the significant differences among 1st and 2nd grades, 1st and 3rd grades, 1st and 4th grades, 2nd and 4th grades, and 3rd and 4th grades in favor of higher grade levels. These results show that there are no significant differences only among the 2nd and 3rd grades. The highest score to be taken for this component (11) had been taken in all the grade levels and the lowest score (0) was taken in the 1st, 2nd and 3rd grade levels while the lowest score taken in the 4th grade level is 2.

Relationships between the Components of 3DGT

In order to investigate the relationships between the components of 3DGT, correlation coefficients had been calculated; and positive, medium and significant correlations had been found among all the components. Thus, it can be said that as an increasing score is taken for any of the components, the scores taken for the other components tend to increase. The correlation values among the components of 3DGT are given in Table 7.

The component of recognizing properties of 3D objects and comparing them has medium, positive and significant correlations with the component of recognizing 3D geometric objects (r=.36, p<.05), medium, positive and significant correlations with the component of establishing relationship of 2D and 3D (r=.45, p<.05), medium, positive, and significant correlations with the component of recognizing the 3D structures made up of identical objects (r=.42, p<.05), medium, positive, and

significant correlations with the component of calculating the area and volume of 3D objects (r=.44, p<.05).

Table 7. Correlations between the components of 3DGT

Components		Pearson Correlation Coefficient				
		Recognizing properties of 3D objects and comparing them	Recognizing 3D geometric objects	Establishing relationship of 2D and 3D	Recognizing 3D structures made up of identical objects	Calculating the area and volume of 3D objects
Recognizing properties of 3D objects and comparing them	Pearson K. Sig. (2-tailed) N	1 520	.360* .000 520	.454* .000 520	.425* .000 520	.442* .000 520
Recognizing 3D geometric objects	Pearson K. Sig. (2-tailed) N		1 520	.353* .000 520	.307* .000 520	.314* .000 520
Establishing relationship of 2D and 3D	Pearson K. Sig. (2-tailed) N			1 520	.418* .000 520	.523* .000 520
Recognizing the 3D structures made up of identical objects	Pearson K. Sig. (2-tailed) N				1 520	.465* .000 520
Calculating the area and volume of 3D objects	Pearson K. Sig. (2-tailed) N					1 520

* p<.01

The component of recognizing 3D geometric objects has medium, positive and significant correlations with the component of establishing relationship of 2D and 3D (r=.35, p<.05), medium, positive, and significant correlations with the component of recognizing 3D structures made up of identical objects (r=.30, p<.05), medium, positive, and significant correlations with the component of calculating the area and volume of 3D objects (r=.31, p<.05).

The component of establishing relationship of 2D and 3D has medium, positive, and significant correlations with the component of recognizing the 3D structures made up of identical objects (r=.41, p<.05) and medium, positive, and significant correlations with the component of calculating the area and volume of 3D objects (r=.52, p<.05).

The component of recognizing the 3D structures has medium, positive, and significant correlations with the component of calculating the area and volume of 3D objects (r=.46, p<.05).

DISCUSSION and CONCLUSIONS

The scores taken from the 3DGTT revealed that the primary school students' 3DGT improves as their grade increase. Understanding a 3D object requires the visualization of the object as a whole in mind as well as distinguishing the elements of the object (Deregowski & Bentley, 1987). The visualization of a 3D object, which the drawing of is given, can be accomplished through the spatial ability and this ability develops in hierarchical stages depending on experience (Guay & McDaniel, 1977). Accordingly, as the grade increases, the experiences gained may enable the improvement of this ability and facilitate the understanding of 3D objects. In addition, except for the 1st and the 2nd grades and the 2nd and the 3rd grades, significant differences were found among all the grades in favor of upper grades. Thus, it can be claimed that the most remarkable improvement occurs while the students pass from 3rd grade to the 4th grade.

When the lowest and highest scores taken from the 3DGTT are examined, it had been seen that there are 1st grade students who obtained 40 points, 2nd grade students who obtained 42 points, 3rd grade students who obtained 43 points and 4th grade students who obtained 44 points. These results may indicate that 1st grade students, who are expected by the mathematics curriculum (MEB, 2013) to recognize the elements making up the objects, and to classify the objects according to their "being round or cornered", might have a higher ability of 3DGT than the anticipated. Moreover, there are 2nd grade students who got 42 points in the test, which includes questions requiring important visualization processes, such as determining the view of a structure made of cubes from different angles and comparing objects with different surface areas. Those results show that in younger students, 3D thinking skills can develop independently from the instruction. On the other hand, the presence of students who got 6 in the 3rd grade and 5 in the other grades indicate that some students performed well below their grade's average. These results support the view of Van Hiele (1999) that a child may have a higher level of geometric thinking, compared with an older child. In addition, increases had been observed in the scores depending on the grades, and the significant score differences found in favor of the upper grades may be a result of students' achieving more experience in 3D geometry each year, depending on the structure of mathematical course curriculum. These results show that students' 3DGT mainly depends on their grade but may also develop independently from the grade.

NCTM (2000) contends that the students from preschool to 2nd grade should be able to explain the properties of 3D objects and their constituent parts, to use their representations; and that 3rd to 5th grade students should be able to analyze the properties of such objects and classify them according to their properties. In the 1st to 4th grade mathematics curriculum, which was in effect in Turkey when this study was being conducted, the properties of 3D objects were first mentioned in the 2nd grade and, at this level, it was aimed to make students recognize the properties such as vertices, edges, and faces. At the 3rd grade, students were expected to visualize the parts of 3D objects in their minds when they are given the nets of these 3D objects (MEB, 2013). In that case, it is understood that an improvement depending on the grade was expected in terms of the recognition of objects' properties. In our study, the scores obtained by the students at the 1st to 4th grades on the component of recognizing the properties of 3D objects were compared and were found to be very close. It is an important result that there are no significant differences in terms of the grades among students' scores for this component. In that case, it became evident that students at different grades are at a similar level in determining the vertices, edges and faces of 3D objects and comparing different 3D objects according to their properties. However, these results should not be read as 'the students' skills of recognizing the properties of 3D objects do not improve at all as their grade levels increase'. It should be noted that the current study is based on the 3DGTT, limited with the representations through drawings. Our study reveals the fact that young students' noticing some features of three-dimensional objects, which are not included in the curriculum, is in line with the result that 8- and 9-years old students' noticing the components of polyhedras, as also observed by Ambrose & Kenehan (2009). The fact that an average of about 10 points /18 points was obtained at all grades for this component, indicate that students begin to notice the properties of three-dimensional objects earlier than expected by the curriculum.

The findings obtained for the component of recognizing 3D geometric objects show that the relevant skill develops depending on the grade. The fact that the significant difference found stemmed from the significant differences between 1st and 4th, 2nd and 4th and 3rd and 4th grades can be regarded as an indicator of a significant improvement in this skill at the 4th grade. This result may also indicate that the skills of distinguishing 2D and 3D objects and recognizing similar 3D objects develop only at the ages of 9 and 10 (Mitchelmore, 1980). The results related to this component show that students' related skills start to develop at the 1st grade or earlier, and in this respect, they support the study by Hallowell et al. (2015), who showed that the 1st grade students were able to envisage two-dimensional representations of three-dimensional objects. However, the absence of a significant difference among grades till the 4th grade addresses that it may be beneficial especially for the students at lower grades to be provided experience on three-dimensional objects on paper. The views that concrete objects are not

as effective as it is thought to be after the age of 5, and that the use of representations, such as drawings and symbols, is necessary after that age (Sarama & Clements, 2016) are considered to be important in respect with that.

The significant differences found between 1st and 2nd, 1st and 3rd, and 1st and 4th grades in favor of upper grades for the component of establishing relationship of the 2D and 3D indicate that this skill shows a remarkable improvement after the 1st grade. This result may be due to the fact that the 1st grade students aged 6-7 in the study group had just begun to recognize the relationship between a 3D object and its net but yet not have an idea about the object that the net will create (Piaget & Inhelder, 1956). In addition, although the subject of nets is first mentioned in the 3rd grade according to the mathematical curriculum, which was in effect in the academic year during the current study was conducted (MEB, 2013), the improvement observed in the students when they passed to the 2nd grade, and the lack of significant difference between 2nd and 3rd grade students are important outcomes of that study. This outcome addresses that, students started to visualize the parts of 3D objects in their imagination, independent from the curriculum. In addition to these, the existence of students with skills related to this component in the first grade supports the studies of Harris et al. (2013), who argued that 5.5-year-old children can fold shapes on paper in their minds.

The facts that the students' mean scores taken for the component of recognizing 3D structures consisting of identical objects vary significantly depending on grades, and that, significant differences were found between all the grade levels, other than the 1st and 2nd grades, in favor of upper grades, proves that as their grade increase students use significantly more advanced strategies in visualizing and counting identical cubes (Battista & Clements, 1996; Olkun, 2003a). According to the mathematical curriculum, which was in effect in the academic year during the study was conducted, students encounter drawings of buildings consisting of identical cubes for the first time in the 4th grade (MEB, 2013). However, the significant score differences observed for this skill after the 2nd grade indicate that there is a remarkable leap after this grade and student start to recognize 3D structures consisting of identical objects independent from the curriculum .

Accordingly, it had been found that the mean scores obtained for the component of calculating the area and volume of 3D objects vary significantly depending on grade may indicate that students can use unit squares to calculate areas on the basis of the experience they gained over a few figures (Heraud, 1987). It had also been found that the skill of calculating volumes with unit cubes develop depending on the grade (Battista & Clements, 1996; Olkun, 2003a). Students' experience with geometric shapes and 3D geometric objects improves as their grade increase. In addition, in our study, which had been conducted during an academic term when area measurement with non-standard units was addressed in the 3rd grade and the volume measurement was addressed in the 5th grade according to the mathematical curriculum, it has been concluded that students showed improvement for this component from the 1st grade onward. This result addresses that important steps had been taken towards the development of the concepts of area and volume as of the first years of primary school, independent from the curriculum.

When the relationships between the scores taken by the students for the components of 3DGT were examined, it was observed that while the scores obtained for one component increased, the scores obtained for the others also increased and positive and medium significant correlations were found between all the components. This result points out the necessity to consider as many components as possible together in order to determine the 3DGT state of primary school students. This result is also believed to provide guidance for the teaching to be delivered on the relevant subject. For example, in the mathematics curriculum, which was in effect in the academic year during the current study was conducted, the properties of 3D objects were addressed in the 2nd grade and the identical structures in the 4th grade for the first time (MEB, 2013). Different skills can be developed at different ages and at different grades, and this also affects the teaching to be done according to grade. Moreover, the results obtained are considered to be remarkable in terms of understanding the importance of teaching the components of 3DGT in an integrated manner. In mathematical curriculums there sometimes may

occur considerable changes on the objectives regarding the 3D objects from time to time. Also, the objectives addressed for each grade, or the content of the current objectives might change. For example, the properties of 3D objects were addressed in the 2nd grade when the current study was conducted (MEB, 2013), but this subject is included in the 3rd grade at the current curriculum (MEB, 2018). It is thought that much more effective results can be obtained from such changes, if the facts that the development of the components of 3DGT depends on grade level, and that the components of 3DGT are interrelated, are taken into consideration.

As a conclusion, the scores obtained for both the components of 3DGT and the whole test show that 3DGT starts to develop from the 1st grade onward, and that some students were able to correctly answer questions concerning objectives normally addressed in the upper grades according to the mathematical curriculum. This result reveals that some important 3DGT skills develop independently from the objectives set in the mathematics curriculum for each grade. However, as the grade increases, despite the scores for the components sometimes decrease, the mean scores at the test and the significant score increase too especially after the 3rd grade; and this shows the effects of grade and related objectives on the development of 3DGT. These results reveal the importance of determining the subjects and objectives of curriculum according to grades and the importance of considering the fact that, while planning the instructional process, some skills may be developed at an early age to a certain degree. In particular, inclusion of the basic skills related to the components of calculating the area and volume of 3D objects, establishing relationship of 2D and 3D, recognizing the 3D structures made up of identical objects and addressed in higher grades together with other components as of the first years of primary school seems to be necessary for the development of geometric thinking at an early age. On the other hand, the results of the study show that the components of 3DGT develop simultaneously. This result points out the necessity of handling the components of 3DGT with an integrated manner in the curriculum and in the instructional process as much as possible.

Limitation of the Study and Suggestions

The data obtained in the current study are limited to the students' responses to the three-dimensional geometric thinking test. Therefore, the study is not extensive enough to explain why and how students gave these responses. Examination of such issues is worth considering in future researches.

In the current study, three-dimensional geometric thinking of students at different grades had been compared. In addition, a longitudinal study is considered as necessary to see the development of students' three-dimensional geometric thinking as their grades change.

Administration of the test used in the current study to students in upper grades can provide more comprehensive information about the change occurring in 3DGT depending on grade. Such a study can also be useful in determining the subjects related to 3D geometry in primary and secondary school mathematical curriculums.

One-to-one interviews to examine how students are affected by the variables while examining 3D object drawings, and how they perceive 3D objects in different positions and colors can provide detailed information about young students' 3DGT.

It is thought that it would be beneficial to determine by what means the students, who got higher scores since they were in lower grades and who got lower scores since they were in upper grades, think in a different way from others. One-on-one interviews with students with very low and very high scores at each grade will provide information about the 3DGT state of those students and offer important insights into teaching, in which individual differences will be taken into account.

The fact that younger students have some important 3D thinking skills makes us curious about what those students have about higher order skills such as "classification", which is not included in the current study. Studies with young students, including such skills, can provide more comprehensive information about their 3DGT.

Ethics and Conflict of Interest
This article is based on Zeynep Akkurt Denizli's PhD dissertation entitled "The Development, Application, and Evaluation of a Three-Dimensional Reasoning Test for Grades 1 to 4", conducted under the supervision of Abdulkadir Erdogan. It is hereby declared that the authors of the current study acted in accordance with the ethical rules in the course of the research process. There are no conflicts of interest by and between the authors. This research was conducted with the 26 November 2015 dated and 14588481-605.99-E.12164053 numbered permission granted by the Ministry of National Education. We hereby wish to present our gratitude to primary schools, middle schools, classroom teachers, and all students who participated in the research.

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IMPACT OF DIFFERENTIATED TEACHING IN DISTANCE EDUCATION PRACTICE ON GIFTED AND TALENTED PRIMARY STUDENTS

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Abstract

The main purpose of the present study was to develop and apply a mathematics program that meets the academic and mental needs of gifted and talented primary school students during distance education and to test the effectiveness of the program. The current study involved 120 gifted and talented fourth-grade students, 60 of whom were in the experimental group and 60 in the control group. The distance learning program was prepared based on the parallel curriculum model and the differentiation techniques proposed by the grid model were used. For the collection of data, the Mathematics Achievement Test and the Attitude Scale for Mathematics were given to the students in the experimental and control group as pre-test and post-test. The paired-samples t-test was used to compare the pre-test-post-test scores of students in the experimental and control group. The independent group's t-test was used to compare the post-test scores of the students in the experimental group with the post-test scores of the students in the control group. Also, covariance analysis was used to compare post-test achievement and attitude scores after controlling pre-test scores in the experimental and control groups. The results of this study indicate that a differentiated mathematics program delivered via distance education increased the achievement and attitude toward mathematics in the experimental group. It was also stated that conducting similar studies for different courses and comparing results will contribute to distance education.

Keywords: Distance education, gifted and talented children, primary school students, mathematics teaching, program differentiation.

INTRODUCTION

The concepts of special talent, giftedness, and special intelligence are sometimes used interchangeably and sometimes as two separate concepts of intelligence and talent (Renzulli, 2012). When studies on how the topics should be used correctly are examined, the first use focuses on the concept of giftedness and intelligence is a term used to understand the world, produce solutions to problems encountered, and adapt to life in this context (Levent, 2013).

Thurstone, who examined intelligence as a multidimensional concept, said that each dimension represents a mental ability. According to Thurstone, mental abilities stand side by side like an independent mosaic. An interpretation of these factors used the concepts of Gestalt psychology (Kane & Brand, 2003). Guilford was an ardent advocate of Thurstone's model. He developed Thurstone's model of primary mental abilities and presented his model of the structure of intelligence. In this model, intelligence is defined as a "systematic collection of abilities" or "a function of processing different information in various forms".

According to Clark et al. (2012), the concept of "giftedness" is the product of a dynamic and interactive event that makes a difference in thinking and performance, both quantitatively and qualitatively. The term "gifted" denotes a high level of intelligence and represents highly accelerated and integrated brain function. Such a developed structure is expressed as leadership, academic ability, creativity and productivity in the artistic field. How giftedness will occur is directly related to the genetic structure of the individual and its interaction with the environment.

In research on intelligence, there is more than one definition of intelligence. The concept of intelligence and superiority is no longer limited to the cognitive function of the brain; it should include all brain functions and their effective and integrated use. Superiority emerges as a function of creativity in producing ideas, analytical intelligence in evaluating the quality of thoughts, practical intelligence in persuading people to value these ideas and follow them when putting these ideas into practice, and the view that these decisions and their implementation are for the benefit of society. These traits are not completely inherited, they also interact with the environment during development (Sternberg, Jarvin, & Grigorenko, 2011). Galton, who conducted early studies in the field of intelligence, argued that the benchmark for being more mentally capable is to be able to distinguish more from less. According to Binet and Simon, gifted and talented individuals have improved ability to decide and judge (as cited in Sternberg, 2003). According to Renzulli (2016), one of the first to propose the concept of multidimensional superior intelligence and ability, superior intelligence and ability can be explained by the interaction of three main characteristics: high levels of general and special ability, creativity, and motivation. Gardner (2011) stated that superior intelligence and ability encompass the competencies of producing original products, finding and solving problems. Similarly, superiority is the way of solving complicated problems in the most appropriate, efficient, and cost-effective manner, according to Maker (1993). Although definitions vary, for many people, superior intelligence and ability are directly proportional to academic achievement. Described by Renzulli (2005) as “school superiority” or “academic superiority”, this concept is often seen as the only expansion of superior intelligence and ability.

Education of gifted people is increasingly important due to individual educational needs. Educational programs are organized for an average level of intelligence and ability. The perception of these individuals, whose requests and needs are very different, is clear; they learn faster, but they have disadvantaged situations that accompany all these characteristics. The fact that these individuals need to learn based on their interests and needs, and do not want to learn anything they do not need to, is also an important consideration that should not be overlooked. These individuals, who need to learn according to their interests, face several problems in the educational environments available, and many of them are left out of education, unnoticed because they cannot meet this need.

Although students are at the same grade level in classes, their interests, readiness, learning rates, expectations from school, past learning experiences, cultures, and family structures are quite different. Such differences also affect their learning and the support they will need. Planning without taking these differences into account will slow the progress of talented students with a good level while making it difficult for deficient or slow-learning students to understand (Atalay 2014; Crosnoe et al., 2010; Vygotsky, 2011).

Differentiated instruction involves multiple ways used to structure a lesson in which each student has an appropriate level of challenge. Differentiated instruction may include student-centeredness, planned assignments, assessment-based lesson planning, flexible grouping, materials, resources, and supervision (Tomlinson & Hockett, 2008). According to Tannenbaum, differentiation is the modification of a program to meet the different needs of individuals or small groups (Dobron, 2011). Gregory and Chapman (2013) described differentiation as changing the learning process in accordance with individual differences

Differentiated teaching is planned with activities that will advance, support, and improve the cognitive learning levels of gifted individuals, while new studies based on certain theories can also be proposed

according to the results of these studies. Theoretical-based differentiation studies, which are good examples of special educational work, can support the development of gifted individuals and help them receive better quality education. Some of the differentiation models that can be given as examples of theoretical-based differentiation models include differentiation of gains according to Bloom taxonomy (Feldhusen, 1994), curriculum differentiation model (Maker, 1982), curriculum compacting model (Renzulli & Reis, 1985), Kaplan's curriculum differentiation model (Kaplan, 1986), parallel curriculum model (Tomlinson et al., 2002), multi-menu model (Renzulli, 1977), ÜYEP model (Sak, 2009), ÜYÜKEP model (Tortop, 2013; 2015), and the integrated curriculum model (Kutlu Abu & Gökdere, 2020; VanTassel Baska & Wood, 2009).

Differentiation is based on taking into account what each person needs. When differentiating, it is important to plan widely according to the readiness, interest, and learning styles of the students, as the aim is to improve their learning potential. In this way, the study was based on the Kaplan grid model and the parallel curriculum model.

In the grid curriculum model, content must be organized within the framework of a theme. The use of themes is intended to provide an understanding of deductive thought and to support creative thought. Many teachers working with superiors can differentiate their curricula based on this model without being program experts because the grid model is prepared in a frame plan, and the scope and the order do not matter (Van Tassel-Baska & Brown 2007). The Kaplan grid curriculum model, introduced by Kaplan (2009), has continued to be developed since 1973 and is known as a model that draws a framework for differentiation. Complexity and depth should be included within the curriculum, and there is a framework for depth and complexity. Depth refers to progress from concrete to abstract, from information to data, concepts, generalizations, and theories. Complexity is the relationship between concepts. It is the interdisciplinary aspect of the curriculum. It is recommended that the gradually complex subjects be taught to students in an accelerated manner while they are self-learning, as well being focused on concepts and ideas. It is where high-level thinking skills will be developed. According to the curriculum differentiation program to be prepared based on this model, procedures to help the student overcome their existing limits in demonstrating their abilities should be included. Implementation for gifted students is important in terms of representing an appropriate model.

The parallel curriculum model consists of four parallels (sections): the general curriculum, the connections curriculum, the practices curriculum, and the awareness curriculum. Each dimension contains different types of learning achievements. According to Sak (2013), the general curriculum is the first dimension that forms the point of origin of the model. This dimension is where the curriculum has learning gains that improve gifted individuals. The second dimension creates the connections curriculum. Students make connections in this dimension within themselves and across different disciplines. It aims to develop concepts, principles, and skills that are not included in the general curriculum or are not given sufficient weight. The third one is the implementation dimension. It aims to give students behaviors that will allow them to think like experts in that discipline. The fourth dimension of the parallel curriculum model aims to allow students to explore and understand a discipline in depth. They are asked to compare their interests, skills, and abilities with the discipline in which they work. The goal is to enable them to make comparisons to determine which discipline interests them and fits their abilities. According to Tomlinson (2009), the parallel curriculum model is a compelling model for a gifted individual, which enables them to move to an advanced level. It is a curriculum that requires work to develop advanced thinking skills that challenge the student by using four parallel paths simultaneously in the process of selecting and creating content. In the parallel curriculum model, assessments are made for multifaceted measurements of gifted students. It aims to provide students with educational opportunities in different fields at an early age, enabling them to live various experiences and discover and develop their abilities and interests in this way (Doğan & Saraçoğlu, 2019; Tomlinson et al., 2002).

Levy (2008) defined differentiated teaching as an adventure in which the teacher moves the student forward from their current level by determining where the student is, providing flexibility in content,

process, and product. To provide effective mathematics teaching, it is also important to build new knowledge on top of the student's previous knowledge (Van de Walle et al., 2016). In differentiated mathematics teaching, the goal is to maximize student capacity. To increase the development of advanced students, a teaching program is needed where students are told the goal of their studies is to exceed their potential. This is because negative results may occur if the mathematics curriculum is applied to gifted and talented students without differentiation; boredom, regression, and low achievement.

It is necessary to differentiate the mathematics curriculum based on the concepts of acceleration, abstraction/complexity, diversity and creativity, which are the basic principles of curriculum differentiation, and creative thinking in mathematics, which is important in the field of mathematics, thinking styles of mathematical scientists, personality traits and life stories.

Mathematics education is a branch of science that enables the development and application of methods and theories about the learning and teaching of mathematics within the framework of academic studies (Baki, 2018). Objectives of the mathematics course curriculum are to enable the student to use mathematical language effectively, to develop mathematical thinking skills, to develop a positive attitude towards mathematics, and to ensure that they value mathematics. It also aims to develop the student's problem solving, reasoning, research, generation and use of knowledge skills, metacognitive knowledge and skills, and the characteristics of being systematic, careful, patient, and responsible (MoNE, 2018). Since mathematics is a science focused on principles and operations that follow a logical and consistent pattern (Van De Walle, et al., 2016), if the concepts and rules are memorized without permanence in students' minds, they will have difficulties with different problem structures and this will prevent students from achieving the desired success in the mathematics lesson. It is believed that effective mathematics teaching is possible in environments where the teacher is a guide, students have sufficient knowledge, complete technological equipment, engage in active participation and the number of students is low (Öztürk & Güven, 2012). A study of the relevant literature also showed that differentiated teaching practices in mathematics education have a positive effect on the concepts of achievement, attitude, persistence, cognition skills, self-efficacy perception, creativity, and academic self (Akkaş, 2014; Eşiyok, 2017; Karataş, 2013; Sezgin & Baysal, 2019; Taş, 2013; Yabaş, 2008). Traditional mathematics teaching, which focuses on academic achievement, often emphasizes computation, formula memorization, and routine problem-solving skills with practice. The problems that may arise during the implementation of differentiated programs in traditional education are listed as follows: lack of adequate time, teachers requiring a lot of time for evaluation and monitoring tests, individual differences in learning speed, and challenges in doing and assessing additional activities. These problems that inevitably arise in traditional education can be easily addressed in internet-based distance education, which can offer individualized education through distance education management system software. The advantages of distance education are many. The proportion of benefits compared to face-to-face education is high. Distance education is student-centered and it offers equal opportunity, provides educational opportunities for physically handicapped students, and removes geographical and regional barriers. It is ideal for those who cannot benefit from traditional education. It enables employees to continue their education and allows the person to learn at their own pace. It provides the opportunity to access information quickly and easily. It eliminates the additional expenses such as transportation, accommodation, accommodation and nutrition required in face-to-face education. It provides an interactive and dynamic learning process with the instructors. Being independent of time and place, it provides students with 24/7 access to the educational environment from any place with internet access.

Due to combining a differentiated mathematics program with the possibilities of distance education, students can perform activities such as projects, assignments, and research, which makes them active recipients. In this way, students can maximize their learning by accessing resources such as computers, the internet, online data banks, and academic journals to access necessary information other than the information learned in the course. As a method, internet-based distance education means that teachers

organize learning tools, materials, subjects, and teaching techniques according to distance learning opportunities to achieve their teaching goals.

In this context, unlike previous studies conducted in the field, differentiated mathematics teaching was carried out with distance education applications and the impact of the differentiated program on the achievement and attitude of gifted and talented students was investigated.

Purpose of the Study

The basis of the educational process lies in the teaching-learning processes. The compatible use of methods and techniques in these processes allows a person to achieve what is expected from education most efficiently. Distance education differs from traditional education in that it makes extensive use of communication and information technologies, both in terms of its goals and the tools and equipment it employs. For this reason, the techniques and the course materials should be planned and used according to the possibilities provided by the distance education method based on the educational model. In distance education applications, the random use of teaching techniques without being based on an educational model and the emphasis on applications that prioritize technology can prevent internet-based distance education from being effective and efficient. For these reasons, during the implementation of distance education, an educational process should be planned that will facilitate the achievement of the goals of education. In this study, differentiation in mathematics prepared for superiors was based on internet-based distance education applications. The distance learning program was prepared based on the parallel curriculum model and the differentiation techniques proposed by the grid model were used.

In previous studies, differentiated mathematics teaching was carried out and the effect of the differentiated curriculum on the achievement and attitudes of gifted students was examined. In this study, unlike previous ones, differentiated education was carried out with distance education applications and the effectiveness of differentiated education given through distance education was examined. The main objective of the study was to prepare a mathematics program aiming to develop the creative thinking of gifted and talented students in mathematics and to test its effectiveness in distance education. Based on this main objective, the sub-objective of the study was to reveal whether there was a statistically significant difference between the achievement and mean scores for attitude towards mathematics of the group to which the differentiated program was applied and the achievement and mean scores in attitude towards mathematics of the group who did not receive a differentiated program.

Research Problem

What is the impact of differentiated mathematics teaching prepared by considering the characteristics of students in distance education applications on the achievement and attitude of gifted and talented students?

Sub-problems:

For students in the experimental and control group in the distance education process;

1. Is there a statistically significant difference between the academic achievements in the mathematics course?
2. Is there a statistically significant difference between attitudes towards the mathematics courses?

METHOD

Research Model

A pre-test/post-test control group experimental design was used to obtain data for the study. In this design, participants are measured before and after the experimental process related to the dependent variable (Büyüköztürk, 2016; Karasar, 2020). This pattern is a powerful one that allows the researcher to interpret the results in the context of cause and effect when testing the effect of experimental processing on the dependent variable and is often used in behavioral sciences (Büyüköztürk, 2020).

The independent variable in the study is the teaching method applied. Attitude and achievement, which are likely to change depending on this method, are dependent variables.

Research Group

The research was conducted with 120 fourth-grade students who took mathematics courses for the 2019-2020 academic year with the distance education method. All students were identified as gifted by the WISC-R intelligence test. A total of 60 students constituted the experimental group, while 60 students constituted the control group. In the experimental group 27 of the students were female (45%), 33 were male (55%), while in the control group 30 of the students were female (50%) and 30 were male (50%). According to these data, the number of students in the experimental and control groups, as well as their gender distribution, are equivalent.

During the research, the units about natural numbers and fractions were differentiated considering the principles of differentiation, differentiation models, creativity models, and Bloom's revised taxonomy (Anderson & Krathwohl, 2001) for the experimental group. All subjects in the unit of natural numbers and fractions are included in the theme of system, conservation, equivalence, and evaluation. The application of the research lasted a total of 35-course hours (7 weeks). First, natural numbers unit was taught. This unit lasted 15-course hours (3 weeks). After that, the fractions unit was taught for 20-course hours (4 weeks).

Teaching and learning activities were carried out with lesson plans prepared to ensure the gains of the units and the effective participation of the students. At this stage, elements of the distance education management system were also used. A virtualized version of the real class environment was used by ensuring communication and interaction (see Appendix A Teaching and learning activities for visual samples). The course content was presented to students, questions were asked, feedback and notifications were provided. It was possible to evaluate the students individually by obtaining data about the extent to which the students followed the course and which questions were answered correctly or incorrectly.

A daily lesson plan was prepared for each unit, and the course being taught through distance education was considered when preparing these lesson plans (see Appendix B for sample lesson plan). In the experimental group, activities, involving high-level thinking skills were prepared in accordance with distance education, and creative thinking strategies were featured. Creativity and differentiation models were investigated, the theoretical foundations of the applied program were established and expert approval was obtained. Mathematics teaching was completed using a distance education program and course materials prepared based on the parallel curriculum model used in the study and differentiation techniques proposed by the grid model.

In the control group, no intervention was made to the educational process. The teacher requested students take notes during the lesson and asked them questions. At the end of the lesson, the teacher completed the lesson in classical form, by summarizing and repeating the subject.

Before starting the natural numbers unit, the experimental group was informed about the grid and parallel curriculum models, which were used as the basis for the research, and the program used for differentiation of mathematics subjects. These models and materials were described to students. In addition, since the characteristics of mathematics and mathematicians constitute one of the main dimensions of the differentiated curriculum, students were also informed about these issues. During the application, worksheets suitable for differentiated instruction, problem menus consisting of real-life problems, activities that enable students to determine their own hypotheses and propose their own hypotheses were prepared.

Although differentiated units are based on a comprehensive theme and mathematics, they also include different disciplines. The chosen theme was change. The activities were designed to reinforce the features of mathematics, thinking strategies and styles of mathematicians, as well as the use of creative thinking skills. Mathematics teaching was carried out by synthesizing creativity, high-level thinking

skills and differentiation models. One of the models utilized in the differentiation dimension of the prepared program was the grid curriculum model developed by Kaplan. In the grid model, it is argued that it is beneficial to consider the subjects within a theme including all disciplines. For this reason, the theme of the program was determined as "change". In the grid model, the content, process and product are differentiated under the selected theme.

In the differentiated program, in accordance with the theoretical basis of the grid model, “big ideas” and “generalizations” were added to the content, allowing interdisciplinary issues and interdisciplinary connections to be established. Within the scope of content differentiation of the model, “key questions” were prepared for the relevant parts of these generalizations.

Each lesson started with these key questions. At the end of the course, generalizations were given as a summary. The process differentiation part of the model covers using different thinking skills while teaching the lesson. All of the process skills topics mentioned in the grid model were used in the differentiation program (basic skills, creative thinking skills, problem-solving skills, critical thinking skills). The product differentiation part of the model allows the acquired knowledge and skills to be expressed in various ways. The differentiated program allows for diversity in terms of communication as it attaches importance to both written and verbal communication.

Data Collection Tools

In the study, an achievement test with multiple-choice questions was used to assess differences in academic achievement between the experimental and control groups before and after the experimental practice, and an attitude scale consisting of Likert-type items was used. Permission for this study was obtained from the local ethics committee (protocol number: E-35853172-300-00001536076).

Achievement Test

In distance education, the achievement test used to determine the impact of differentiated teaching on students' achievements was developed by the researchers. Relevant literature screening was conducted for the development of the achievement test, and information about the creating test items was taken into account (Doganay & Karip, 2006; Linn, 2006; Tekin, 2004). The achievement test was used to measure the achievement status before and after the experimental practice. Applications of the test used the educational management system. The highest score that can be obtained from the achievement test consisting of 20 questions is 100 points. Item separation indices for the items in the test vary from .31 to .84, while item difficulty indices vary from .34 to .86. The mean difficulty of the test was calculated as .58, which indicates that the test has moderate difficulty. The Cronbach Alpha coefficient of the test was determined as .74. Büyüköztürk (2020) stated that the reliability coefficient calculated for a test of .70 and higher is sufficient for reliability. The reliability of test scores is within acceptable limits.

Attitude Scale

The Short Form of Attitude Scale for Mathematics, developed by Lim and Chapman (2013) and adapted to Turkish by Hacıömeroğlu (2017), was used in the research. The scale obtained in the adaptation study conducted by Hacıömeroğlu (2017) consists of 19 items and three sub-dimensions. The reliability coefficient calculated for the entire scale was .84. Five ranges were taken as the basis for the evaluation of the scale. These are strongly disagree, agree, undecided, disagree, and fully agree, respectively. The scale includes three sub-dimensions: happiness, motivation, and self-confidence. In the happiness sub-dimension, 'how much students enjoy learning maths' is measured. In the motivation sub-dimension, 'students' interest in mathematics and their desire to study advanced mathematics' is measured. In the self-confidence sub-dimension, students' "confidence and self-concept related to mathematics performance" and "their beliefs about the benefits, importance, and value of mathematics in life" are measured.

Applications of the attitude scale used the education management system. Students were contacted by e-mail or phone and given information about the scale. In addition, they were also reminded of the importance that their responses should reflect their true views about the items.

The application of the achievement test and attitude scale was made using the user names and passwords of the students in the experimental and control group via the distance education management system. For tests administered online to be performed reliably, some requirements must be met. These requirements include ensuring that those who take the test are not in a disadvantageous position in the computer environment compared to paper-pen tests, they can fully use the facilities in the computer environment, and the control of the test taker is at the highest level during the application. Meeting these requirements depends on whether the computer skills of the applied group are sufficient, as well as the suitability of the software used. People should be able to freely navigate between app screens, go back and review their responses, and change them if necessary. The user should be able to see the elapsed time, which question they are answering, and how many questions are left. In this way, practitioners can use the facilities they have in paper and pen tests (Şencan, 2005). These points were considered in the applications of the tests.

Analysis of Data

Following reliability calculations for the prepared multiple-choice test, the achievement test and the mathematics attitude scale were applied separately to the experimental and control group students as pre-test and post-test. Before the analysis of the data, a general evaluation was made and the presence of missing values was checked. After this evaluation, the assumptions of normality, such as skewness and kurtosis, were examined. Since the skewness and kurtosis coefficients were within the range of ±3 limits, the data was determined to have normal distribution and parametric tests were used (Büyüköztürk et al., 2020).

To analyze the pre and post-test achievement and attitude scores of students in the control and experimental groups, the t-test for paired samples was used. The t-test for independent samples was used to compare the achievement and attitude test pre-test and post-test scores of students in the experimental group with the pre-test and post-test scores of the control group. Also, covariance analysis was used to compare post-test achievement and attitude scores after controlling pre-test scores in the experimental and control groups. If the difference between groups or variables was statistically significant during the analysis, Cohen's d effect size was calculated for the t-test. Cohen's d values for effect size of small, medium, and large are classified as .20 (small), .50 (medium), and .80 (large), respectively. (Cohen, 1988; Rosnow & Rosenthal, 1991).

RESULTS

In this study, the impact of higher-level thinking skills and curriculum differentiation strategies, mainly creative thinking, on the achievement and attitude levels of gifted and talented students was analyzed for a mathematics course and was statistically significant in developing behaviors targeted by the mathematics course.

First, the groups were compared according to their achievement scores before the implementation to see if the experimental and control groups were equivalent. As a result of the t-test for independent groups conducted to determine whether the group averages differed according to the pre-test variable for achievement, the difference between the group averages was not found to be statistically significant [$t_{(118)}$=1.787, p>.05]. The pre-test mean scores for achievement of the groups indicate that the groups match each other.

Table 1. Comparison of experimental and control groups according to pre-test achievement and attitude scores

	Control Group			Experimental Group					
	Mean	Std.Dev.	n	Mean	Std.Dev.	n	t	df	Sig.
Achievement (Pre-test)	84.93	9.242	60	87.63	7.183	60	1.787	118	.077
Attitude (Pre-test)	82.28	10.145	60	85.18	9.296	60	1.632	118	.105

*p<.05

To determine the effective readiness levels of the groups, the scores obtained by the students from the pre-test for the attitude scale for the mathematics course were compared. As a result of an independent group t-test conducted to determine whether the groups differed according to the pre-test attitude scores variable, the difference between the mean scores for the groups was not found to be statistically significant [$t_{(118)}$=1.632, p>.05]. This indicates that there was no statistically significant difference between the attitudes of experimental and control group students towards mathematics courses and that the groups are equivalent to each other in terms of effective readiness levels.

First sub-problem: what is the impact of differentiated mathematics teaching in distance education applications on academic achievement in gifted and talented students?

The t-test for paired samples was used to compare the pre-test and post-test achievement scores of students in the experimental and control groups to research this sub-problem.

Table 2. T-test results showing the impact of differentiated mathematics teaching on the academic achievement of the experimental and control groups

	Pre-test		Post-test						
	Mean	Std.Dev.	Mean	Std.Dev.	n	t	df	Sig.	d
Achievement (Control G.)	84.93	9.242	81.55	10.351	60	2.316	59	.024	.344
Achievement (Experimental G.)	87.63	7.18	97.58	2.77	60	10.329	59	.000*	1.80

*p<.05

As seen in Table 2, as a result of the t-test for paired samples conducted to test whether there was a statistically significant difference between the pre-test mean score for the achievement test in the control group ($\bar{X}_{pretest}$=84.93) with the post-test mean score ($\bar{X}_{posttest}$ =81.55), the difference between the means was not found to be statistically significant [$t_{(59)}$=2.316, p<.05]. The effect size calculated from the test result shows that this difference was very small. Based on this data, traditional teaching applied in the control group did not have much effect on the academic achievement levels of the control group students.

As can be seen in the table, the academic achievement level of students in the experimental group were pre-test mean score $\bar{X}_{pretest}$= 87.63 and post-test mean score $\bar{X}_{posttest}$= 97.58. As a result of the t-test for paired samples conducted to test whether there was a statistically significant difference between the mean pre-test and post-test scores, the difference between the group means was found to be statistically significant [$t_{(59)}$=-10.329, p<.05, d=1.80]. The effect size calculated from the test result shows that this difference was quite large. Based on this data, the differentiated teaching applied in the experimental group significantly increased the success of the experimental group students.

Table 3. Corrected post-test means for achievement scores in the experimental and control groups

Group	N	Mean	Corrected Mean
Control Group	60	81.55	81.886
Experimental Group	60	97.58	97.248

As can be seen in Table 3, the post-test mean score of the students in the experimental group for academic achievement was $\bar{X}_{experimental}$=97.58, and the post-test mean score of the students in the control group for academic achievement was $\bar{X}_{control}$=81.55. When controlled according to the pre-test mean score, the corrected mean for the post-test scores for academic achievement of students in the experimental group was $\bar{X}_{experimental}$=97.248, and the corrected post-test mean score of students in the control group for academic achievement was $\bar{X}_{control}$=81.886.

Table 4. Covariance analysis results for post-test achievement scores after controlling for pre-test scores in the experimental and control groups

Source of Variance	Sum of Squares	df	Mean Squares	F	p	(η2)
Pre-test	499.802	1	499.802	9.318	.030	.074
Group	6893.210	1	6893.210	128.514	.000*	.523
Error	6275.631	117	53.638			
Total (Corrected)	14487.467	119				

*p<.05

As a result of covariance analysis, there was a statistically significant difference between the post-test academic achievement scores of the students in the experimental group and the control group ($F_{(1-117)}$=128.514, p<.05, η2=.523). When the corrected means of the groups are examined, the difference was in favor of the experimental group. The effect size calculated from the test result showed that this difference was quite large. Based on this data, the differentiated teaching method applied in the experimental group was more effective in improving the academic achievement of students than the traditional teaching applied in the control group.

Second sub-problem: what is the impact of differentiated mathematics teaching in distance education applications on attitudes towards mathematics in gifted and talented students?

The t-test for paired samples was used to compare the pre-test and post-test attitude scores of students in the experimental and control groups to look for the answer to this sub-problem.

Table 5. T-test results showing the impact of Differentiated Mathematics Teaching on the Attitude Scores of the Experiment and Control Group

	Pre-test		Post-test						
	Mean	Std.Dev.	Mean	Std.Dev.	n	t	df	Sig.	d
Attitude (Control G.)	82.28	10.145	82.42	9.582	60	.340	59	.735	-
Attitude (Experimental G.)	85.18	9.296	91.37	4.614	60	4.921	59	.000*	.83

*p<.05

As seen in Table 5, as a result of the t-test for paired samples conducted to test whether there was a statistically significant difference between the attitude pre-test mean scores of the students in the control group ($\bar{X}_{pretest}$=82.28) with the post-test mean scores ($\bar{X}_{posttest}$=82.42), the difference between the means was not found to be statistically significant [$t_{(59)}$=.340, p>.05].

The mean pre-test attitude score of the students in the experimental group was $\bar{X}_{pretest}$= 85.18, and the post-test mean score was $\bar{X}_{posttest}$= 91.37. As a result of the t-test for paired samples conducted to test whether there was a statistically significant difference between the pre-test and post-test mean scores for attitude, the difference between the group means was found to be statistically significant [$t_{(59)}$=4.921, p<.05, d=.83]. The effect size calculated from the test result shows that this is quite a big difference. Based on these data, the differentiated teaching applied in the experimental group significantly improved the attitude of the experimental group students. When the effect sizes of both groups are compared, this difference was significantly greater than the difference in the control group.

Table 6. Corrected post-test mean attitude scores for experimental and control groups

Group	N	Mean	Corrected Mean
Control Group	60	82.42	83.177
Experimental Group	60	91.37	90.607

As can be seen in Table 6, the post-test mean score of the students in the experimental group for attitude was $\bar{X}_{exp.}$=91.37, and the post-test mean score of the students in the control group for attitude was $\bar{X}_{control}$=82.42. When corrected according to the pre-test mean score, the corrected mean post-test score for attitude of the students in the experimental group was $\bar{X}_{exp.}$=90.607, and the corrected post-test mean score for attitude of the students in the control group was $\bar{X}_{control}$=83.177.

Table 7. Covariance analysis results for post-test attitude mean score when controlled according to pretest score in the experimental and control groups

Source of Variance	Sum of Squares	df	Mean Squares	F	p	(η2)
Pre-test	3068.584	1	3068.584	99.620	.000*	.460
Group	1619.609	1	1619.609	52.580	.000*	.310
Error	3603.933	117	30.803			
Total (Corrected)	9075.592	119				

*p<.05

As a result of covariance analysis, there was a statistically significant difference between the post-test attitude scores of the students in the experimental group and control group ($F_{(1-117)}$=52.580, p<.05, η2=.310). When the corrected means of the groups were examined, the difference was in favor of the experimental group. The effect size calculated from the test result shows that this difference was quite large. Based on these data, the differentiated teaching method applied in the experimental group is more effective in improving the attitude of students than the traditional teaching applied in the control group.

DISCUSSION and CONCLUSION

The present study aimed to test the effectiveness of a mathematics program to develop creating thinking skills of gifted and talented students in mathematics during distance education. The presence of statistically significant differences between the mean achievement and attitude towards mathematics scores of the group undergoing the differentiated unit program in the mathematics course and the group with traditional education was analyzed.

As a result of the study, there was a statistically significant difference between the pre-test and post-test achievement test scores for students in the experimental group, while there was no statistically significant difference between the pre-test and post-test achievement test scores for students in the control group. Furthermore, there was a statistically significant difference between the achievement post-test scores for the students in the control and experimental groups. According to these findings, it was concluded that differentiated teaching during distance education increased the achievement of gifted and talented students. Previous studies also support this finding.

There are numerous models developed about how to differentiate the curriculum for gifted and talented students. However, the number of studies that test the practical effectiveness of many models, including the parallel curriculum model and grid model used in the present study, is quite limited. The study by Karaduman (2012), which analyzed the impact of differentiated geometry teaching based on the parallel curriculum model for gifted and talented student on creative thinking and academic success, is one of the few studies. The present study concluded that the scores for experimental group students studying the geometry units differentiated with the parallel curriculum model on the achievement test developed by the researcher, Van Hiele Geometric Thinking test and Creative Thinking-Image Creation test were statistically significantly higher than the gifted and talented control group students experiencing traditional teaching.

Although no research was found on the direct application of the grid model, one of the curriculum differentiation models, a study about the effectiveness of differentiated mathematical units was conducted by Kilcan (2005) based on the interdisciplinary thematic approach proposed by the model. The "interdisciplinary-thematic approach" is the process of integrating many different subject areas

with a comprehensive and general theme that is predetermined, associating them with each other. The main idea of the chosen theme can be a general concept that connects different areas of knowledge or a question that covers the whole.

Kansu (2021) developed a differentiation approach for the visual arts education of gifted and talented individuals. The measurement tool used to measure the effectiveness of this differentiation approach was the Torrance Creativity test. When the results of the analysis of the verbal A test and verbal B test scores on the Torrance creativity test were examined, the fluency, flexibility and originality scores increased significantly in line with the scores obtained in the 3 subtests used. Considering the scores before the application of the differentiation approach, there were significant differences between the pre-test and post-test scores. The differentiation approach used in the visual arts education of gifted and talented students explained 85% of the variation in the verbal creativity scores of the students. This situation reveals the effectiveness of the differentiation approach developed for visual arts education of gifted and talented students.

Altıntaş (2014) compared the academic success of students within the scope of the development of a new differentiation approach for gifted students and its application in mathematics teaching. There was a significant increase in the success scores of the students in the experimental group, where the courses designed with the developed differentiation approach were compared with the control group. This situation also shows that enriched, creative thinking-based, dominant intelligence-based activities and curriculum differentiation studies increase the academic success of students. In addition, the content, process, product and learning environment changes made on the basis of creativity strategies increased the academic success of the students.

Kilcan (2005) differentiated the subject of measurements in mathematics by using art, in a way that connected information belonging to different disciplines and created a common pattern to respond to what they experienced through art. In this study, which examined the impact of the interdisciplinary-thematic approach on students' achievement in the 6th grade of primary school, the thematic teaching method was more effective in achieving the goals and behaviors of the unit than teaching with the traditional method. In addition, thematic teaching practice significantly increased the achievement of students in the experimental group. The most important conclusion of the study by Maxey (2013), which examined the extent to which differentiated teaching affected primary school students' mathematical achievement, was that high-level students had a statistically significantly greater increase in achievement scores than low-and middle-level students. However, there were no statistically significant differences in grade-wide achievement test scores in the experimental and control groups. As the most important conclusion of the study by Yabaş (2008), which was conducted to determine the impact of the differentiated teaching approach on students' academic achievements, metacognitive skills, and self-efficacy perceptions, the achievement test, metacognitive skills, and self-efficacy perception scale scores of the class experiencing the differentiated teaching approach were higher than the scores of the class administered the traditional teaching method. Karataş (2013) found in their studies that a learning environment organized for the application of the differentiated teaching approach had an impact on mathematics achievement, creativity, attitude, and academic self-concept of gifted and talented students. The learning environment organized for the differentiated teaching approach significantly improved students' achievement levels, creativity, attitude towards mathematics course and academic self-concept.

The application of differentiated teaching in the traditional education process is considered to increase the achievement level of students. Similarly, it can be said that differentiated teaching applied in distance education also increases the achievement level of students. A study conducted by Scrima (2009) also reached conclusions supporting these findings. The two groups, both traditional and online, achieved similar levels of success. In Scrima's (2009) study, the impact of internet-based education and traditional education on students' achievement levels in a similar way supports the finding that the achievement level observed in the control group of this study increased. According to the results of a similar study conducted by Wu and others (2012), which used differentiated teaching in

traditional education, the achievement of students in the experimental group was significantly higher than those in the control group.

The most important conclusion of the study by Şaldırdak (2012), which was conducted to determine the impact of differentiated teaching practices on students' mathematical achievement and student opinions, was that the differentiated teaching approach positively affected students' achievement. The most important conclusion of the study by Taş and Sırmacı (2013), which was conducted to determine the impact of the differentiated teaching design on students' metacognitive skills and academic mathematical achievement, was that a statistically significant difference was found in favor of the experimental group in academic achievement with the application of the differentiated teaching approach. However, there was no statistically significant difference in the metacognitive skill test scores.

Another study examining the impact of differentiated teaching design on academic achievement was conducted by Springer et al (2007). As part of the research, a computer-aided mathematics program was developed and implemented that supported students to learn at their own pace. As a result of the study, the experimental group's post-test mathematics achievement scores were statistically significantly higher than the control group. Based on this, the experimental group taught with a differentiated curriculum was more successful than the control group taught with traditional instruction.

After the study, the pre-test and post-test scores on the attitude scale of students in the experimental group showed a statistically significant and large difference, while the pre-test and post-test scores on the attitude scale of students in the control group showed a statistically significant but smaller difference. It was concluded that while there was a greater positive change in the attitude of the students in the experimental group towards the mathematics course, the attitude of the students in the control group did not change much. In the present study, the post-test attitude scores of the students in the experimental group and the control group were compared and the attitude towards mathematics course was higher in the experimental group gifted and talented students to whom a differentiated teaching method was applied in distance education practices.

In a study by Aydın (2011), which examined the impact of active learning on the attitude toward mathematics, academic achievement, and creative thinking levels, a statistically significant difference was found after the experimental practice between the level of creative thinking, overall academic achievement, and attitude towards the mathematics of the experimental and control group students. These groups had the equal levels of creative thinking, overall academic achievement and attitude towards mathematics before the experimental practice. Since the statistically significant difference obtained was in favor of the experimental group, it was interpreted that the active learning method improved students' level of creative thinking, overall academic achievement, and attitude towards the mathematics course more than traditional teaching methods. Based on these results, differentiated learning methods are effective in improving students' creative thinking, overall academic achievement, and attitude levels. The most important result in the study by Ekinci & Bal (2019) conducted to determine the impact of differentiated teaching method on students' achievement and attitude towards mathematics course was that there were no statistically significant differences in achievement scores in favor of the experimental group, while there were no statistically significant differences in attitude scores. Students stated that the lessons were fun and that their learning was permanent.

Differentiated instruction is an approach developed for the teacher to diversify instruction according to student characteristics. Teachers design a teaching plan that can meet the individual needs of students in the classroom (Avcı & Yüksel, 2016). Based on the findings of our research, differentiated mathematics teaching develops in accordance with the needs of students.

As a result of the research, both the achievement test and attitude scale scores differed statistically significantly in favor of the experimental group, and the full learning model applied with the education management system and course software increased achievement in distance education. For these

reasons, this model can be used in courses that are suitable for use of a full learning model among distance learning courses. In addition, due to the positive impact of the practice with the full learning model on student attitudes in distance education, studies can be carried out aiming to provide awareness of the full learning model for students who will receive distance education.

The distance learning model based on differentiated teaching in mathematics course teaching increased students' academic achievement and positively affected their attitude to the course. Therefore, research can be performed using other learning-teaching approaches and methods such as project-based teaching, programmatic teaching, learning through research, modular teaching, and cascading teaching in distance education.

Limitations

This study has some limitations, for instance it is limited only to the mathematics lesson and the natural numbers and fractions units. It is also limited to course materials prepared based on the parallel curriculum model and differentiation techniques proposed by the grid model.

Suggestions for practitioners

Mathematical communication, which is an important component of research and differentiated curriculum, can be handled separately, verbally and in writing, and the effects of these two separate dimensions on mathematics achievement, comprehension and attitude can be examined. In addition, differentiated education was applied in the study by a mathematics teacher who is an expert in the education of gifted students. Investigations can examine how the same differentiated study is implemented by a classroom teacher.

The findings obtained in the study indicate that practitioners should use differentiated instructional design more. For this, teachers should be informed about the usage areas, principles, techniques, positive and limited aspects of differentiated teaching in pre-service and in-service training. In order to support teachers' use of differentiated instructional design, it may be important to include lesson plans using these designs in teacher workbooks. Larger samples can be studied to arrive at more precise generalizations.

Since the developed unit program only covers the natural numbers and fractions units within the scope of the 4th grade mathematics course, it is insufficient in terms of meeting the differentiation needs of gifted and talented students in mathematics education. Therefore, similar studies can be done for different levels of education and in different subject areas.

Since the developed unit program is limited to the province of Istanbul, there is a need for this study to be applied in other regions of Turkey and to be tested on different sample groups.

Suggestions for researchers

There is a common misconception that success in mathematics is possible only with special talent or skill. The effect of effort and systematic work using techniques specific to a certain field is not considered important in mathematics achievement. This is why it's important to show students that it is possible to learn math, make sense of math, and even solve math problems in creative and original ways. In this context, it is thought that similar studies should be disseminated for all students, including gifted and talented ones. It is important to expand the use of open-ended tests, in which students feel more comfortable and more productive, as emphasized in studies, rather than single-answer test items, especially for higher-order thinking skills. It is necessary to increase the number of studies examining the effects of differentiated units on academic achievement, general creativity, disciplinary creativity, and attitude towards mathematics, as in the current study. Both the short-term and long-term effects of such differentiated teaching should be examined and the curriculum should be constantly renewed in line with these data. In summary, developing effective and high-level programs suitable for the level of students should take priority in the list of things to be done to meet the needs of gifted and talented students. For this, the first thing is to differentiate the existing units in accordance with the potential and interests of the students.

Ethics and Conflict of Interest

This research was approved by permission of Hacettepe University Ethics Board dated 12.04.2021-E-35853172-300-00001536076. The authors have no conflicts of interest to declare.

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A CASE STUDY ON SPECIALIZATION MODELS IN PRIMARY SCHOOL TEACHING

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Abstract

The aim of the present study is to evaluate specialization models in primary school teaching based on the opinions of teachers and academicians studying teacher education. The research is considered to be important in that it is one of the first studies in the national literature on the related issue and it reveals advantages and disadvantages of each model. Multiple case-holistic design, one of the qualitative research methods, was followed in the study since it focuses on data obtained from primary school teachers working in private schools that adopt different specialization methods as well as academicians specializing in the field of teacher education. In order to receive opinions from participants, two different data collection tools were used, which were the Private School Teacher Interview Form and the Academician Interview Form. 33 participants were interviewed using the determined data collection tools in the 2018-2019 academic year. A content analysis method was used in the analysis of the obtained qualitative data. According to the results of the study, advantages and disadvantages of each model were identified. It was recommended as a result of the study that it might be effective to use departmentalized classroom models and looping models simultaneously in order for the students to establish positive relationships with teachers and for teachers to develop professional knowledge and skills.

Keywords: Primary school teaching, specialization, self-contained classrooms model, departmentalized classrooms model, looping model.

INTRODUCTION

Human beings have had the need for learning and knowing since their creation, at times benefiting from their own knowledge to fulfill this need and other times consulting others with knowledge. The relationship between the ones with and without knowledge evolved into a relationship of teacher-learner in time. Afterwards, formal education processes that include teacher-student relationships were formed. In this process, the professional and personal characteristics of teachers have played an important role in constructing effective learning experiences for students. Throughout their learning experiences, students are directly and indirectly affected by teachers' thoughts, emotional reactions, values, and habits while acquiring certain skills, knowledge, and attitudes (Darling & Hammond, 1999). These elements exert their positive or negative effects more on students, especially at the primary school stage. Teachers and students spend an important part of the day by interacting with each other on the primary school stage (Gözütok, 2007). Within this context, it is possible to state that teachers, who interact intensely with children during the primary school stage, play a huge role in shaping children's futures and enabling them to develop healthy personalities (Senemoğlu, 2013). Based on this reality, predictions about the society of the future can be made by looking at the qualifications of primary school teachers who train the people that will create the society of the future.

Primary school teachers must have certain fundamental professional skills in order to carry out effective teaching, such as monitoring student progress, enriching the teaching-learning processes by taking into account students' learning styles, diversifying teaching materials based on student needs, preparing learning activities in accordance with the objectives, selecting different teaching strategies, methods, and techniques according to the subject, and using alternate methods. Considering that the teaching profession requires specialized knowledge and skills (MoNE, 2017), primary school teachers are expected to be in charge of the teaching of more than one course, to teach different grade levels each year, and to improve themselves holistically and in multiple ways in the context of professional skills and specialized knowledge as a result of taking care of young learners. However, in the primary school stages of various countries (Sweden, Germany, Japan, China, Israel, the USA) (Cristone & Shneyderman, 2004; Grant, 1996), courses and the grade levels taught by primary school teachers differentiate, thus affecting the process of training primary school teachers. The models applied to primary school teachers' specialization in the teaching of certain courses (s) or grade levels (s) were examined by reviewing international literature. The application of each model was classified and presented in Table 1. On the other hand, when the national literature is examined, it is seen that the mentioned models have no equivalents in Turkish terminology. Within this framework, it was necessary to create Turkish terms for each model by reviewing the related studies and using them in the current research. In this direction, Turkish equivalents for each model were created by obtaining expert opinion. Additionally, "specialization" was used as an umbrella term to cover each of the models mentioned.

Table 1. Specialization models in primary school teaching.

Model	Application of the Model
Self-Contained Classrooms Model / Generalist Teacher Model	➢ A primary school teacher teaches the core courses (Turkish, Mathematics, Life Studies, Physical Sciences) and branch courses (Music, Painting, Physical Education, etc.) only at a single grade level continuously or for a particular duration, or a branch teacher teaches branch courses (Music, Painting, Physical Education, etc.).
Departmentalized Classrooms Model	➢ A primary school teacher teaches a single grade level or different grade levels by specializing in one or more courses. a) A primary school teacher teaches more than one course at each grade level during the academic year and rotates through different grade levels. b) A primary school teacher teaches more than one course at each grade level during the academic year, and students rotate through classes. c) A primary school teacher specializes in a single course and teaches the course that s/he specializes in to only a single grade level. d) A primary school teacher specializes in a single course and teaches the course that s/he specializes in to each grade level.
Looping Model/ Multi-Year Teaching Model/ Two-Cycle Teaching Model/ Teacher Rotation Model	➢ A primary school teacher proceeds with the same group of students for at least two years and teaches the core courses (Turkish, Mathematics, Life Studies, Social Studies, etc.) and branch courses (Music, Physical Education, English, etc.) or a branch teacher teaches branch courses (Music, Physical Education, English, etc.). e) A primary school teacher teaches core courses (Turkish, Mathematics, Life Studies, and Physical Sciences) and branch courses (Music, Physical Education, English, etc.) to students in the first and second grades, or as a second stage teacher to students in the third and fourth grades. f) A primary school teacher proceeds with the same group of students throughout the primary school, teaching the core courses (Turkish, Mathematics, Life Studies, Social Studies, etc.) and branch courses (Painting, Music, etc.) or a branch teacher teaches branch courses (Painting, Music, Physical Education, etc.).

Source. Anderson, 1962; Lobdell & Van Ness, 1963; Otto, 1931; Shane, 1960

Table 1 explains the self-contained classroom model, the departmentalized classroom model, and the looping model and the way they are applied. According to Table 1, the looping model has two different types of applications, the departmentalized classroom model has four different types of applications, and the self-contained classroom model has one type of application. In the current study, two types of applications within the looping models were named "two-cycle teaching model" (model e) and "looping model where the same teacher teaches 1st–4th grades" (model f) in Table 1, and they were discussed separately.

Lobdell and Van Ness (1963), who define self-contained classrooms as a model in which a primary school teacher teaches the core courses (Turkish, Mathematics, Life Studies, Physical Sciences) and branch courses (Music, Painting, Physical Education, etc.) only at a single grade level continuously or for a particular duration, and a branch teacher teaches branch courses (Music, Painting, Physical Education, etc.), advocate that it is the most appropriate model in the sense that permanent learning is enabled, continuity in the relationship between the teacher and student, social and emotional development of the students is monitored holistically, and interdisciplinary studies are carried out. McGrath and Rust (2002) define the self-contained classroom model as a student-centered model. Focusing on the departmentalized classroom model, Otto (1931) defines it as a model in which the primary school teacher teaches a single grade or several grades by specializing in a particular course or courses. Anderson (1962) emphasizes that a departmentalized classroom model could be effective for teachers to reinforce their subject matter knowledge and develop teaching skills, and for students to choose the best role model for themselves among many teachers with whom they interact. Defined as "the teacher's proceeding with the same group of students for at least two years," the looping model is expressed with various terms such as "Multi-Year Teaching Model", "Two-Cycle Teaching Model", and "Teacher Rotation Model" (Burke, 1997; Christone & Shneyderman, 2004; Grant, Johnson, & Richardson, 1996). The looping model provides opportunities for students and teachers alike, such as recognition of the strengths and weaknesses of the students, diversification of teaching, and a greater amount of time allocated for learning. To illustrate, a 3rd grade student who has not been able to achieve learning outcomes may make up for the learning loss under the guidance of a teacher who recognizes the student's strengths and weaknesses (Roberts, 2003). In this model, the long-lasting teacher-student relationship affects the academic performance of the students and job satisfaction of teachers positively. Besides, the looping model is supported by many researchers, since more effective classroom management is ensured, more information about students is obtained, students are monitored holistically, and stronger teacher-parent communication is built (Burke, 1997).

When the related international literature is examined, it is seen that various studies have been carried out with the purposes of determining which model is the most appropriate and effective one for students, specifying the decision criteria in putting the specialization models into effect, revealing the advantages and disadvantages of each specialization model from the viewpoint of teachers and students, and determining the effects of these models on the teacher-student relationship and students' academic success (American Association of School Administrators, 1965; Anderson, 1962; Berry & O'Connar, 2010; Gerretson & Schofield, 2008; Hill & Jones, 2018; Hood, 2009; Martin, Fergus, & Noguera, 2010; Markworth, Brobst, Ohana & Parker, 2016; Myrberg, Johansson, & Rosen, 2019; Parker, Rakes, & Arndt, 2017; Reitz, 2012; Strohl et al., 2014).

In their study in which academic success levels of 200 5th and 6th grade students studying in schools with self-contained and departmentalized classroom models were compared based on the Tennessee Comprehensive Assessment Program (TCAP), McGrath and Rust (2002) found that students studying in schools that apply self-contained classroom models are more successful in courses related to science and language. Moore (2008), who compared standardized test scores of 5th grade students studying in schools with self-contained and departmentalized classroom models, found that the students studying in schools with departmentalized classroom models had higher mathematics scores compared to those in schools that applied the self-contained classroom model. Myberg, Johansson, and Rosen (2019) investigated the relationship between teachers' specializing on a subject matter and students' reading

success and revealed a positive relationship between teachers' specializing on a subject matter and the reading success of students in the classes where these teachers teach. In their study carried out with the aim of revealing the beliefs of principals towards specialization models applied in primary schools and their decision-making processes about these applications, Parker et al. (2017) concluded that personal experiences, perceptions, and contextual dynamics are influential in the decisions made on the application of these models. Mark et al. (2016) conducted a study on the opportunities and limitations created by teachers' specialization on a subject matter in the primary school stage and found out that specializing on a subject matter provides opportunities for concepts such as time planning, professional development, and pedagogical time, while it causes limitations regarding certain issues such as the absence of collaboration with other teachers about the subject matter or the fact that it does not provide teachers with flexibility. In a study conducted by Liu (2011) on the applicability of the departmentalized classroom model in primary schools, advantages of this model were identified as teachers being able to teach more effectively by specializing on a course based on their interests and gaining time while preparing lesson plans, as well as easing the process students go through when transitioning to secondary education; on the other hand, disadvantages were identified as an absence of a departmentalized classroom model. Minott (2016) carried out a study to present experiences about teacher perceptions of the departmentalized classroom model and the effects of this model on the emotional needs of students, establishing that teachers had a positive perception of the departmentalized classroom model and that this model did not have any negative effect on meeting the emotional needs of students. Freiberg (2016) also studied teacher and student attitudes towards the departmentalized classroom model and detected that the teachers and students held positive attitudes towards this model. In order to support the results on student attitudes, opinions were also gathered from students who studied in a school with a self-contained classroom model in the 3rd grade and then transferred to a school that applied a departmentalized classroom model in the 4th and 5th grades. According to the results, a majority of the students stated that it was exciting to meet more than one teacher and that it was easier to access information. In their research, Cristone and Shneyderman (2004) determined the advantages of the looping model as strengthening the teacher-student relationship, supporting the slow learners, and gaining the teacher time in the second year, while mentioning the disadvantages as not being able to have a command of the syllabi of many courses and disagreements between teacher and student.

Very few studies were found in the Turkish context about the specialization models in primary school teaching. In a study conducted by Güzelbey (2006) about changing the primary school stage into two separate areas of specialization as 1st, 2nd, and 3rd grade teaching and 4th and 5th grade teaching, it was concluded that principals and teachers held positive opinions about this change. However, in time, concerns were addressed about the possibility that subject matter knowledge and general knowledge levels of teachers might decline, and they would generally prefer teaching at the 4th and 5th grade levels. In their research on training teachers for 1st, 2nd, and 3rd grades and for 4th and 5th grades separately, Tok and Bozkurt (2010) expressed various reasons why it might be more efficient for teachers to be trained in a way that would prepare them for two different stages (for 1st, 2nd, and 3rd grades and for 4th and 5th grades separately), such as: difficulties that teachers face in adapting to 1st grade again after the 5th grade; being able to communicate with children; catching up with the changes; and designing activities; teachers' being unable to qualify for every course; inability to retain information; and hindering students' personal growth with a single teacher. Başaran and Güçlü (2020) concluded in their study on which teacher should teach which courses in primary school that it would be more appropriate for primary school teachers to teach courses other than music, visual arts, games and physical activities, foreign languages, and religion and ethics.

In recent years, there has been a dramatic increase in the number of private schools in Turkey. According to the formal education statistical report published by MoNe, while the number of private primary schools was 335 in 1997, it increased to 835 later in 2009, and reached 1618 in 2018 (MoNe, 2018). According to these statistics, it can be seen that the number of private schools that offer primary school education has nearly quadrupled in the past 20 years. In this competitive environment, private schools, which have been in search of making a difference, have carried out many practices, innovations, and

regulations. One of these innovations is the application of different specialization models in primary school teaching. However, each applying a different specialization model, private schools do not provide information as to which scientific knowledge or data they base their applications on. Benefitting from the viewpoints of teachers, who are the most important shareholders of education, and academicians working in the field of teacher education, contributing to the literature with this kind of study is considered to shed light for both practitioners and researchers. It is critical to identify the benefits and drawbacks of specialization models in primary school teaching and conduct an assessment of the issue. In addition, determining the grade levels and courses to be taught by the primary school teachers will have a profound influence on the teacher training process. This research has been required since there are very few studies focusing on the advantages and disadvantages of specialization models in the national literature. In this direction, taking into account the advantages and disadvantages of specialization models in primary school teaching, it is aimed to offer recommendations for the primary school teacher training process.

Within this context, the research problem is to determine the opinions of various participant groups on specialization models in primary school teaching and to evaluate specialization models based on these opinions. Based on the research problems, answers to the following research questions have been looked for:

1. What are the opinions of academicians studying teacher education about specialization models?
2. What are the opinions of primary school teachers working in private schools in which different specialization models are applied to specialization models?
3. What are the recommendations offered by primary school teachers and academicians studying teacher education about the teacher training process within the context of specialization models in primary school teaching?

METHOD

Research Design

This research was designed as a case study, which is one of the qualitative research approaches. A case study can be described as collecting in-depth and detailed information about a circumstance or more than one circumstance in its limited context, using various data collection tools (observation, interviews, documents, etc.) and examining that circumstance by defining it under certain themes (Creswell, 2013). The circumstances examined in this study were determined by evaluations of specialization models conducted by primary school teachers working in schools using various specialization models and academicians studying teacher education. Additionally, because each of the participant groups whose opinions were gathered about specialization models in primary school teaching was determined as a unit of analysis, this study is described as a multiple case-holistic design. In multiple case-holistic designs, each case is evaluated holistically in itself, and later, the cases are compared with each other (Yıldırım & Şimşek, 2013).

Participants

Participants of the study are 21 primary school teachers working in private schools in Ankara and 12 academicians working in the field of teacher education. Thus, data was obtained from two different data sources. Since people with certain characteristics were preferred while creating the participant groups, criterion sampling was utilized. The main understanding that lies in the use of the criterion sampling method is that cases that meet a set of pre-determined criteria are investigated. The criteria or the criterion mentioned here can be determined by the researcher (Yıldırım & Şimşek, 2013). The criterion for the teachers was to be working in private schools where self-contained classroom models and two-cycle teaching models are applied, while the criterion for the academicians was to be studying in the field of teacher education. Teacher participants were comprised of a total of 21 primary school teachers, 8 of them working in private schools that apply the self-contained classroom model and 13 of them working in private schools that apply the two-cycle teaching model. Six of the teachers teach 1st grades;

five of them teach 2nd grades; another six teach 3rd grades; and four of the teachers teach 4th grades. The professional seniority of the participating teachers varies as well, with two having 0–4 years of experience, four having 5–9 years of experience, seven having 10–14 years of experience, and eight having 15 years or more of experience. In terms of working in a school with the applications of the self-contained classroom model and the two-cycle teaching model, eight primary school teachers had an experience of 2-4 years, seven teachers had an experience of 5–9 years, and six of them had an experience of 10 years and above. There are a total of 12 faculty members working in 4 different universities in Ankara in the field of teacher education, 11 of whom are female and 1 is male. In the process of including academicians in the study group, it was determined as a criterion that they are experts in teacher education and/or have worked in the field of primary education. Five of the academicians work in the field of curriculum and instruction, and seven academicians work in primary education. Among participants, 3 academicians have 5–9 years of professional seniority, 4 academicians have between 10–19 years, 2 academicians have 20–29 years, and 3 academicians have a professional seniority of 30 years or more.

Data Collection Tools

The semi-structured interview forms were used, which were prepared by the researcher to collect data from two different participant groups, one of them being primary school teachers, and the other group was comprised of academicians. Expert opinions were received from two academicians from the field of education programs; one academic working in the field of assessment and evaluation; and one academic working in Turkish education; with the purpose of ensuring content validity and face validity by evaluating the data collection tools in terms of expediency, language and expression, and technical properties. Interview forms were restructured by the researcher in accordance with expert opinions. Other than the actual participants, restructured interview forms were piloted on two primary school teachers and one academic. After the pilot interviews, some of the questions were excluded from the interview forms, changes were made in the instructions, and the order of questions was revised.

Data Collection Procedure

The data collection phase of the research was conducted in the second semester of the 2018–2019 academic year. The Private School Teacher Interview Form was initially used with 21 primary school teachers working in private schools that use self-contained classroom models and the two-cycle teaching model. lasted approximately 25–30 minutes, and all interviews were completed in 5 weeks. Afterwards, interviews were conducted with academicians. Data was collected from 12 academicians through an Academician Interview Form. All interviews lasted approximately 25–30 minutes, and all were completed in 2 weeks. Interviews were conducted by the researcher himself. Besides, the fact that the researcher had a 4-year experience of teaching in a school that applied the self-contained classroom model contributed to the quality of interviews. Because it was not possible to contact a school that applies a departmentalized classroom model, data about this model was limited to the opinions of teachers working in a school with other models and academicians.

Role of the Researcher

The role of the researcher in qualitative research differs from that of quantitative research. Qualitative research involves a process in which researchers interact with the participants intensively and for long periods. They continuously have direct contact with the participants and the research environments, and they reflect the perspectives gained in the field into the research. Considering the position of the researcher in the process, the necessity of giving detailed information about the researcher emerges (Creswell, 2013). The researcher worked as a primary school teacher in a school that applied the self-contained classroom model between the years 2015–2019. In this direction, the researcher's perspectives on the evaluation of specialization models in primary school teaching were shaped by his own personal experiences. The researcher decided on this study after considering that specialization models applied in his own school during the years he worked there as a teacher had various effects, especially on teachers and students. Interviews were conducted by the researcher himself in the school environment

where specialization models were applied and in the offices of the academicians. In this process, the researcher only asked the questions and adopted an attitude of not affecting the participants.

Data Analysis

Content analysis was used in the analysis of qualitative data obtained. The main objective of content analysis is to uncover unnoticed concepts, relations, and themes by running an in-depth data analysis in order to explain the gathered data (Yıldırım & Şimşek, 2013). In the present study, coding was carried out according to the concepts drawn from the data. The research questions and theoretical framework were considered in the first stage, and data were coded with words that are related to each other. In the second stage, commonalities were detected by noticing the meaningful relationships between the codes, and codes were categorized according to the sub-problems of the research. In the third stage of the analysis, the codes and categories obtained were defined without giving any place to the researcher's own opinions and comments in a way that could be understood by the readers, and they were later explained. In the last stage, relationships were tried to be detected between the findings with the aim of giving meaning to the data, and certain results were drawn. During the analysis, academicians were coded as A-1, A-2,… and private school teachers were coded as PST-1, PST-2,... PST-21. In addition, the themes and codes of the findings related to each research question are presented in detail.

Validity and Reliability

In order to ensure validity and reliability in qualitative studies, strategies such as persuasiveness, transmissibility, and consistency need to be used (Shenton, 2004). Certain points were paid attention to ensure persuasiveness. These can be expressed as receiving expert opinions while preparing the interview forms, increasing the number of participants to start repetition in data, and increasing the duration of interaction during the interviews. Similarly, participant opinions were presented with direct quotations from the participants while presenting the results and the triangulation method was used. In the current research, data sources triangulation was used by choosing primary school teachers working in private schools in which different specialization models (self-contained and looping models) are applied and academicians studying teacher education and/or primary education as data sources. Data triangulation is considered to be important since multiple realities may be reached by revealing the differing experiences and perceptions with the inclusion of participants with different characteristics (Yıldırım & Şimşek, 2013). With the aim of ensuring the transmissibility as a factor of the external validity of the research (Lincoln & Guba, 2013), a purposive sampling method was used while choosing the participants, and the research procedure was explained in detail. Another researcher also conducted content analysis and coded the data in order to ensure consistency of the results obtained as a result of qualitative data analysis. Consistency in the research was calculated by detecting the number of "agreements" and "disagreements" for each code created by both researchers and using Miles and Huberman's (1994) formula (Reliability= Number of Agreements / [Number of Agreements + Number of Disagreements] x 100). Regarding the coding of data obtained from teachers and academicians, the agreement percentages of the codes created by the researcher and the field expert were determined to be 73% for the teachers and 76% for the academicians. According to Miles and Huberman (1994), an agreement percentage of 70% or above for the lists of codes created by the researchers indicates a sufficient reliability value.

RESULTS

The results of the study were presented in the light of the research questions created in accordance with the aim of the research.

What are the opinions of academicians studying teacher education about specialization models?

Answers to the research question, "What are the opinions of academicians studying teacher education about specialization models?" were sought. In line with the research question, results were presented regarding the models preferred by academicians, the reason for these preferences, and the effects of specialization models on teachers and students.

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The Specialization Models Preferred by Academicians and the Reasons for These Preferences

The specialization models preferred by the academicians are presented in Figure 1.

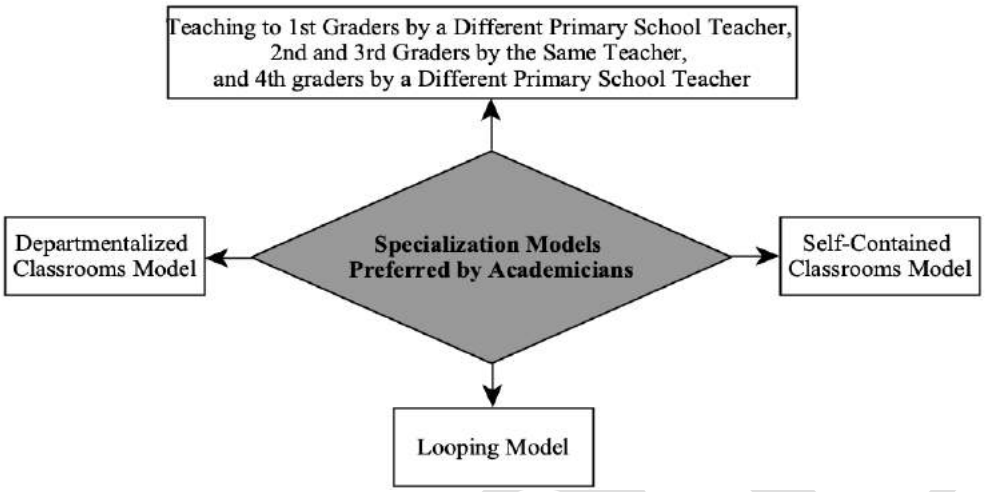

Figure 1. Models preferred by academicians.

More than half of the Academicians (n: 8/12) preferred the Looping Model, whereas the Self-Contained Classroom Model and the Departmentalized Classroom Model were preferred by 1 academician each. Besides, while one of the academicians offered a model that had not been specified by the researcher, another academician did not state any preference because of the thought that each model might have advantages and disadvantages in its own context. The reasons for the preferences of academicians shown above are presented in Figure 2.

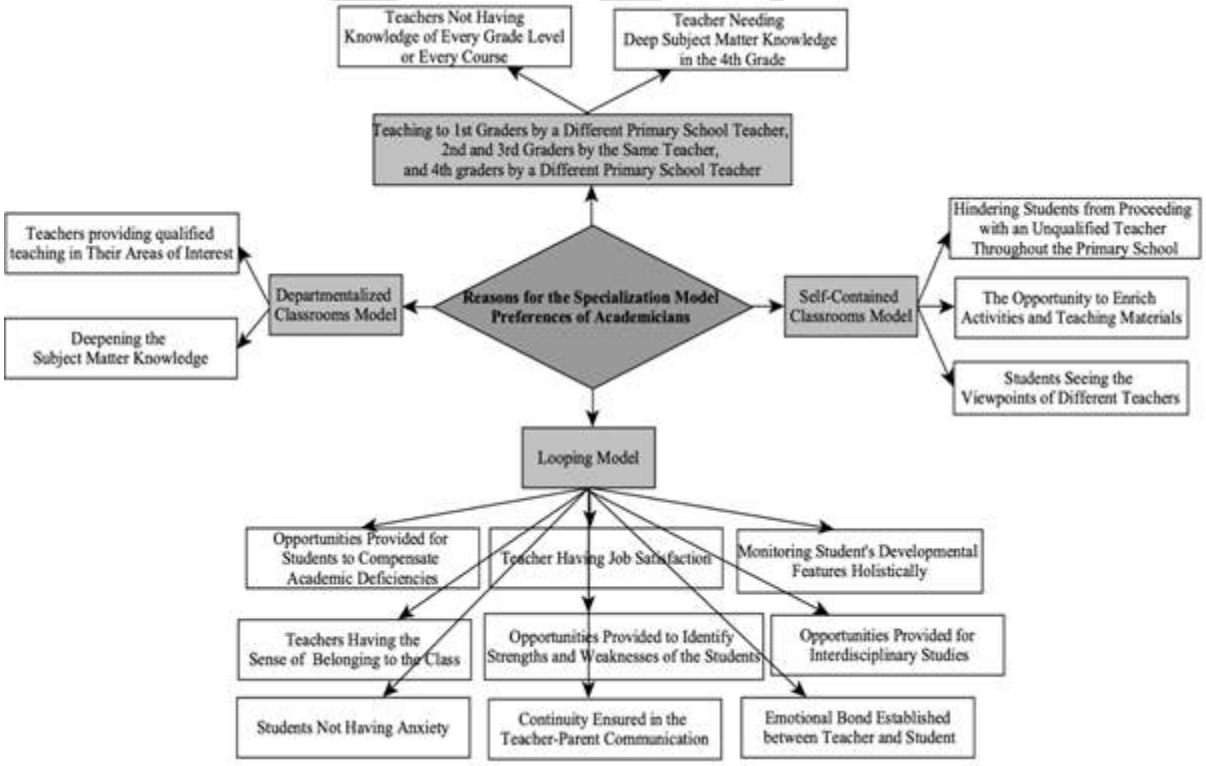

Figure 2. Reasons for model preferences of academicians.

According to Figure 2, the reasons for specialization model preferences of teachers were evaluated from the viewpoints of teachers and students. Academicians preferring the Departmentalized Classrooms Model and Self-Contained Classrooms Model (n: 2/12) generally mentioned reasons for teachers' professional knowledge and skills, such as providing qualified teaching, deepening subject matter knowledge, and enriching activities and teaching materials. On the other hand, frequently mentioned reasons by the academicians who preferred the Looping Model (n: 9/12) are recognizing and monitoring students holistically, strengthening teacher-parent communication, establishing an emotional bond between teacher and student, teachers having a sense of belonging to the class, identifying the strengths and weaknesses of the students, and students not having anxiety over changing teachers in each academic year. One of the academicians who preferred the Looping Model emphasized the importance of teachers' recognizing students' strengths and weaknesses, monitoring, and guiding them in order for qualified learning to occur and summarized thoughts on the issue as follows:

> …The only name that remains in primary school students' minds when they grow up is the name of their primary school teacher. The main reason for this is the quality of time spent. The more a student spends time with his/her teacher, the more qualified the interaction gets. When there is specialization at the course level, a student meets his or her teacher for 30 or 40 minutes a day. Hence, there is no commitment in this case. For example, if you could not get to the student in first grade, you have three more years to get to that student. On the other hand, when you are a branch teacher, your only goal would be to cover course topics in 40 minutes. (A-1)

A-4 offered a model as "teaching to 1st graders by a different primary school teacher, teaching to 2nd and 3rd graders by the same teacher, and teaching to 4th graders by a different primary school teacher". A-4 justified the model s/he proposed with the following opinions:

> …Teaching of first reading and writing in the 1st grade is a very particular area. School maturity, development of lacking skills, behavioral rules, reading and writing processes, and creating school and class routines for the students who come here is an area of specialization on its own. Therefore, I think the first grade should be separated from the other grades. For example, in the USA, I met teachers who told me that they worked as reading experts for 3rd graders for 12 years when I asked their names. In the 3rd grade, we reach a level where we realize whether there is a problem or not, the tendencies of students, and the progress of students. I think at the 4th grade level, there could be a different branching since the 4th grade is a preliminary grade for secondary school and requires serious subject matter knowledge. (A-4)

Academicians' Thoughts about the Effects of Specialization Models on Teacher and Student Dimensions

The effects of specialization models on teacher dimension are classified into three areas, according to data obtained from academicians: "professional knowledge and skills," "personal characteristics," and "attitudes toward school. "The effects of specialization models on student dimensions are classified as "academic success," "teacher-student relationship," and "process of secondary school adaptation." Academicians (n: 8/12) stated that the application of the self-contained classroom model or departmentalized classroom model will provide positive outcomes in terms of a teacher's professional knowledge and skills, for circumstances such as having a command of syllabi, gaining time in planning teaching, archiving teaching activities, deepening the subject matter knowledge, and managing behaviors and reactions according to age groups. According to A-5, the most significant contributions of the application of departmentalized and self-contained classroom models to teachers are in the dimensions of "having a command of syllabi" and "deepening subject matter knowledge."A-5 expressed his or her opinions as follows:

> …I think the most important contribution to the application of departmentalized and self-contained classroom models is about syllabi. Our teachers do not read the plans. Learning outcomes should be known very well. For example, there is a learning outcome in the 4th grade called "intertextual reading." I heard that there are teachers who do not know about this. This means that teachers will be unable to adequately implement the plans. Needs to have a certain degree of competency in the context of syllabi, and I believe that this will be the biggest advantage in this system. (A-5)

A-4, who expressed that the individual differences of students can be better noticed with the application of departmentalized or self-contained classroom models, explained as follows:

> …I think our profession and that of psychologists are very similar. They gain experience as they encounter various cases, just as we do. As a teacher teaches the same course or at the same level of grade for a long time, the possibility of coming across various cases increases. Hence, he/she becomes more experienced. For example, a first-year teacher may panic and become anxious about what to do when he or she encounters a student who is having difficulty reading. On the other hand, a teacher who has experience in 1st grade teaching knows what to do and can manage the stress in the same situation. (A-4)

Some of the academicians (n: 4/12), on the other hand, emphasized that in the event that the looping model was applied, the teacher's professional knowledge and skills would develop in terms of recognizing, monitoring, and assessing the students; maintaining the classroom routines; planning interdisciplinary activities; and applying the spiral programs effectively. A-6 highlighted that the programs in primary school have a spiral structure and stated that teachers need to make a connection between the syllabi of the courses taught by them and the syllabi of other courses in an upper or lower grade. A-11 discussed that one of the vital professional skills of primary school teachers is recognizing the students and monitoring their development. A-11 expressed the importance of monitoring the students in the primary school stage with the following remarks:

> …In the case that the self-contained classroom model is applied, information exchange and sharing among teachers should be at a high level and the information about the strengths and weaknesses of the students, thus their background stories, should be transferred to upper grade levels realistically. (A-11)

Likewise, A-2 expressed that it is impossible to guide the students without knowing them, their family, and their social environment, adding:

> …Let's say you have specialized in 2nd grade teaching, and you have significantly improved a student who was not very good. It is not certain what will happen or what kind of teacher the student will come across in the 3rd grade. It is necessary to perceive the child as a whole and monitor his/her development. (A-2)

Academicians (n: 3/12) noted that departmentalized and self-contained classroom models will contribute more to personal characteristics and skills such as self-efficacy, self-confidence, intrinsic motivation, collaboration, and communication. For instance, A-3 explained that the confidence of teachers would increase in the self-contained classroom model, stating that "it is an expected result for the teacher to gain confidence due to teaching to the same grade level every year and getting better at the things that repeat after a certain period of time." A-11 figured that the application of departmentalized or self-contained classroom models could develop the collaboration and communication skills of the teachers with the following remarks:"... it will be a system in which other teachers will also have an idea of the class, and teachers will be in a position to communicate with each other about the students and in collaboration." A-9 expressed opinions that the teachers' self-efficacy belief levels could increase in departmentalized and self-contained classroom models by stating:

> …Maybe the area that the teacher is into should be given a chance. For instance, if the teacher does not like the Life Studies course, the time s/he allocates to that course declines, as well. Or s/he may be doing the lesson superficially. I think that at this point, it is important to keep in mind the proposition that if you are good at an area, you make that area better, according to self-efficacy theory. (A-9)

Although academicians verbalized that departmentalized and self-contained classroom models could contribute to the personal characteristics of the teachers, they expressed that these models could create negative circumstances in teachers' attitudes towards school. According to A-8, "in the application of self-contained classrooms, leaving the decision of which grade levels the teachers will teach to the school administration means forcing the teachers." This situation causes the teacher to lose motivation, become unhappy, and question this system. " At this point, academicians suggested the necessity of allowing the teachers to decide on the grade level or the course themselves. Similarly, according to Symlie (1992), the important point is that the school administration should not be the decision maker in

determining the model to apply but should be consulted by the teachers, who are one of the most important shareholders. Through ensuring teachers' participation in decision-making, the validity of the decision can be ensured. At the same time, teachers' commitment to the decision and their motivation to apply it could increase. Academicians (n: 4/12) put forward that the application of looping models will give teachers dynamism in different grade levels each year; it will prevent them from becoming monotonous and routine; and it will develop a sense of responsibility. A-2 stated that teaching the same course at the same grade level each year will force the teacher to become monotonous after a while and using the same materials and activities every year will blunt their creativity.

Academicians (n: 5/12) specified that in the case of applying the looping model, a teacher's attitude towards school would not be expected to be negative, since a sense of belonging and ownership could develop in the teacher. Burke (1997) also expressed that the formation of a long-lasting teacher-student relationship would lead to positive experiences such as teachers' developing classroom management skills, having a deeper knowledge about students, and feeling a sense of belonging to the class.

Half of the academicians (n: 6/12) advocated looping models and 3 of them supported departmentalized and self-contained classroom models for students' academic success. Three academicians did not present any opinion, reasoning that a separate scientific study should be conducted for this issue. Academicians (n: 3/12) were of the opinion that in the departmentalized and self-contained classroom models, factors such as development of teachers' skills in teaching a subject, seizing the learning opportunities, deepening of the subject matter knowledge, and gaining experience in a specific course or grade level could indirectly affect students' academic success positively. A-4, who specified that departmentalized classrooms models, self-contained classrooms models, or the model s/he proposed (different teachers teaching in the 1st and 4th grade, the same teachers teaching in the 2nd and 3rd grade) should be applied, with the consideration that the teacher's "teaching skills" would develop, also alleged that these models would affect students' academic success positively, presenting the opinions below:

> …The application of the self-contained classroom model, the departmentalized classroom model, or the model I suggested will definitely affect the academic success of the students. For example, a friend of mine who works at a school where specialization is applied told me that he/she uses a rhythm and a story that he/she developed while teaching names-pronouns-adjectives. He/she also told me that when he/she asks his/her former students who are now in secondary school about what they remember about this topic, they say that they remember the stories and music. I think that a teacher's skills and distinctive teaching methods are developed by teaching a specific topic continuously at the same grade level. (A-4)

Additionally, A-9 stated that teachers with good subject matter knowledge seize the "learning opportunities" in the classroom very well. Likewise, A-11 put forward that "gaining experience" for a long time in a specific course or grade level will ease the detection of students' mislearning, alternative conceptualization, the subjects they have difficulties in, and the points in which they make the greatest number of mistakes, adding that this would hence increase students' academic success. Yearwood (2011), who found out that departmentalized classroom models have a positive contribution to students' academic success, compared the mathematics success of 2152 5th grade students who studied in schools with applications of departmentalized and self-contained classroom models and determined as a result of the study that there was a statistically significant difference in the success rates of students who studied in schools with a departmentalized classroom model. Academicians (n: 6/12), who thought that the looping model might be effective in providing academic success, highlighted the importance of positive factors such as teachers recognizing the strengths and weaknesses of students; students knowing the routines of the teacher; the opportunity to monitor and assess the student; the sufficient amount of time for compensating learning deficiencies of students; and emotional bonding between teacher and student. A-1 expressed that one of the most important factors which is overlooked is the issue of "teachers recognizing the students" and explained the role of this issue in increasing the students' academic success as:

> …The student gets to know the teacher too. He/she knows about the teacher's likes, dislikes, and things that the teacher cares about. On the other hand, if the teacher is replaced every year, it takes nearly half a

> semester for the student to get to know the new teacher. When this happens, the student behaves accordingly. He/she knows when to study and what to study. In contrast, having different teachers may lead to confusion in the student's mind. It could be hard to control too many variables for a student at that age. Also, it could decrease a student's success level. (A-1)

Although A-6 believed that there were too many variables predicting her academic success, s/he believed that monitoring and assessing the student, particularly young learners who lack self-control, by a teacher throughout primary school would result in the student's success.A-10 emphasized that the fundamental variable that affects academic success in primary school is the emotional bond between the teacher and student, adding that a looping model could support the increase in students' academic success levels. Expressing the importance of recognizing students' developmental characteristics, interests, and needs and monitoring students in increasing their academic success, A-12 explained the importance of looping model application as shown below:

> …Replacing the teacher every year affects the student's success negatively since the new teacher does not know about the student's weaknesses. In addition, it is an opportunity to improve students' academic deficiencies. Not every student is able to achieve the learning outcomes at their level. For example, a 1st grade student's deficiency in writing can be overcome in the 2nd grade by the same teacher. On the other hand, if the teacher changes, it could take a long time for the new teacher to notice such a deficiency. (A-12)

The opinion of A-12 that the looping model might be beneficial in terms of overcoming academic deficiencies is supported by Grubb's (2007) expression that, along with the stability between teachers and students in schools that apply the looping model, teachers will have more knowledge about students, and they will have more opportunities to solve learning problems.

For the teacher-student relationship, 9 of the academicians think that looping models may be effective; 2 of them advocate departmentalized and self-contained classroom models; and 1 of them supports his/her own model. Academicians (n: 2/12) reflected that with the application of departmentalized and self-contained classroom models, factors such as students seeing different role model teachers, having equal opportunities, and adapting to changes easily may be effective. For instance, A-11 put forward that students adapt to people and events more easily than adults. Therefore, in the self-contained classroom models, it will not take a long time for students to adapt to the teacher. Besides, A-11 expressed that the application of departmentalized and self-contained classroom models would provide equality in opportunity for students, mentioning the problem of qualified teachers in our country:

> …On the other hand, specialization in certain grade levels can provide equality in opportunity for the students who are obliged to have teachers below a certain quality level for 4 years. I say this because quality concerns are on our agenda. In this context, I approve of applying self-contained or departmentalized classroom models. The primary school experience of a student who happens to have an unqualified teacher in the 1st grade is almost wasted. (A-11)

Because of the long duration of interaction between the teacher and student in the self-contained classroom model, Hood (2009) stated that the important features of this model are building strong relationships and the opportunity to provide stability and consistency. On the other hand, Anderson (1962) expressed that in the departmentalized classroom model, teachers who are experts in their field will have a reference framework to assess student development and they may be more competent in interpreting students' usual behaviors. Academicians (n = 9/12) who think that the most important effect of the looping model can be seen in the context of the teacher-student relationship brought up things like providing continuity in teacher-student communication, having quality time, students accepting the teacher as an authority, teachers managing behaviors, and building emotional bonds.A-5 determined that it is important to undergo processes such as behavioral problems encountered frequently in primary school, adaptation to school, and teacher-parent communication with a single teacher throughout primary school. Similarly, considering that pre-school education is not compulsory, A-7 expressed that the first person that the students encounter after their parents is the teacher. Therefore, it is important that the students love their primary school teacher and accept him/her as an authority figure.

Accordingly, in cases where the teacher is replaced every year or each course is taught by a different teacher, it can be said that it may be difficult for students to embrace teachers and accept them as authorities. Jacoby (1994) alleges that the teacher-student relationship is a case that gains strength in time in the classroom, and in classes where the looping model is applied, shy students get more willing in time to express their thoughts. Burke (1996) put forth that in the looping model, a strong, extensive, and meaningful relationship can be built between the teacher and student, and this improves students' learning by increasing their motivation. All academicians are of the opinion that the application of departmentalized or self-contained classroom models will provide convenience for students in the process of passing to secondary school. It is also stated in the literature that one of the biggest advantages of the departmentalized classroom model is that it prepares the students for secondary education (Chan & Jarman, 2004).

What are the opinions of primary school teachers working in private schools in which different specialization models are applied to specialization models?

Answers to the research question of "What are the opinions of primary school teachers working in private schools in which different specialization models are applied?" were sought. In line with the research question, results were presented regarding the models preferred by primary school teachers, the reason for these preferences, and the effects of self-contained classrooms and two-cycle teaching models on teachers and students.

The Specialization Models Preferred by Private School Teachers and the Reasons for These Preferences

The Specialization models in primary school teaching preferred by the private school teachers are presented in Figure 3.

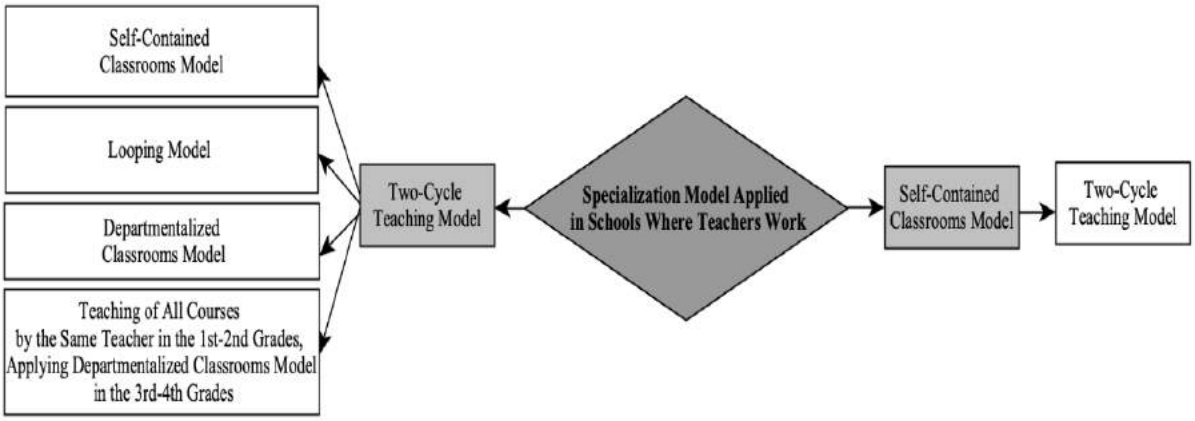

Figure 3. Specialization models preferred by private school teachers.

As can be seen in Figure 3, all the teachers working in the private school where self-contained classrooms model is applied expressed their opinions that two-cycle teaching model should be applied. On the other hand, it is seen that nearly half of the teachers (n: 5/13) working in the private school where two-cycle teaching model is applied preferred the looping model in which a teacher teaches all the course in the 1st-4th grades. It is an important result that all the teachers preferring this model have been teaching to 1st and 2nd graders for the last 4 years. Some of the teachers (n: 5/13) proposed different models that are not encountered in the literature. The model proposed by the teachers which involves teaching by a different teacher in the 1st grade, by the same teacher in 2nd and 3rd grades, and a different teacher in the 4th grade is the same as the model offered by the academicians. Another model proposed by teachers is one which includes teaching by the same teacher in 1st-2nd grades and applying departmentalized classrooms model in the 3rd-4th grades. None of the private school teachers preferred the model applied

in their own schools. The reasons for the preferences of teachers and the models they proposed are presented in Figure 4.

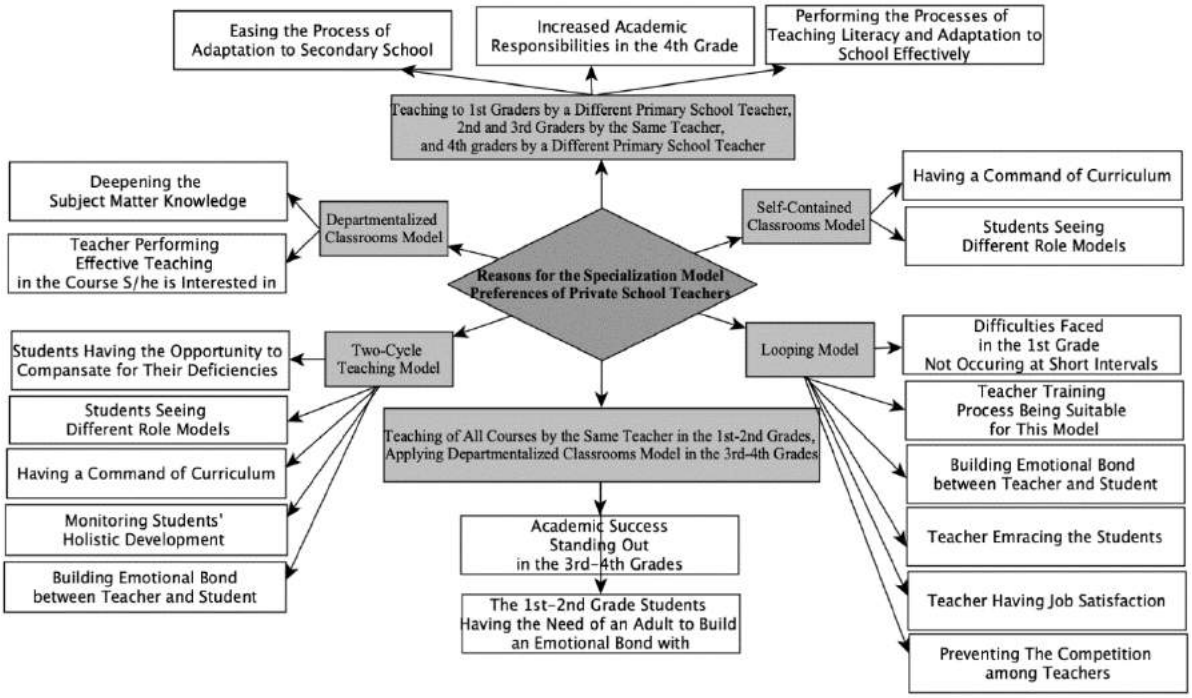

Figure 4. Reasons for model preferences of private school teachers.

According to Figure 4, the common point of the models proposed by the teachers, which are different from the literature, is an increased academic responsibility in the 4th grade and the fact that teachers teaching at this grade level should be well equipped. It can be seen that the teachers (n: 14/21) who regard the emotional bonding between the teacher and student as important preferred the looping model.

On the other hand, teachers (n: 3/13) preferring the departmentalized and self-contained classroom models supported their opinions for certain reasons, such as students seeing different viewpoints in general, teachers deepening their subject matter knowledge, teachers failing to satisfy the needs of many courses, and teachers having a good command of syllabi. According to PST-1, who proposed a new model that involves the teaching of all courses by the same teacher in the 1st–2nd grades and applying a departmentalized classroom model in the 3rd–4th grades, students need to commit to a teacher in the 1st–2nd grades in terms of controlling their emotions and behaviors, feeling safe, and adapting to school. PST-1 added that since the 3rd–4th grades require greater academic responsibilities and they gain self-awareness and independence, branching could be considered in these levels. Emphasizing that teachers give more place in their schedules to the courses they are interested in, and they teach them more effectively, eagerly, and with high motivation in these courses, PST-3 put forth that branching at the course level would contribute to teachers' teaching skills. PST-2 stated that because of the processes such as first reading-writing and adaptation in the 1st graders, and the need for deepening in subject matter knowledge in the 4th grade, these grade levels in the primary school stage are critical, which creates the need for teachers to have a separate area of specialization. On the other hand, PST-8 expressed that the self-contained classroom model would be efficient since it provides the opportunities for monitoring student development in all courses, having a good command of the syllabi of the courses at that grade level, and increasing the quality of the activities with each passing year. In addition, PST-8 highlighted that this model would contribute in terms of the aspects to pay attention to in the program applied as well as the official program. PST-14, who thinks that there needs to be a change of teachers in primary school for students to gain different perspectives, explained the reasons for preferring the two-cycle teaching model, as indicated below:

> …in the two-cycle teaching model, the teacher can act flexibly since he/she knows about the next year's program, subjects, and learning outcomes. For example, in the 2nd year, he/she can teach the topic that was not covered in the 1st year. The teacher can have the opportunity to observe the student more. Students' acknowledging different points of view thanks to teacher replacement is also important. (PST-14)

The reasons provided by private school teachers for preferring the two-cycle teaching model can be counted as; training the primary school teachers at a level to make them capable of teaching all courses in all grade levels (PST-4), building an emotional bond between teacher and student and teachers embracing the students (PST-10), preventing the polarization among teachers (PST-13), monitoring students' cognitive and affective development and evaluating the learning outcomes (PST-5).

Private School Teachers' Thoughts about the Effects of the Self-Contained Classroom Model on Teacher and Student Dimensions

The effects of the self-contained classroom model on teacher dimension were classified into three areas based on data obtained from private school teachers who teach in schools with self-contained classroom models: "professional knowledge and skills," "personal characteristics," and "attitudes toward school. "The effects of the self-contained classroom model on student dimensions were also divided into three categories: "academic success," "teacher-student relationship," and "process of adaptation to school". The effects of self-contained classroom model on teacher and student dimensions are presented in Figure 5.

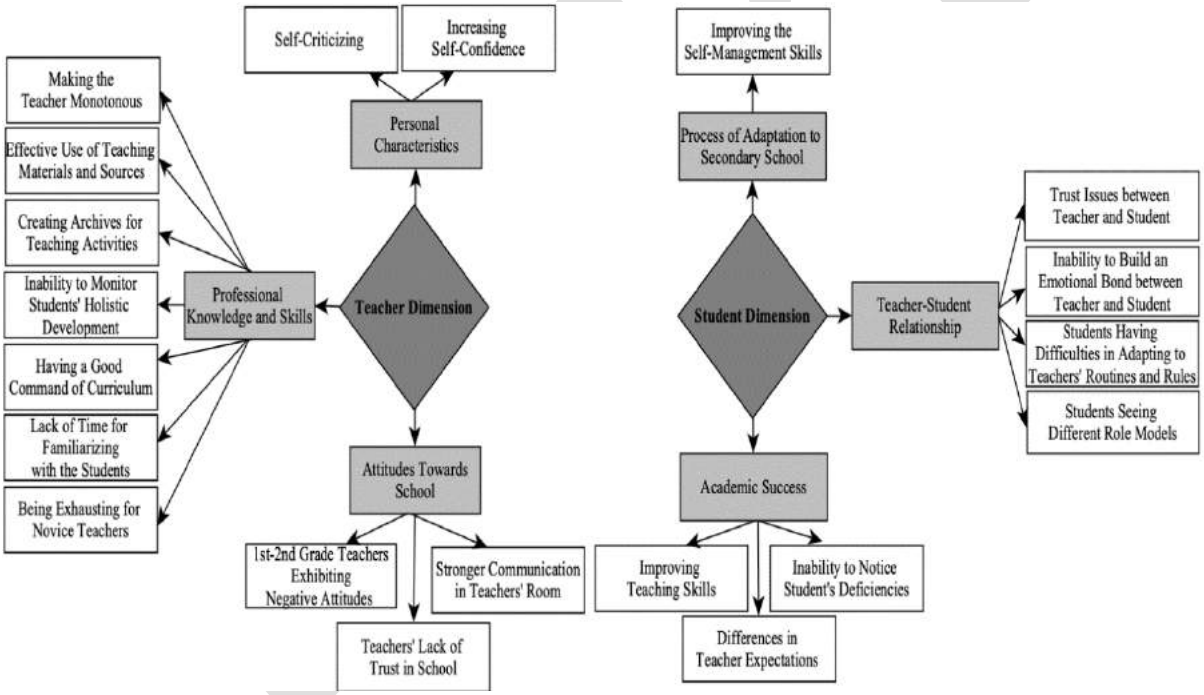

Figure 5. Effects of self-contained classrooms model on teacher and student dimensions.

A majority of teachers (n: 6/8) stated that the self-contained classroom model contributes positively to teachers' professional knowledge and skills. PST-14, who believes that the positive contributions of the self-contained classroom model are in the areas of "revising lesson plans and activities" and "having a good command of the curriculum and subjects," adding: A majority of teachers (n: 6/8) stated that the self-contained classroom model contributes positively to teachers' professional knowledge and skills. PST-14, who believes that the positive contributions of the self-contained classroom model are in the areas of "revising lesson plans and activities" and "having a good command of the curriculum and subjects," adding:

> …Having a good command of the program makes it easier to manage the whole process. You can also give yourself feedback on the activities. For example, when you carry out an activity for a year, you can

> evaluate whether the activity is suitable for the students and how much it contributes to the students' learning process. Also, you can change, revise, or improve the activity and apply it again next year. Do you know what math subjects 4th grade students should be learning in November? (PST-14)

There were also teachers (n: 3/8) who expressed concern that the self-contained classroom model would have a negative impact on their professional development.PST-17 regarded this model as negative in terms of the short duration of recognizing, monitoring, and assessing the students. Again, most teachers (n = 5/8) stated that no relationship exists between the application of this model and the personal development of the teachers. On the other hand, PST-16 expressed that the fact that teachers see the points they need to improve every year, adapt themselves to new situations, and self-criticize is a contribution of the self-contained classroom model to the personal development of the teachers. It has been seen that regarding teachers' attitudes towards school, teachers who teach lower grades (1st–2nd) had negative perspectives and teachers who teach upper grades (3rd–4th) had positive perspectives. PST-15 put forward that it could blunt the abilities of the teachers and make them monotonous to get unaware of other courses while specializing in a single course and to do similar things all the time, expressing:

> …I have specialized in 4th grade, but I have no knowledge at all of the other grade levels. I only went to the 4th grade. I do not know what happens in the other grade levels. I have teacher friends who teach other grade levels, which I do not see. Even so, this affects teaching skills negatively. Think of a factory where a product is loaded at the first stage, then at the second stage it is loaded again, and then it moves to the fourth stage and is loaded again. The teachers become robotized as they do the same thing every year. (PST-15)

Students and parents compare the teachers, and this influences the teachers' performances, expressing that the teachers get competitive while trying to prove that they are "better" than the other teachers who teach the same students and that they do not reflect the students' actual academic success rates.

> …For sure, a competitive environment is created among the teachers. For example, when a student moves from your 3rd grade to 4th grade, the teacher of that grade gives you feedback about the student's deficiencies. At this point, communication breakdowns among the teachers occur. For example, the teachers who teach for the first three years are surprised when their unsuccessful students receive certificates of high achievement in the 4th grade. In the end, it turns out the 4th grade teacher gave undeserved high marks to make himself/herself look like a better teacher. This happens very frequently. (PST-19)

According to data obtained from private school teachers, the self-contained classroom model may have both negative and positive effects on teacher dimension. Self-contained classroom model has positive effects on teachers' professional knowledge and skills, such as revising the activities, having a good command of the syllabi, effective use of materials and sources, and internalizing the course subjects, it also has negative aspects such as making the teacher monotonous, involving exhausting processes for novice teachers, the absence of enough time to familiarize with the students, and the inability to monitor students holistically. Within the context of personal characteristics, the self-contained classroom model provides opportunities in that teachers gain self-confidence and they self-criticize. As to the teachers' attitudes towards school, 1st grade teachers who work in private schools that apply the self-contained classroom model stated that teaching to the 1st graders every year exhausts them and this causes them to hold negative attitudes towards school. Besides, they emphasized that since they spend time with the same group of students for only one year, the school's administration does not reassure them about working in the school for longer periods.

Teachers (n: 5/8) who vocalized that there are many factors that affect students' academic success expressed their opinions that a self-contained classroom model might have positive and negative influences on academic success. In general, primary school teachers (n = 6/8) think that a self-contained classroom model affects teacher-student relationships negatively. PST-17 explains that the success expectancy of the teacher from the student is one of the most important variables in academic success and that replacing teachers every year affects students' academic success negatively.

> …It is important that it affects the students in monitoring them. At this point, the student is affected negatively. For example, the 1st grade teacher gives importance to writing. The students improve themselves in this subject. Then, the 2nd grade teacher says writing and spelling rules are not important for him/her. At this point, the student is also negatively affected. The student, going through this contradiction, may not acquire certain skills and learning outcomes for the sake of meeting the expectations of teachers, and this results in the failure of the student. (PST-17).

PST-18 stated that teachers who specialize at grade level improve in terms of teaching of the course subjects, and this has a direct positive effect on students' academic success. Further explaining

> …I believe that this application greatly contributes to the teaching skills of the teacher. For example, I know better than any other teacher how to teach the subject of angles in the 3rd grade mathematics course in the best way possible; which points students mostly have difficulties with; which activity is the most effective and efficient one for a certain topic; what kind of methods and techniques should be used; and which assessment and evaluation method is best suitable for a subject. This is because I have been teaching at this grade level for years. This improves the academic success of the students; do you not think so? (PST-18)

PST-14, who shared positive opinions about the teacher-student relationship, put forth that the main aim of teaching is to make students independent, and it would yield negative results to become dependent on the teacher, especially in terms of students' affective development and in their future lives. According to PST-15 and PST-21, students adapt to new circumstances and environments, and it does not take a long time for them to get used to their new teacher. PST-15 reflects on the issue as follows:

> …does a firefighter emotionally bond with the house that s/he extinguishes? Does a doctor emotionally bond with his/her cancer patient before operating? Why should a teacher do so? A teacher is not a father or a mother. It is necessary to act professionally if this is a profession. (PST-15)

According to PST-14, in the self-contained classroom model, the replacement of teachers every year plays a significant role in students' taking responsibility and leading a learning life as an independent individual. On the other hand, PST-14 pointed out that the application of the self-contained classroom model has negative impacts regarding the issue of familiarizing with students. In this sense, explaining that a teacher with a concern about managing to proceed with the curriculum on time would not have time to allocate for familiarizing with the students, PST-14 highlights that the deficiencies of students are not noticed by the teacher in this process, and students pass to the upper grade without achieving certain learning outcomes.

All the teachers (n = 8/8) are of the opinion that this model eases the process of adaptation to secondary school. PST-21 remarked that it develops students' self-management skills so they are not dependent on a single teacher and can keep in step with different conditions, which also eases the process of passing to secondary school.

Private School Teachers' Thoughts about the Effects of the Two-Cycle Teaching Model on Teacher and Student Dimensions

The effects of the two-cycle teaching model on teacher dimension were classified into three areas based on data obtained from private school teachers who teach in schools that use the two-cycle teaching model: "professional knowledge and skills," "personal characteristics," and "attitudes toward school". The effects on student dimensions were also classified into 3 areas: "academic success", "teacher-student relationship", and "process of adaptation to school". The effects of the two-cycle teaching model on teacher and student dimensions are presented in Figure 6.

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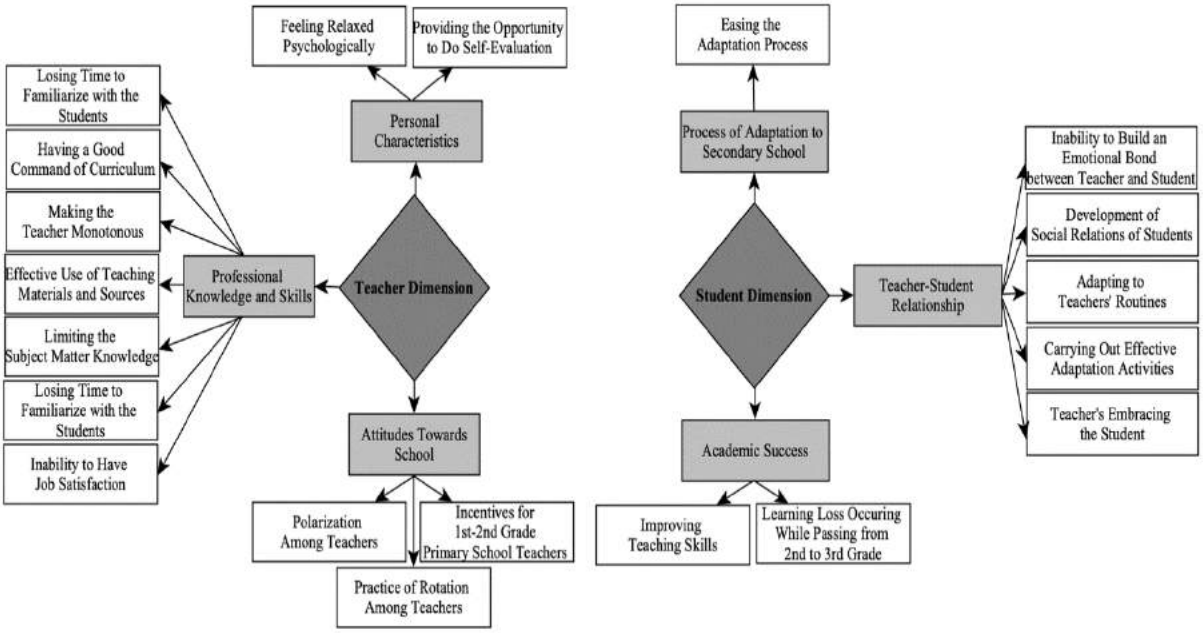

Figure 6. Effects of two-cycle teaching model on teacher and student dimensions.

The majority of teachers (n: 8/13) working in schools where a two-cycle teaching model is used expressed their belief that this model contributes positively to teacher professional development. Some students expressed the contribution of the two-cycle teaching model to their professional knowledge and skills with the remarks below:

> …on the other hand, it also has positive sides. It contributes greatly to the planning process. For example, I prepare the students for the 4th grade. I know what to pay attention to. I have the opportunity to diversify the methods and techniques according to student age and subjects I teach. (PST-7)

> …We have a chance to realize our failures since we teach at the same grade level every other year. In addition, we can estimate the behavior of the students in the grade levels we teach. We know where, when, and what the students will do. This eases the process from our perspective, for sure. **(PST-2)**

On the other hand, PST-1 and PST-3 explained that although this model is efficient in terms of professional development of the teacher, it could restrict the teacher:

> I believe that this is a nice application. When you teach the 1st-2nd or the 3rd-4th grades continuously, you can evaluate and reapply an activity you did the previous year. You can also change an activity that failed. In this regard, it supports the professional development of a teacher; however, in a way, it also blunts the abilities of teachers. For example, after teaching the3rd and 4th grades for years in an institution, and when changing that institution, a teacher might have a hard time teaching the 1st or 2nd grades since s/he have not taught in these grades for years. S/he might have forgotten how to teach the subject. In fact, this situation restricts the teacher in every sense. (PST-1)

> I think this application restricts the teacher in terms of subject matter knowledge. Because I do not know anything about the 1st-2nd grade subjects. For some time, they made students write in cursive italic handwriting, then they moved to writing in basic letters, and letter groups have changed. I am not familiar with these subjects at all. I do not know whether the methods for teaching the sounds that we learned in university are still used. (PST-3)

In addition, PST-5, who have taught to 3rd–4th graders in schools where a two-cycle teaching model is applied, stated that the first semester of the 3rd grade is spent on familiarizing with the students, and this process is time lost since teachers try to keep up with the program. PTS-3 also shared opinions and expressed that the teachers do not have job satisfaction in this model, and this situation causes them to hold negative perspectives towards the profession. A majority of the teachers (n = 5/13) expressed that

there is no relationship between the specialization model and teachers' personal characteristics. Some of the teachers (n: 3/13) working in private schools that apply the two-cycle teaching model emphasize that it has various effects, such as gaining self-confidence, feeling relaxed psychologically, and being able to self-evaluate. PST-8 regards the greatest aspect of this model in terms of teachers' personal development as gaining self-confidence. According to PST-8, this model gains the teachers' confidence since it enables them to: know which activities are effective for which subjects; guess the questions to come from students; know which questions to ask students; restructure the course benefiting from their experiences; have knowledge about students' developmental characteristics based on student age; and communicate with the parents effectively in this matter. PST-12 also puts forward that it gives teachers the opportunity to do self-evaluation about positive or negative attitudes, behaviors, plans, and activities that they have undertaken in the previous years.

A majority of the teachers (n: 5/6) working in schools that apply the two-cycle teaching model as 1st–2nd grade teachers continuously expressed that this model negatively affects the teachers' attitudes towards school and certain arrangements should be made. Some of the recommendations presented by teachers are: periodical rotation among 1st–2nd grade teachers and 3rd–4th grade teachers (PST-8; PST-9); providing moral and material support for the 1st–2nd grade teachers (PST-12); and consulting teachers for their preferences about the grade level to teach (PST-11). PST-6 explained that this model causes polarization among teachers and that this situation prevents teachers from working in the school happily, stating:

> …a kind of polarization occurs between the teachers. If such an application is going to be used, a unit responsible for the coordination among all the grade levels is necessary in the school. This unit should ensure coordination among all the grade levels. For example, this unit should be able to tell 3rd-4th grade teachers how the 1st-2nd grade subjects are covered, and we should act accordingly. We have 3rd graders who say they have never seen base-ten blocks. In this case, I deduce that their teacher only wrote the information on the board without any modelling. The student memorized it all. Because of this situation, I have difficulties in introducing the material. Labelling can be seen among teachers as '1st-2nd teachers' or '3rd-4th teachers'. Teachers may be describing each other as successful or unsuccessful. (PST-6)

Majority of the teachers (n = 8/13) presented opinions that the two-cycle teaching model has positive influences on students' academic success. PST-12 thinks that academic success is more important in the 3rd and 4th grades, and this model increases the academic success levels because it gives the same teacher the opportunity to make up for the deficiencies of students. PST-8 explained how the experience of teachers makes the teaching-learning process more qualified.

> …you can guess the subjects in which students may have difficulty in. This aspect of the process improves as you use your experiences and contribute more to the student. For example, I have noticed that the 2nd grade students have had difficulties in the 'time' subject for 3 years. At this point, when you think about how to teach better, you come up with a solution. I believe that it affects the students positively in every academic aspect. (PST-8)

Some of the teachers (n: 3/13) determined that this model would affect students' academic success negatively, while others (n: 2/13) did not present opinions, thinking that it would be wrong to comment on this issue without first conducting a study on it. PST-4 expressed that absence of communication between 1st-2nd grade teachers and 3rd-4th grade teachers has negative effects on students' academic success:

> …there is an abrupt transition in our school. This creates a gap from time to time. The reason for this gap is that the expectations of 3rd–4th grade teachers and those of 1st–2nd grade teachers of the students are very different. This originates from the lack of communication between teachers. For example, I carried the 2nd graders to a certain level. There is no problem if the 3rd grade teacher builds up to this level, but the teacher does not start at the point where s/he should. S/he gets their own way, believing the child should be at a different level, and that is how a learning gap is created. Teachers should form unity in a vertical direction. (PST-4)

Teachers (n: 6/13) who teach in the 1st-2nd grade level shared their opinions that this model affects teacher-student relationship adversely. PST-4 stated that replacement of the teacher causes shy students

or those with problems in social relations to get traumatized and deny the situation. Opinions of PST-12 about the negative effects of this model on teacher-student relationship are presented above:

> …this is the situation that I have most frequently problems with. The 1st–2nd grade teachers are stricter about rules. We all suffer the consequences. I do not want to cope with behavioral problems while teaching the 3rd grade. I want to focus on the academic part, but unfortunately, this is not the case. While the teacher is more dominant in the class in 1st and 2nd grade, we teach most of the things in 3rd and 4th grade. They see us as a guide and them as parents. The students have difficulties at this point. We face attitudes such as "I do not like my teacher; I do not want to go to school." (PST-12)

Teachers (n: 5/13) who teach in the 3rd–4th grade level expressed that students adapt to changes and new conditions quickly, so replacement of teachers does not affect the teacher–student relationship negatively. For instance, PST-1 emphasized that an emotional bond between the teacher and student can be built in a short time and a teacher can build trust in a year. PST-2 said students like every teacher, and they learn different things from each. PST-8 highlighted that the teacher knows how to approach a student s/he has just met. All of the teachers (n: 13/13) working in schools that apply the two-cycle teaching model stated that this model eases the process of adaptation to secondary school and it is a preliminary preparation for secondary school.

What are the recommendations offered by primary school teachers and academicians about the teacher training process within the context of specialization models in primary school teaching?

Answers to the research question of "What are the recommendations offered by primary school teachers and academics studying teacher education about the teacher training process within the context of specialization models in primary school teaching?" were sought in this chapter.

Recommendations about the Process of Primary School Teacher Training within the Context of Specialization Models

The results of the teacher training process were classified as "recommendations about self-contained classroom models", "recommendations about departmentalized classroom models" and "recommendations about looping model" based on data obtained from teachers and academicians. Recommendations about the process of primary school teacher training within the context of specialization models are presented in Figure 7.

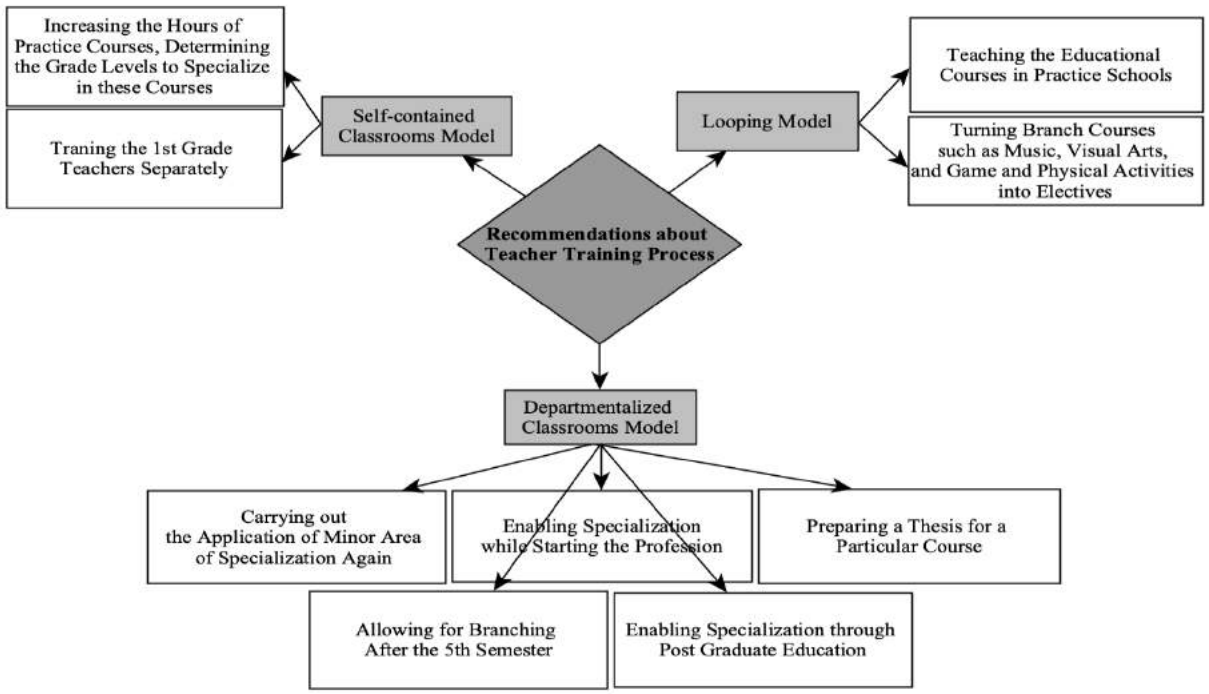

Figure 7. Recommendations on teacher training process.

When Figure 7 is examined, many recommendations have been made about the process of training primary school teachers. Recommendations about the self-contained classroom model can be specified as training the 1st grade teachers separately, increasing the course hours of teaching practice and school experience courses, and allowing the teacher candidates to decide on the grade levels in which they want to specialize in these courses. To illustrate, private school teacher PST-6 stated the necessity of starting the teaching practice and school experience courses as of the 3rd semester and enabling students to specialize in a grade level of their choice in practice schools. Likewise, academician A-4 is of the opinion that, in accordance with the specialization model s/he proposed, 1st grade teaching should become a separate specialization area, similar to pre-school teaching. Therefore, 1st grade teachers should be trained in a separate undergraduate program. Recommendations presented by participants about the departmentalized classroom model include restructuring the Division of Classroom Education, preparing a thesis for one of the four courses (Mathematics, Turkish, Social Studies, and Science), enabling branching through post-graduate education, carrying out the application of minor areas of specialization, giving the educational sciences and general knowledge courses in the first two years of undergraduate education, and giving subject knowledge in a course in the last two years. Drawing attention to the process of teacher training in 1998, academician A-4 expressed that in the case of specialization at course level, teacher candidates can do a minor and they can prepare a thesis or a graduation project within their minor. According to A-5, in the case that the departmentalized classroom model is applied, general knowledge and professional knowledge courses should be given in the first two years of undergraduate education, and teachers should be given the choice of selecting a branch as of the 3rd year, enabling them to take courses on their own branches. Private school teacher PST-15 explained the necessity that courses about the areas that teachers want to specialize in should be offered as elective courses in the undergraduate program. According to PST-15, teacher candidates should be given the opportunity to carry out studies not only on theoretical but also practical aspects of these courses. Regarding the looping models, participants recommended that the general process of current teacher training may continue. However, practice should be given weight besides theoretical courses; branch courses such as music, visual arts, and games and physical activities should be turned into electives; and educational courses should be taught in practice schools. For instance, PST-21 emphasized that because syllabi at the primary school level are created in a spiral way that allows for carrying out interdisciplinary studies, primary school teachers need to have knowledge about all grade levels and all courses. PST-8 expressed that teacher candidates should be trained in the existing teacher training programs. However, after graduation, primary school teachers can be provided with area specialization through a master's degree in departments such as Mathematics Education, Turkish Education, Social Sciences Education, and Science Education.

DISCUSSION and CONCLUSION

According to the results, a majority of academics and primary school teachers preferred looping models. The main reasons for preferring these models can be summed up as recognizing the strengths and weaknesses of students, monitoring and evaluating students holistically, and building emotional bonds between the teacher and student. Poulou (2007) also emphasized the importance of the relationship status between teacher and student, which can be indicated as teachers' perceptions about social-affective development, creating an atmosphere of mutual trust, students' accepting the teacher as the authority, establishing an emotional bond, and keeping in long-term interaction and communication with students' social-affective skills. A positive teacher-student relationship directly affects the process of students' adaptation to school, the development of their social and affective skills, and their academic success (Ewing & Taylor, 2009; Rudasill, Reio, Stipanovic & Taylor, 2010). Chirichello and Chirichello (2001) expressed that in the looping model, students are able to overcome emotional problems such as self-defense, anxiety, and shyness. Groves (2000) stated that students continuing with the same teacher for long periods gain confidence; besides, this has positive contributions to their socio-affective, cognitive, and language development. It is one of the remarkable results of the study that teachers working in private schools that apply the self-contained classroom model and two-cycle teaching model

did not prefer the models applied in their own schools. For instance, the reasons for the teachers working in schools that apply the self-contained classroom model to prefer the two-cycle teaching model include having the chance to compensate for the academic deficiencies of students; having a good command of syllabi; establishing an emotional bond between teacher and student; maintaining the routines, etc. Most teachers who continuously teach at the 1st–2nd grade level in schools that use the two-cycle teaching model preferred the looping model in which the same teacher teaches at the 1st–4th grade level. Teachers who continuously teach at the 1st–2nd grade level include not having job satisfaction because of teaching at the same level all the time, thus exhibiting negative attitudes towards school; burnout and exhaustion; having to deal with adapting to school every two years and the process of first reading and writing; and polarization among teachers. Considering these circumstances, solutions offered by private school teachers for these problems are: leaving the selection of the grade level to specialize in to the teacher and doing this on a voluntary basis; rotating among grade levels at certain intervals; providing a salary supplement for the 1st grade teachers; and bringing incentive regulations.

It was expressed by the participants that the self-contained classroom model, departmentalized classroom model, and looping model might have more positive effects on teachers' professional knowledge and skills in general. However, there are also teachers who state that these models have disadvantages in terms of their professional knowledge and skills. These teachers emphasized that teaching the same courses at the same grade levels every year may have disadvantages for teachers, such as having difficulties in making different students adapt to new rules and routines; having negative attitudes towards school; and losing time to familiarize with the students. Private school teachers also elaborated on the drawbacks of the self-contained classroom model, referring to not taking any responsibility for student failure; students making comparisons among teachers; parents qualifying the teachers as "good" or "bad"; lack of communication between parents and teachers; polarization among teachers; competition created; and, as a result, losing motivation. One of the suggestions presented by most teachers in order to prevent this situation and increase motivation is that there should be rotation at certain intervals among the grade levels that they teach. In self-contained classrooms, departmentalized classrooms, and looping models, it is seen as advantageous for students to see the perspectives of different teachers, have equal opportunities, and discover new interests and skills. Participants generally agreed that students could adapt to secondary school faster as a result of applying these models. Similar results were achieved in a study conducted by Freiberg (2016), in which it was determined that the application of the departmentalized classroom model accelerated the process of adaptation to secondary school.

Another result of this study is that advantages and disadvantages are different for the models e and f among the looping models (see Table 1). To illustrate, not having a good command of the program, failing in subject matter knowledge, losing time while preparing lesson plans every year, making it difficult to adapt to secondary school, and training with the perspective of a single teacher were the factors evaluated as negative in the looping model in which the same teachers teach in the 1st–4th grades, while the same factors were evaluated as positive in the two-cycle teaching model. In this sense, the advantages and disadvantages of the two-cycle teaching model for teachers and students differ from the results determined in the literature on looping models. Another issue is that in the international literature, positive sides of the self-contained classroom model were determined as recognizing strengths and weaknesses of students and their learning styles; having flexibility in planning the lessons; establishing close relationships and emotional bonds with students; meeting students' social and psychological needs; and carrying out interdisciplinary studies (Berry & O'Connar, 2010; Bezeua, 2007; Cook & Rushton, 2007; Chang, Munoz & Koshewa, 2008; Hood, 2009; Martin et al., 2010; McGrath & Rust, 2002; Schonert-Reichl & Zakrzewski, 2014). It can be seen that the advantages of the self-contained classroom model determined in this study do not coincide with those of international studies, except for "carrying out interdisciplinary studies". The advantages of self-contained classrooms models shown in the international literature as having job satisfaction (Strohl et al., 2014), monitoring the affective, social, psychological, and intellectual development of students holistically (Berry & O'Connar, 2010; Martin, et al., 2010), establishing a strong relationship between teacher and student (Bezeua, 2007; Hood, 2009),

recognizing students' strengths and weaknesses and personality traits (McGrath & Rust, 2002), and being able to meet the needs of the students (Reyes, Brackett, Rivers, White, & Salovey, 2012) have been determined as the advantages of looping models in this study. The reason for determining the advantages of the self-contained classroom model as such in the international literature might be that primary school teachers are with the students all day long and they teach the core courses. Another important factor may be that only the departmentalized classroom model and the self-contained classroom model have been contrasted in the studies in the international literature (Jack, 2014; Liu, 2011; Hill & Jones, 2018; McGrath & Rust, 2002; Myrberg et al., 2019; Minott, 2016; Parker et al., 2017; Reitz, 2012; Strohl et al., 2014). On the other hand, in the current research, it was found that the advantages and disadvantages of self-contained classroom models and departmentalized classroom models overlap more based on participant opinions. Regarding the two-cycle teaching model, advantages and disadvantages different from the literature were determined in this research, which can be counted as "not having job satisfaction", "polarization among teachers", "negative attitudes of 1st–2nd grade teachers towards school", "having a good command of the program", "deepening the subject matter knowledge" for teachers, and "gaining perspectives from different teachers" for students.

Apart from the specialization models in the literature, recommendations offered by some of the academicians and primary school teachers are among the important results of the study. For instance, a new model of "teaching by a different teacher in the 1st grade, by the same teacher in the 2nd and 3rd grades, and a different teacher in the 4th grade" was suggested by participants. The main reasons for suggesting this model can be counted as enabling adaptation to school and first reading-writing, gaining students certain traits such as socializing and following the rules, increased academic knowledge in the 4th grade, the process of transition to secondary school, subjects becoming more and more difficult, and the preadolescence period. A second different model proposed by the teachers was "teaching by the same teacher in the 1st–2nd grades and departmentalization at the course level in the 3rd–4th grades." Teachers who advocated for this model believe that behavioral characteristics of the first–second grades, as well as monitoring the processes of first reading–writing and adaptation to school, are essential; students in the third–fourth grades can keep up with changes; they become more independent and their self-management skills develop; and teachers should specialize in only one course.

Academicians and primary school teachers made suggestions about the teacher training process in line with the specialization models that they prefer. Academicians who preferred the departmentalized classroom model expressed that general knowledge and professional knowledge courses should take place in the 1st and 2nd years of undergraduate education; and in the 3rd and 4th years, teacher candidates should be given courses on subject matter knowledge, and they should be given the opportunity to specialize in courses of their preference. It may not be suitable to leave the choice of the courses to specialize in only to the teacher candidates themselves. It plays an important role in teacher training to take into consideration the opinions and observations of teacher candidates' advisors; their success in the course on the area to specialize in; their interest and skills in the course; and their performance in the studies carried out in the related course. Another recommendation by teachers who preferred departmentalized classroom models was that the Department of Primary Education in faculties of education should be restructured, and instead of the Division of Classroom Education, train teachers in various branches such as "Primary School Mathematics Teaching", "Teaching of Reading", "Teaching of Writing", and "Primary School Science Teaching". Another suggestion offered by teachers was to make graduate study compulsory and enable teachers to specialize in a course in this process. A suggestion for a new model, different from those in the literature on specialization models in primary school teaching, was made by the participants as "training the 1st grade teachers separately, similar to pre-school teaching." In the case that the 1st grade teachers are trained separately, connections may be built between pre-school education and the 1st grade by enabling teacher candidates to take courses from the department of pre-school teaching.

Recommendations

According to the results of the study, various recommendations have been developed for practitioners and researchers. MoNE could pilot self-contained, departmentalized, and looping models; receive opinions from shareholders; carry out research on the schools with different model applications; or benefit from the research reports on this issue. Private schools that apply self-contained classrooms, departmentalized classrooms, or two-cycle teaching models should clearly indicate in their vision and missions why they choose to apply these models; what motivations are behind the application of these models; how they enable teachers' specialization; and the benefits of the models they apply in terms of teachers, students, and parents. Other studies should be conducted on the process of primary school teacher training in the case of the application of a different specialization model in primary school teaching. Studies can be carried out on how each model affects teacher competencies, which include professional and personal characteristics of teachers, using questionnaires and observations, which were not used in the present study. It can be examined as a different research topic how specialization models affect teachers' self-efficacy, job satisfaction, workload, professional motivation, and their attitudes towards the school and the profession. Through longitudinal studies in schools with different specialization models, teacher-student relationships, students' attitudes towards school, their cognitive, social, and affective development, as well as their learning levels may be examined. New studies that give place to the opinions of parents and school administrations can be carried out. The effects of different specialization models on students' academic performance can be compared using a mixed-methods study that combines qualitative and quantitative data or an experimental research.

Ethics and Conflict of Interest

The ethical committee approval was obtained for this research from the Ankara University Social Sciences Sub-Ethics Committee with the decision number 05-147 dated April 22, 2019. In addition, National Education approval was obtained for this research from the Ankara Provincial Directorate of National Education with the decision numbered 14588481-605.99-E.8599195 dated April 30, 2019. This study was conducted as part of a Master Thesis titled “The Evaluation of Models of Specialization in Primary School Teaching in Terms of Teachers, Students, and Academics' Opinions” and presented at the 19th International Primary Teacher Education Syposium, in Şanlıurfa, Turkey (November 12–14, 2021).

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TRENDS IN EDUCATIONAL TECHNOLOGIES ACCORDING TO ARTICLES PUBLISHED IN THE LAST 20 YEARS IN INTERNATIONAL LITERATURE

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Abstract

The aim of this research is to determine the trends in the field of educational technology by analyzing the bibliometric analysis of the articles about Educational Technology published in the Web of Science Core database in the last 20 years. In this framework, a bibliometric analysis of the articles on educational technology published 2000-2019 was conducted. As a result of the preliminary examination, 96 most used themes in the field of educational technology were reached. These themes are gathered under the headings of Application, Design and Environments, Measurement and Evaluation, Pedagogy and Teaching and Learning. As a result of the findings, a bibliometric analysis of a total of 25 themes was made for 5 main theme findings with the highest number of articles under each main topic. During these analyzes, the most used concepts were analyzed with each theme. VOSViewer version 1.6.13 was used for analysis.

Keywords: Educational technology, bibliometric research, vosviewer, trend analysis, literature analysis.

INTRODUCTION

Educational technology, as a dynamic and interdisciplinary field, has been influenced by constantly changing and developing technology and related learning theories and focused on different educational fields. For this reason, educational technology has been an intense field where researchers are constantly working on and producing scientific publications. Accordingly, it is important for practitioners, researchers, and educators, in the field of educational technology, to follow the academic developments and trends in educational technology (Thompson, 2005). The most used method for determining these orientations and interpreting the results obtained in the bibliometric analysis.

Bibliometric analysis has been defined as an approach to researching publication data within specific science categories or scientific communities (Ivanović & Ho, 2017). Breitenstein (2003, p.32) defined bibliometric analysis as a method of analysis that offers well-tested techniques to characterize the physical and intellectual structure of literature by subjecting the data to the quantitative and qualitative selection, summary, comparison, and analysis methods. Diodato and Gellatly (2013 p.7) stated that bibliometric analysis is a field that uses mathematical and statistical techniques from counting to computation to examine publishing and communication models in the distribution of information. According to the definitions, bibliometric can provide the necessary data for future research by statistically analyzing scientific studies. With the help of bibliometric, researchers can conclude their productivity, subjects, citations, authors, institutions, academic journals, and scientific activity regions

in their studies, enabling them to create scientific maps, construct models and understand scientific growth within the framework of these results (Jacobs, 2010). While Abt (1993) states that the number of published research articles and reviews can be used to assess the amount of science in a given category or community, Brace (1992) argued that citation count can effectively evaluate the quality of science. According to Jacobs (2010), the opportunity to examine the intellectual development of a discipline bibliometrically has become an indispensable research tool.

When the literature was examined, bibliometric studies on educational technology were encountered (Gallegos et al., 2019; Mishra, 2019; Saltan et al., 2018; Tokel & Cevizci-Karataş, 2014; Erdoğmuş & Çağıltay, 2016). However, due to the high number of publications in most of these studies, the date ranges were very limited. In this study, it was tried to reveal the trends in the studies conducted in the last 20 years by using the VOSViewer application. In this line, it was aimed to determine the orientations of the articles published in Web of Science indexed journals 2000-2019 in the field of educational technology by using VOSViewer application in terms of bibliometric. This study is aimed to cover the last 20 years. This study was carried out and completed in the first quarter of 2020.The WoS Core Database was selected to reach the necessary article information in the bibliometric analysis using the keyword list obtained. Since the journals browsed in WoS, SCI-EXPANDED, SSCI, A & HCI, CPCI-S, CPCI-SSH, BKCI-S, BKCI-SSH, ESCI directories can be easily accessed, it was decided to perform keyword searches on this database.

In this study, it is aimed to determine the orientation of the articles published in Web of Science indexed journals published in the field of educational technology between 2000 and 2019 in terms of bibliometrics. In order to get this goal the following research questions were tried to be answered:

- What is the distribution of the articles published on the obtained keywords by years?
- What are the most used concepts with keywords?
- How is the citation analysis of the articles about the keywords in the context of the journal?

METHOD

Research Method

In this study, a bibliometric analysis approach was used. Bibliometric analysis approach is used as an experimental tool to analyze trends in researches, the scientific dimension, impact, and growth rate of researchers, publications, and journals, and to consider the intellectual status in the field (van Eck & Waltman, 2014). With bibliometric analysis, it is possible to analyze the literature numerically and holistically (Ball & Tunger, 2006).

Data Collection

The data used in this study were obtained with the help of the concepts used in the article titles published between 2000 and 2019. To determine these articles, firstly the concepts used in the field of educational technology were determined. For this, the keywords used to classify the articles published by two international journals (Computers & Education, British Journal of Educational Technologies), which have the highest impact factor in the field of educational technology, were used. A total of 54 keywords under ten main headings taken from Computer & Education - Journal and 250 keywords taken from the British Journal of Educational Technologies (BJET) were examined and combined under ten titles. Repeating words were selected and made singular during combining. A list of ten main headings and a total of 250 keywords was obtained. This list was examined by three Ph.D. experts in the field of educational technology and reshaped with expert opinions, the list was finalized with 154 keywords under five main headings.

To search within the scope of WoS, the root form of each keyword was entered one by one in the "Title" field and the searches were performed by entering the value "2000-2019" in the second search line, "Year Published". The wildcard character "*" is used to obtain more comprehensive results in each search and to reach the plural or different word conjugation of the root keyword. Besides, to make research more comprehensive, different words indicating the same concepts were used when necessary.

Abbreviations of more than one word and used words were also used in searches. To access more search results at the same time, the "OR" connector has been added among the criteria. Table 1 shows the keywords and different search texts used in the search.

Table 1. Sample keywords and search texts

Keywords	Search Texts
Facebook	"Facebook*"
Augmented Reality	"Augmented Realit*" OR "AR"
Email	"Email*" OR "E-mail*"
Massively Online Open Course	"Massively Online Open Course*" OR "*MOOC*"
World-wide web	"World-wide web*" OR "www*" OR "World wide web*"
Benchmarking	"Benchmark*"
Mobile Learning	"M-learning*" OR "Mobile Learning*" OR "M learning*"
Communities of practice	"Communit* of practice*"

The data obtained as a result of the search was filtered by selecting the "Article" option from the "Document Types" preferences and the "Education Educational Research" option from the "Research Areas" preferences. In this way, findings were obtained in the WoS system, which were published in the Education / Educational Research category in 2000-2019 and included the desired keyword. The number of different articles published for each keyword was found. Since it is thought that systematic and meaningful analysis results cannot be reached with keywords with less than 50 articles, these keywords have been removed from the list. Considering that the number of articles less than 50 would not show a clear trend in the study, these articles were not included in the study by the researchers. Also, keywords with ten thousand or more articles were removed from the list because there were no analysis reports on the WoS system. As a result, a list of five main titles and 96 keywords was created. This list is shown in Appendix A.

Data Analysis

Text documents obtained individually for each keyword are visualized by Vosviewer 1.6.13 version. During this visualization, five keywords with the highest number of articles in each main title (25 keywords in total) and the most used concepts were emphasized.

In order to reach the network analysis findings of the most used concepts with keywords, the Vosviewer application main screen; a) The "Create" button was clicked. b) Select "Create a map based on bibliographic data" from the window that opens and click "Next". c) The next step has been passed by selecting "Read data from bibliographic database files" in the newly opened window. d) At this stage, the file location of the text file containing the bibliometric information of the word is specified in the field in the "Web of Science" tab and the next page is reached by clicking the "Next" button. e) Here, the "Co-occurrence" and "Author keywords" options were marked and the next step was taken. f) The variable value field on this page has left the value given automatically by the application and proceeded with the "Next" button. g) In the same way, the analysis data were obtained with the "Next" button, leaving the values in the field in the new window as they are. h) The desired visual was reached by selecting the "Yes" option in the question window. In the findings obtained, the five most repetitive concepts for each theme in each main topic were selected and stated in the findings section.

FINDINGS

In this section, the findings obtained from 25 keywords under five main headings are presented one by one under their main headings. The main topics are: a) Application b) Design and Environments c) Evaluation and Measurement d) Pedagogy e) Teaching and Learning.

Application

As a result of the analysis, findings of five keywords in total were reached under this heading. These keywords and the number of articles and citations belonging to them between the years 2000-2019 are listed according to the number of citations and given in Table 3.

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Table 2. Keywords and their article and citation numbers

Keywords	Number of Articles	Number of Citations
Game	3352	34809
Simulation	2244	28278
Facebook	374	6539
Massively Open Online Course	787	5776
Augmented Reality	369	5019

Game

Under the title of the application, one of the subjects that researchers mostly concentrate on is the game. With the help of the text-based data obtained from the WoS system, the concept map created by the Vosviewer program regarding the most used concepts with the game was given in Figure 1.

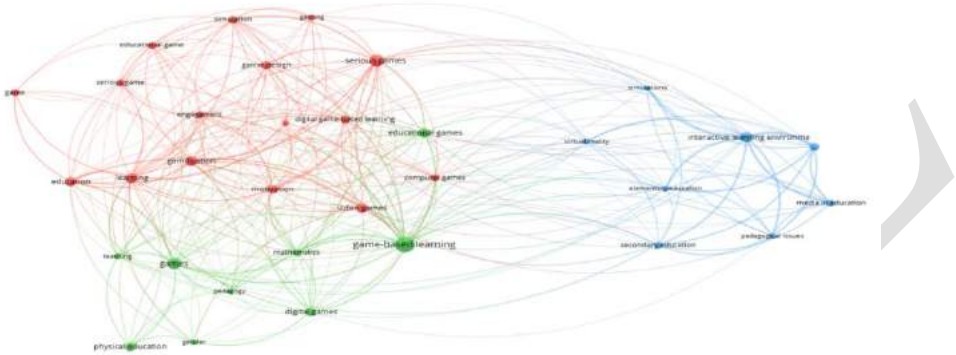

Figure 1. Concept map for the Game

The frequency values of the game (f=122) and the concepts used together were determined by the Vosviewer program. Accordingly, it can be said that game-based learning (f=240), serious games (f=145), interactive learning environments (f=93), video games (f=90) and gamification (f=87) are the most prominent.

Simulation

Under the title of the application, the other subject that researchers mostly focus on is the simulation. The concept map created by the Vosviewer program regarding the most used concepts together with the simulation keyword was given in Figure 2.

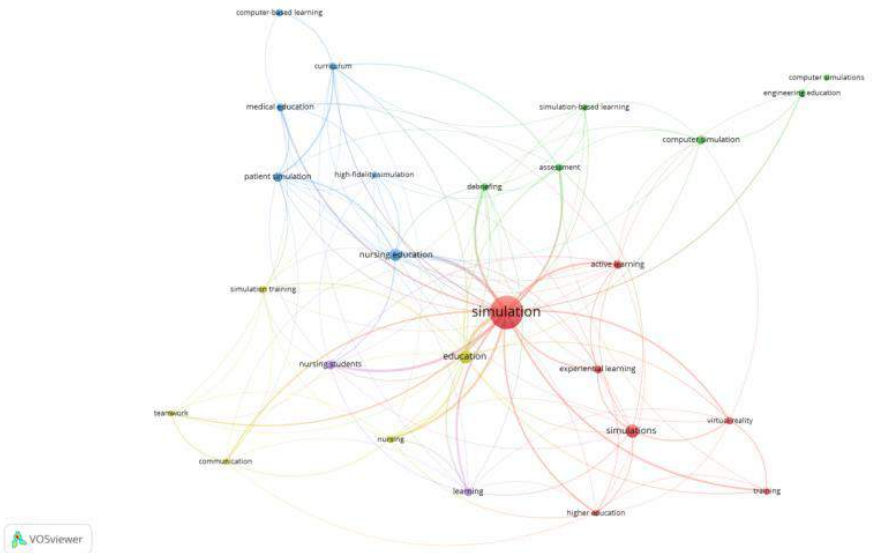

Figure 2. Concept map for the Simulation

Simulation (f=549) and frequency values of the concepts used together, created by the Vosviewer program, are indicated. Accordingly, it is mostly handled with the education (f=88), simulations (f=87), nursing education (f=70), patient simulation (48), and nursing students (f=42).

Facebook

Under the application title, one of the subjects that researchers focus on most is Facebook. The concept map created by the Vosviewer program regarding the most used concepts with the Facebook keyword was given in Figure 3.

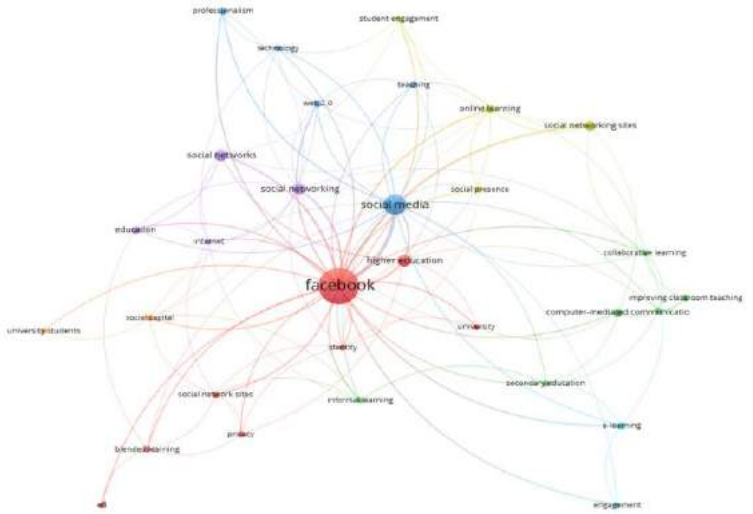

Figure 3. Concept map for the Facebook

The frequency values of Facebook (f=191) and the concepts used together by the Vosviewer program were specified. Accordingly, social media (f=62), higher education (f=22), social networks (f=22), social network (f=18), social network sites (f=15) are mostly studied.

Massively Open Online Course

Under the title of the application, one of the most focused topics of researchers is a massively open online course. The concept map created by the Vosviewer program regarding the most used concepts together with the massive open online course keyword was given in Figure 4.

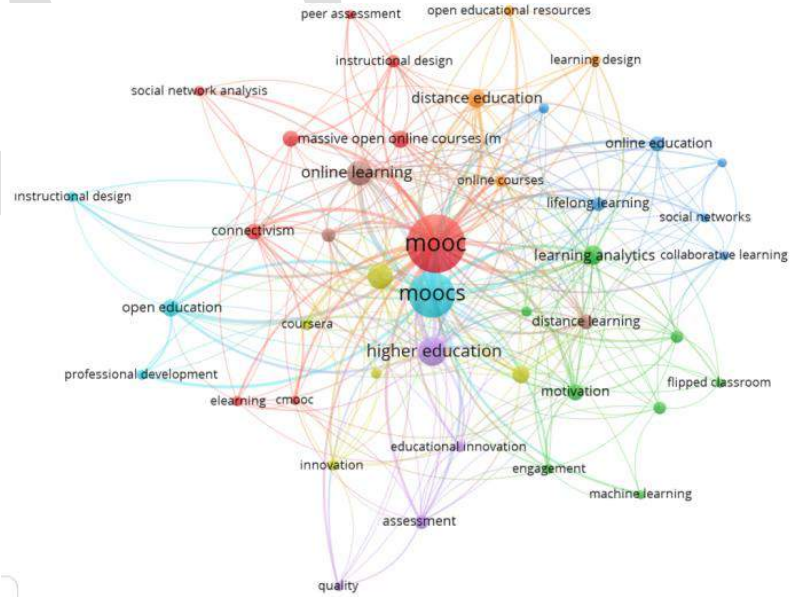

Figure 4. Concept map for the Massively open online course

The frequency values of the massively open online course (f=51) and the concepts used together were determined by the Vosviewer program. Accordingly, there are studies on MOOC (f=278), MOOCs (f=170), higher education (f=68), online learning (f=54), learning analytics (f=30), distance education (f=27) and e-learning (f=25).

Augmented Reality

Under the title of the application, one of the subjects that researchers mostly concentrate on is Augmented Reality. The concept map created by the Vosviewer program regarding the most used concepts with the keyword Augmented Reality was given in Figure 5.

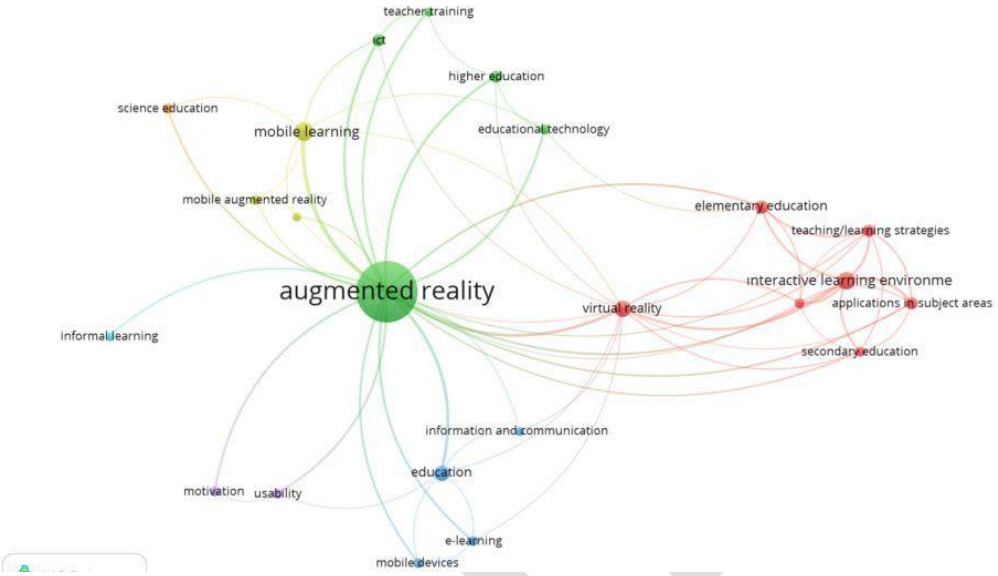

Figure 5. Concept map for the Augmented Reality

The frequency values of the augmented reality (f=229) and the concepts used together, created by the Vosviewer program, were specified. Accordingly, most studies have been conducted on mobile learning (f=22), interactive learning environments (f=19), virtual reality (f=18), education (f=16) and elementary education (f=11).

Design and Environments

Five of the 96 keywords obtained as a result of the analyzes made in the WoS system, with the highest number of articles, were taken from this main title. These keywords and the number of articles and citations belonging to them between 2000 and 2019 are listed according to the number of citations and given in Table 4.

Table 3. Keywords and their article and citation numbers

Keywords	Number of Articles	Number of Citations
Laboratory	3015	25763
İnternet	1095	15120
Virtual World	264	3489
Hypermedia	138	3014
Design principles	83	1640

Laboratory

Under the title of Design and Environments, one of the most focused topics by researchers is Laboratory. The concept map created by the Vosviewer program related to the most used concepts with the laboratory keyword was given in Figure 6.

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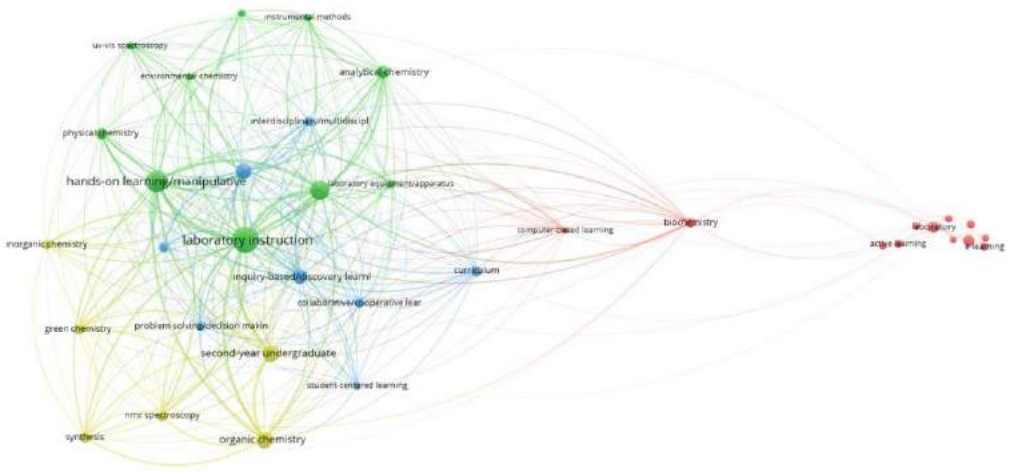

Figure 6. Concept map on the Laboratory

The frequency values of the laboratory (f=80) and the concepts used together were determined by the Vosviewer program. Along with the laboratory, laboratory instruction (f=400), hands-on learning / manipulatives (f=277), upper-division undergraduate (f=225), second-year undergraduate (f=168), and organic chemistry (f=165) are mostly handled concepts.

Internet

Under the title of design and environments, one of the most focused topics of researchers is the internet. The concept map created by the Vosviewer program regarding the most used concepts with the internet was given in Figure 7.

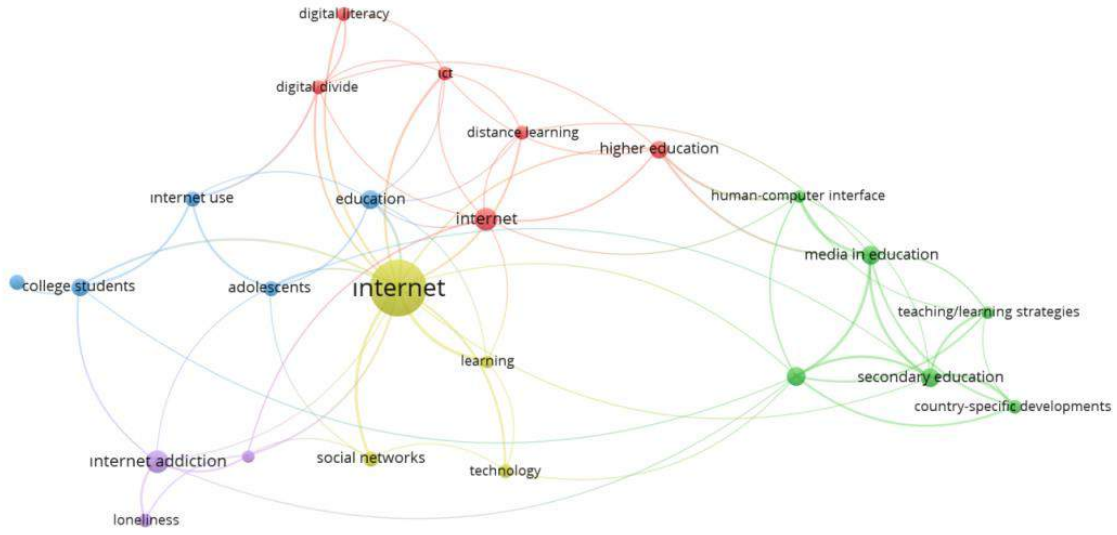

Figure 7. Concept map for the Internet

The frequency values of the Internet (f=202) and the concepts used together by the Vosviewer program were specified. Accordingly, mostly handled with internet addiction (f=30), secondary education (f=20), computer-mediated communication (f=19), education (f=19), media in education (f=19).

Virtual World

Under the title of design and environments, one of the most focused topics by researchers is the virtual world. The concept map created by the Vosviewer program regarding the most used concepts together with the virtual world was given in Figure 8.

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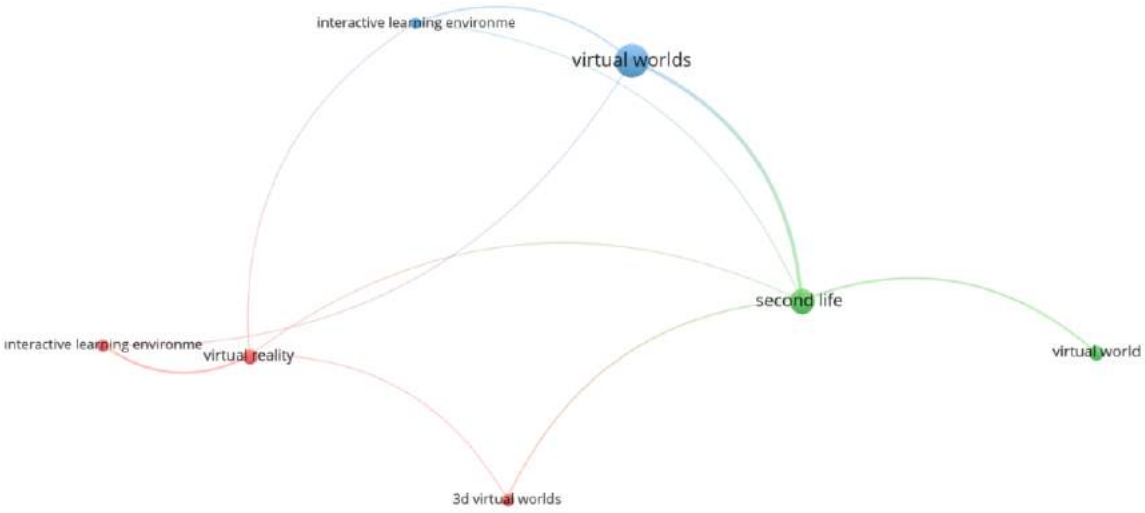

Figure 8. Concept map for the Virtual World

The frequency values of the virtual world (s) (f=55) and the concepts used together were determined by the Vosviewer program. Accordingly, mostly worked on Second Life (f=25), virtual reality (f=10), interactive learning environments (f=12), 3D virtual worlds (f=7).

Hypermedia

Under the title of Design and Environments, one of the topics that researchers focus on is Hypermedia. The concept map created by the Vosviewer program for the most used concepts with the Hypermedia keyword was given in Figure 9.

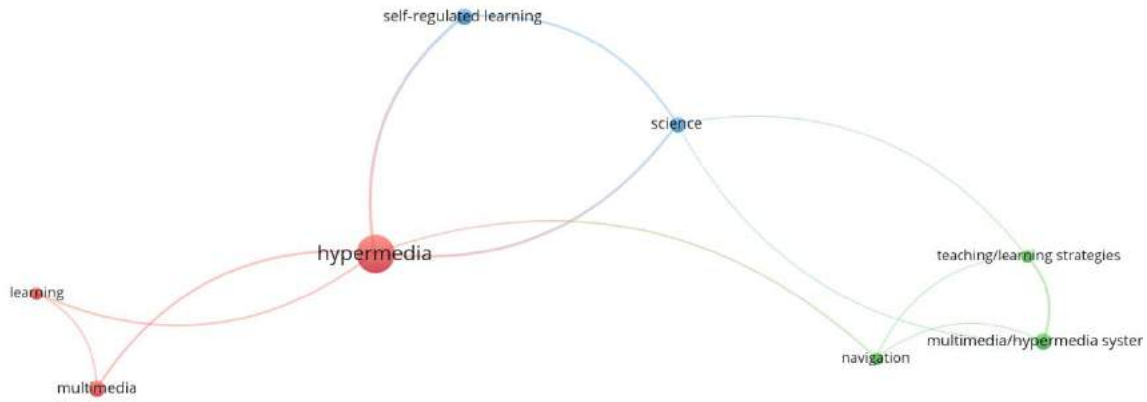

Figure 9. Concept map for the Hypermedia

Hypermedia (f=40) and the frequency values of the concepts used together by the Vosviewer program were specified. Accordingly, studies were mostly carried out on multimedia (f=8), multimedia / hypermedia systems (f=8), self-regulated learning (f=8), adaptive hypermedia (f=7), science (f=7).

Design Principles

Under the title of Design and Environments, one of the most focused topic is the Design Principles. The concept map created by the Vosviewer program regarding the most used concepts together with the Design Principles was given in Figure 10.

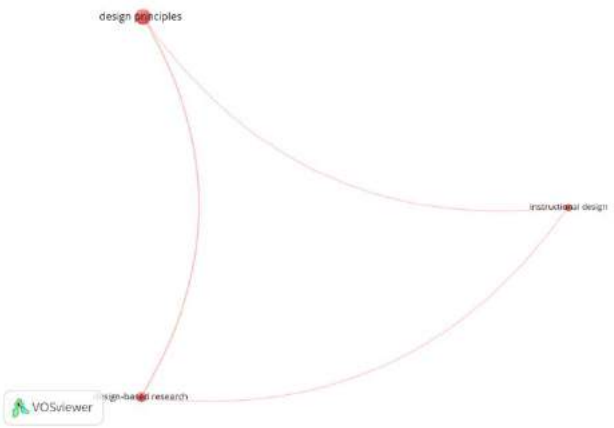

Figure 10. Concept map for the Design Principles

The design principles (f=12) and the frequency values of the concepts used together by the Vosviewer program were specified. Accordingly, these studies were mostly conducted on design-based research (f=5) and instructional design (f=3).

Evaluation and Measurement

Five of the 96 keywords obtained as a result of the analyzes made in the WoS system, with the highest number of articles, were taken from this main title. These keywords and the number of articles and citations belonging to them between 2000 and 2019 were listed according to the number of citations and given in Table 5.

Table 4. Keywords and their article and citation numbers

Keywords	Number of Articles	Number of Citations
Feedback	2354	31449
Competences	3335	26845
Reflection	3753	24437
Systematic Review	245	9696
Questionnaire	804	9349

Feedback

One of the subjects that researchers focus on most under the title of measurement and evaluation was the Feedback. The concept map created by the Vosviewer program was given in Figure 11.

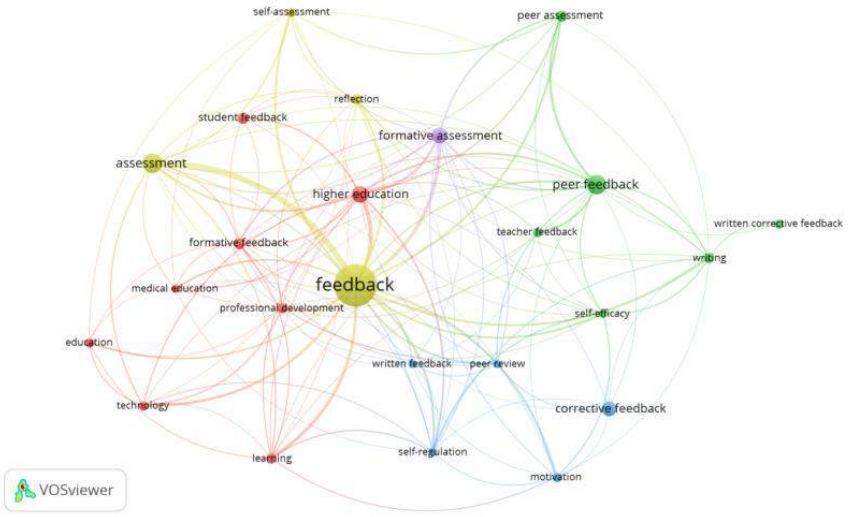

Figure 11. Concept map for the Feedback

Feedback (f=550) and the frequency values of the concepts used together by the Vosviewer program were specified. Accordingly, mostly handled together with assessment (f=122), peer feedback (f=113), higher education (f=83), formative assessment (f=77), corrective feedback (f=72).

Competences

Under the title of measurement and evaluation, one of the subjects that researchers mostly concentrate on is the concept of reflection. The concept map created by the Vosviewer program was given in Figure 12.

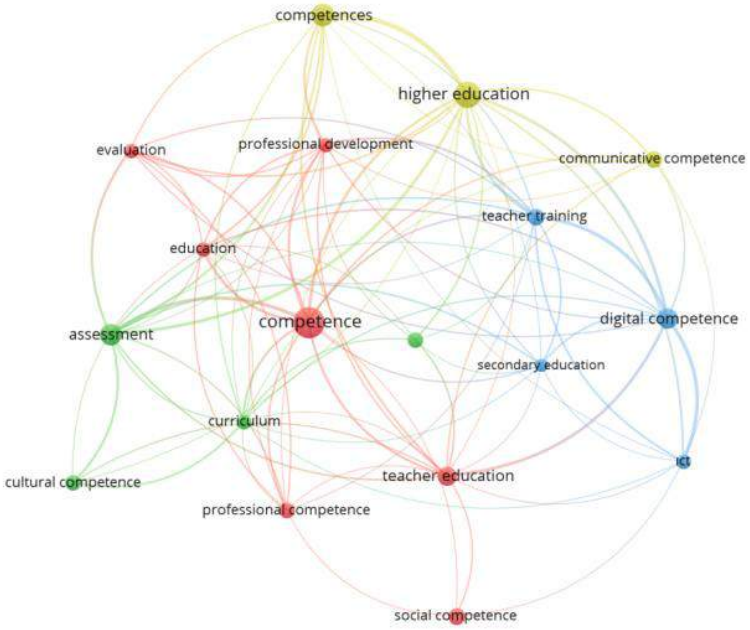

Figure 12. Concept map for the Competences

The competence (s) (f=300) and the frequency values of the concepts used together by the Vosviewer program were indicated. According to these findings, it can be said that it is mostly handled with the concepts of higher education (f=140), assessment (f=96), digital competence (f=82), teacher education (f=73) and communicative competence (f=59).

Reflection

One of the subjects that researchers mostly concentrate on under this main topic is the concept of reflection. The concept map created by the Vosviewer program was given in Figure 13.

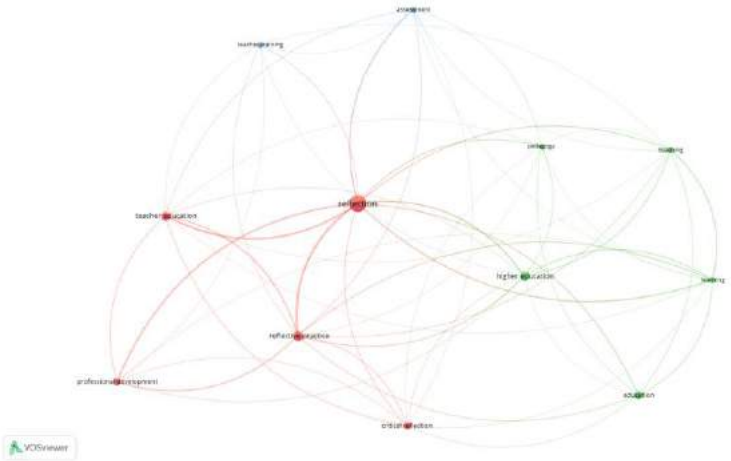

Figure 13. Concept map for the Reflection

Reflection (f=353) and the frequency values of the concepts used together by the Vosviewer program were specified. Accordingly, it can be said that reflective practice (f=125), teacher education (f=105), higher education (f=104), education (f=92) and Professional development (f=66) were mostly studied.

Questionnaire

One of the subjects that researchers focus on most is the Questionnaire. The concept map created by the Vosviewer program was given in Figure 14.

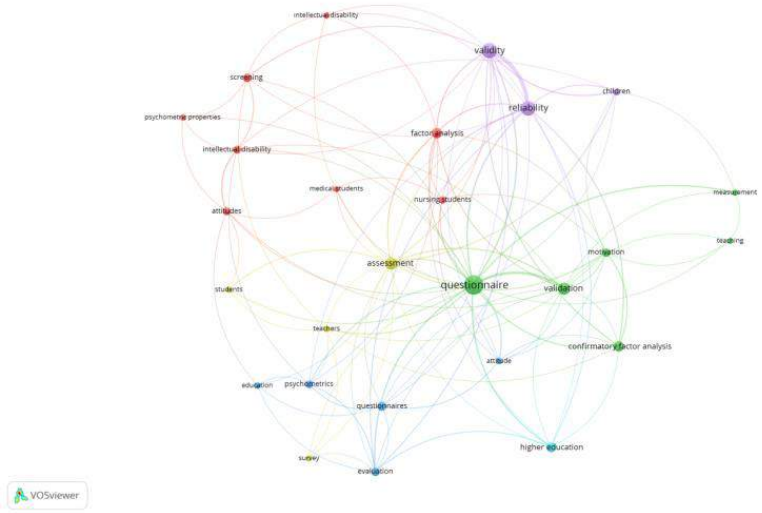

Figure 14. Concept map for the Questionnaire

The frequency values of the Questionnaire (f=82) and the concepts used together were indicated. And most studies have been conducted on validity (f=50), reliability (f=45), assessment (f=33), validation (32), factor analysis (f=24).

Comparative Study

The comparative study theme is one of the subjects that researchers focus on most under the measurement and evaluation. The concept map created was given in Figure 15.

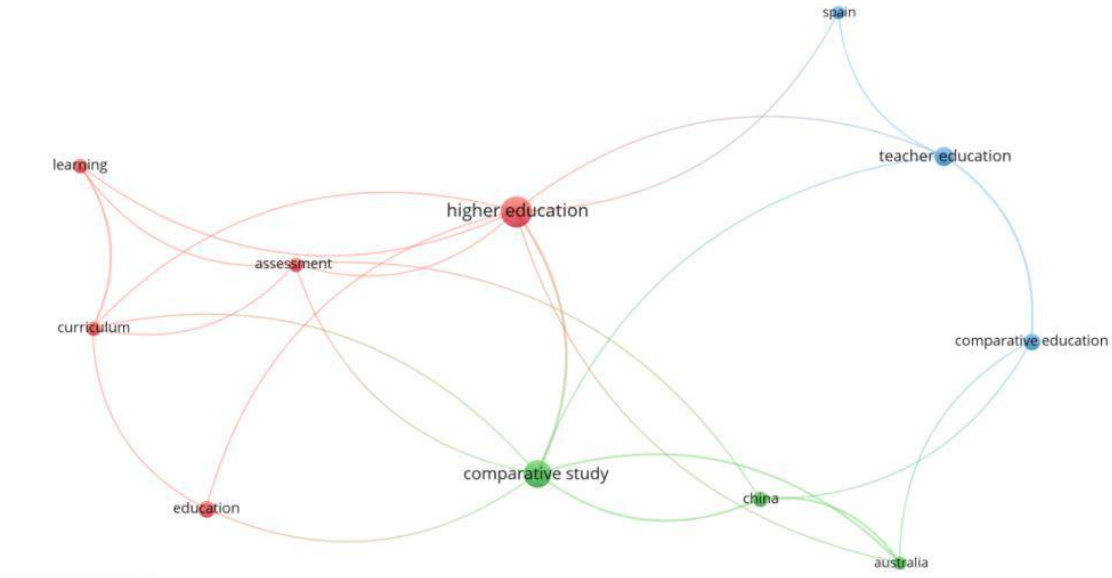

Figure 15. Concept map for the Comparative Study

The frequency values of the comparative study (f=31) and the concepts used together were determined by the Vosviewer program. The studies are mostly conducted on higher education (f=40), teacher education (f=15), comparative education (f=13), education (f=12), China (f=10).

Pedagogy

As a result of the analysis, findings of five keywords in total were reached under this heading. These keywords and the number of articles and citations belonging to them between the years 2000-2019 were listed according to the number of citations and given in Table 6.

Table 6. Keywords and their article and citation numbers

Keywords	Number of Articles	Number of Citations
Experiment	3554	28024
E-learning	1511	22814
Language Learning	1368	12147
STEM	1465	8172
Professional Learning	955	6710

Experiment

Under the title of Pedagogy, one of the subjects that researchers focus on is the experiment. The concept map created by the Vosviewer program was given in Figure 16.

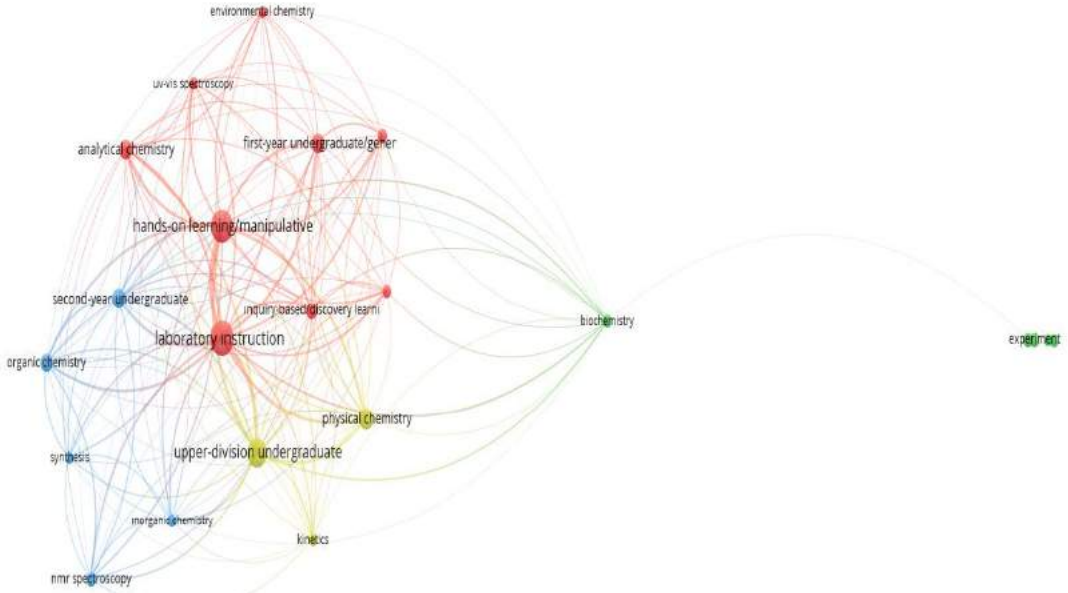

Figure 16. Concept map for the Experiment

The frequency values of the experiment (f=50) and the concepts used together were indicated. Accordingly, the most common concepts have been studied were laboratory instruction (f=290), hands-on learning / manipulatives (f=244), upper-division undergraduate (f=203), physical chemistry (f=114), second-year undergraduate (f=106).

E-Learning

Under the Pedagogy, one of the subjects that researchers focus on most was e-learning. The concept map created by the Vosviewer program was given in Figure 17.

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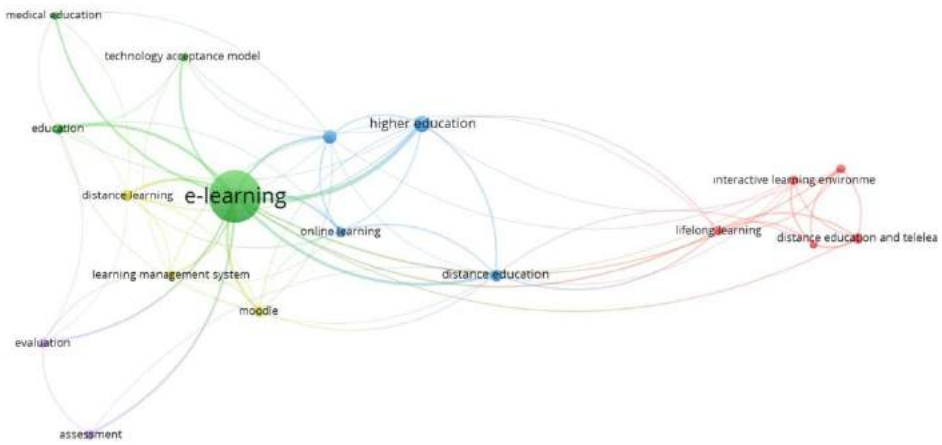

Figure 17. Concept map for the E-Learning

E-learning (f=572) and the frequency values of the concepts used together were specified. According to these findings,the most researches conducted with the concepts of higher education (f=60), blended learning (f=40), distance education (f=34), distance learning (f=31), education (f=25).

Language Learning

Under the title of pedagogy, one of the most focused topics was language learning. The concept map created by the Vosviewer program was given in Figure 18.

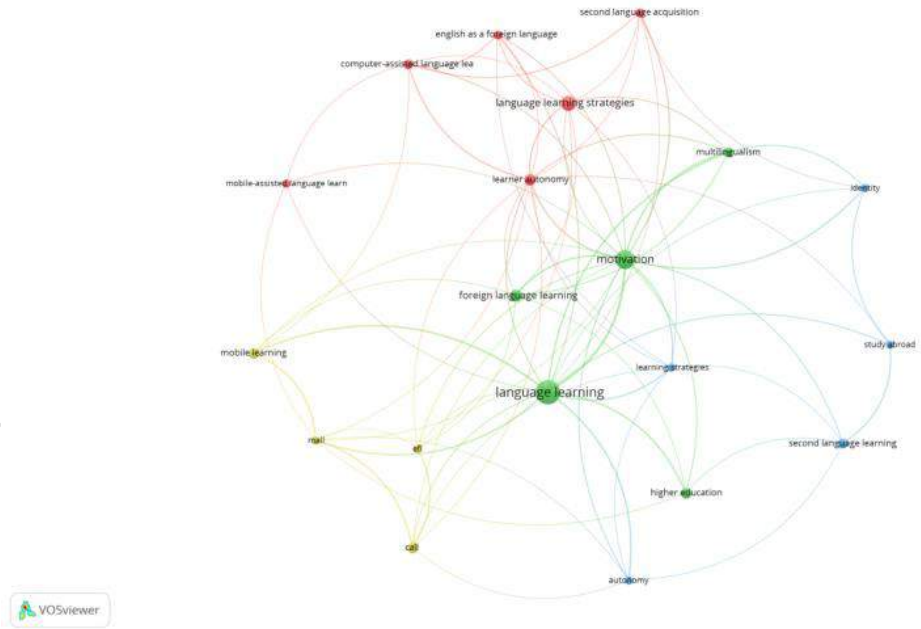

Figure 18. Concept map for the Language Learning

The frequency values of language learning (f=112) and the concepts used together were indicated. The most common studies were about motivation (f=65), language learning strategies (f=43), foreign language learning (f=28), learner autonomy (f=26) and higher education (f=23).

STEM

It was thought that the concept of STEM is one of the subjects that researchers mostly focused. The concept map created by the Vosviewer program was given in Figure 19.

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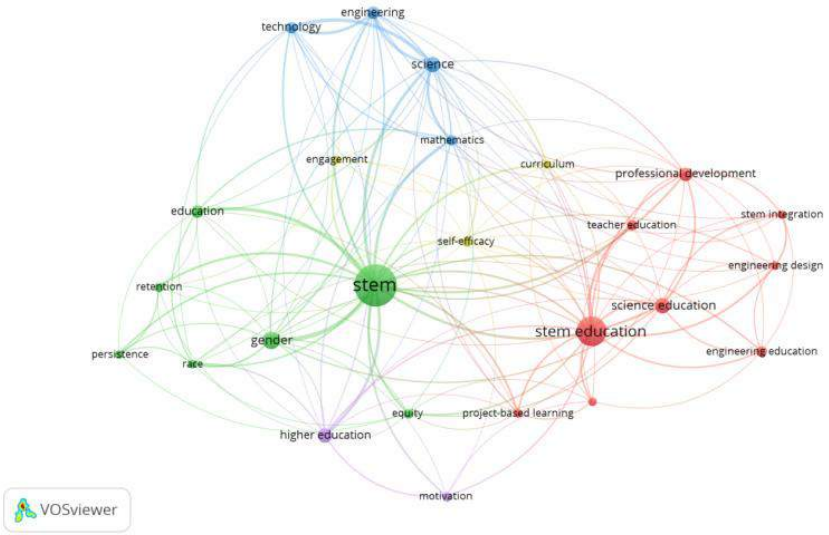

Figure 19. Concept map for the STEM

The frequency values of STEM (f=306) and the concepts used together were indicated. Therefore, mostly studied subjects were STEM education (f=154), gender (f=51), science (f=42), science education (f=40) and higher education (f=38).

Professional Learning

One of the other subjects that researchers focus on is the concept of professional learning. The concept map, created by the Vosviewer program, was given in Figure 20.

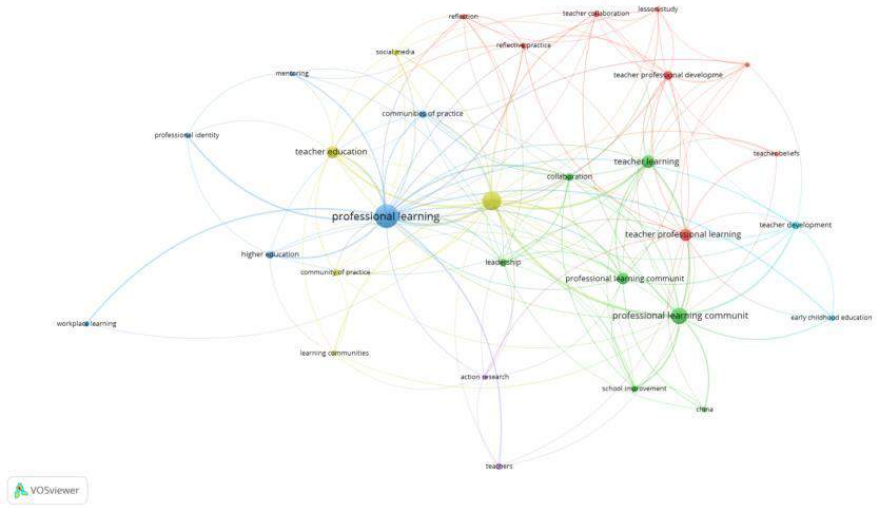

Figure 20. Concept map for the Professonial Learning

The frequency values of Vocational Learning (f=146) and the concepts used together were determined by the Vosviewer program. Hence, studies were mostly carried out on professional development (f=95), professional learning communities (f=70), teacher learning (f=42), teacher education (f=40), teacher professional learning (f=38).

Teaching and Learning

Five of the 96 keywords obtained as a result of the analyzes made in the WoS system were collected under this main title. These keywords and the number of publications and citations belonging to them between 2000 and 2019 are listed according to their citation numbers and given in Table 7.

Table 7. Keywords and their article and citation numbers

Keywords	Number of Articles	Number of Citations
Reading	7393	89775
Instruction	7244	89490
Environments	8009	82682
Communities	7961	64686
Outcomes	7091	61312

Reading

Under the title of Teaching and Learning, one of the subjects that researchers focus on was the reading. The concept map, created by the Vosviewer program, was given in Figure 21.

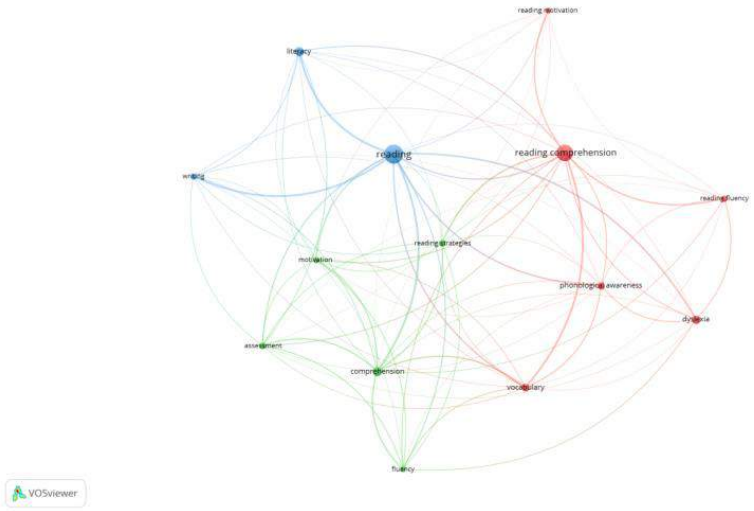

Figure 21. Concept map for the Reading

The frequency values of the reading (f=782) and the concepts those were used with the reading were determined by the Vosviewer program. Consequently, it can be said that the researchers were mostly studied on reading comprehension (f=613), literacy (f=192), comprehension (f=191), dyslexia (f=162) and vocabulary (f=149).

Instruction

Under this heading, one of the subjects that researchers mostly concentrate on is the concept of instruction. The concept map, created by the Vosviewer program, was given in Figure 22.

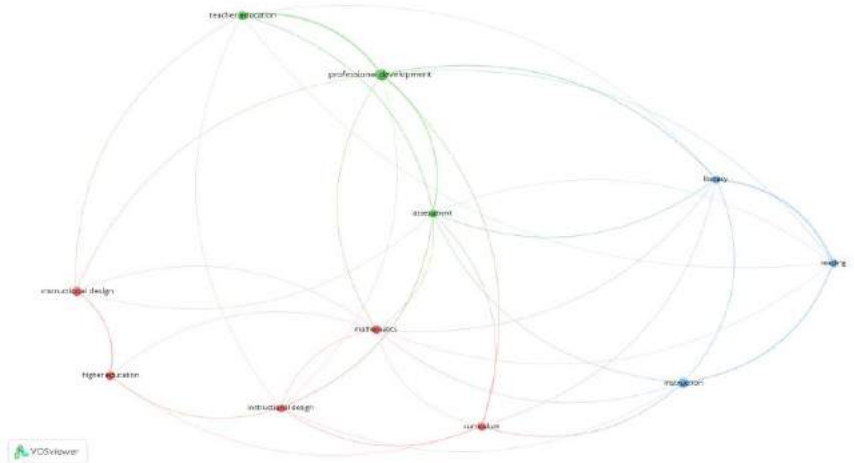

Figure 22. Concept map for the Instruction

Instruction (f=104) and the frequency values of the concepts used together by the Vosviewer program were specified. Subsequently, studies were mostly conducted on professional development (f=148), teacher education (f=101), instructional design (f=100), mathematics (89), and higher education (84).

Environments

One of the subjects that researchers focus on is the Environments. The concept map, created by the Vosviewer program, was given in Figure 23.

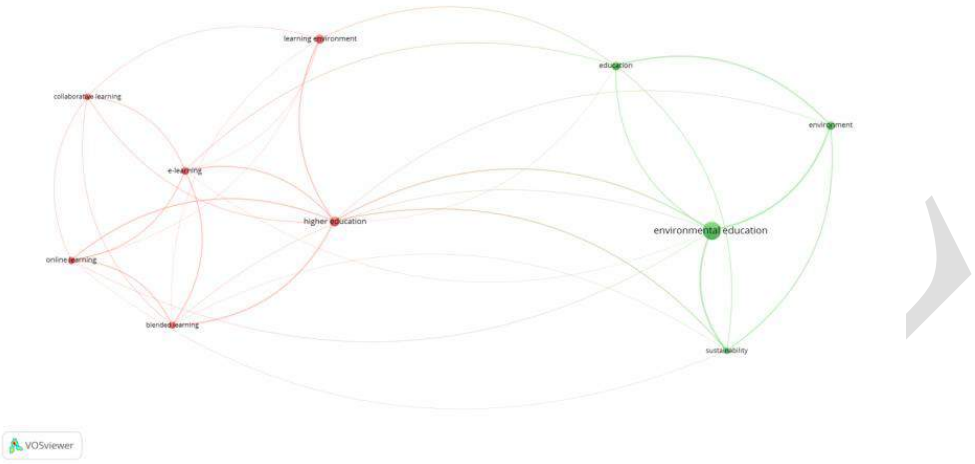

Figure 23. Concept map for the Environments

The environments (f=150) and the frequency values of the concepts used together were specified. Thus, it can be said that it is mostly handled with the concepts of environmental education (f=612), higher education (f=192), learning environment (f=153), education (f=141) and e-learning (f=114).

Communities

Under this heading, another subject that researchers mostly concentrate on is communities. The concept map, created by the Vosviewer program, was given in Figure 24.

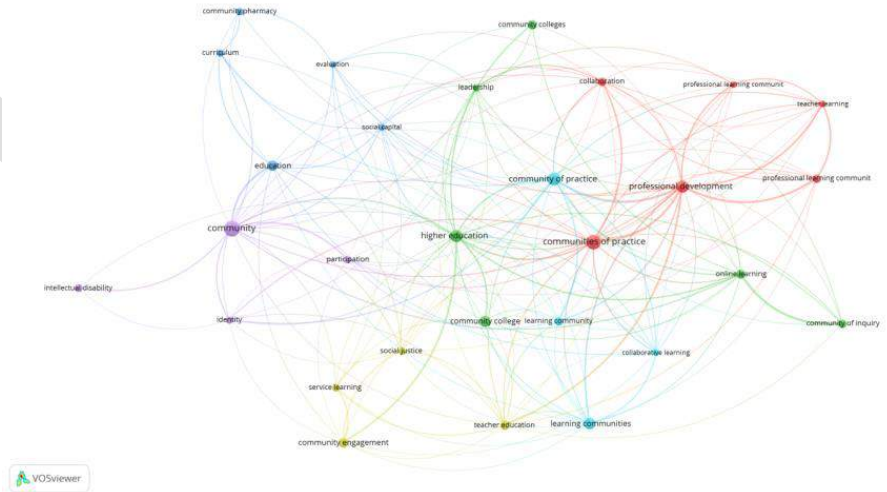

Figure 24. Concept map for the Communities

The frequency values of the communities (f=226) and the concepts used together, created by the Vosviewer program, were indicated. According to these findings, it is mostly discussed with the

concepts of community of practice (f=334), professional development (f=139), higher education (f=136), learning communities (f=116), community college (f=103).

Outcomes

Under this heading, the last topic that researchers focus most on is the outcomes. The concept map, created by the Vosviewer program, was given in Figure 25.

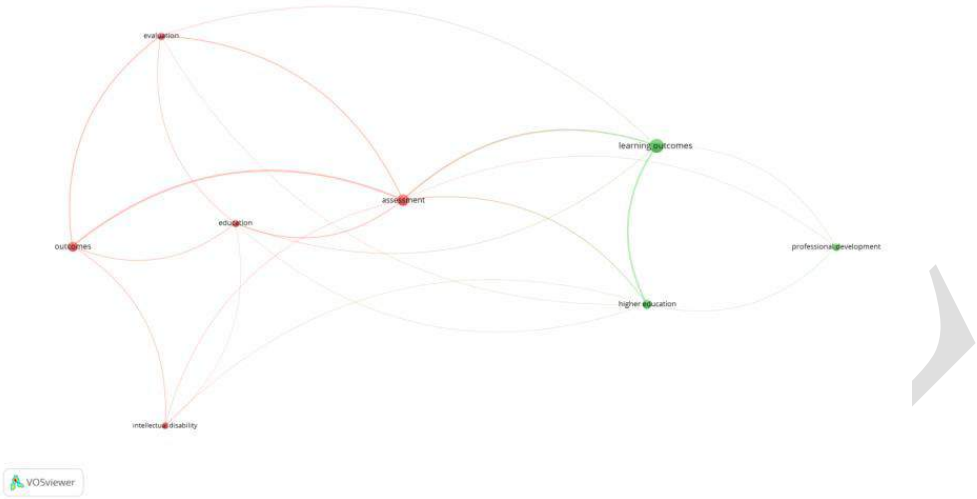

Figure 25. Concept map for the Outcomes

The outputs (f=92) and the frequency values of the concepts used with were specified. According to these findings, it is mostly discussed with the concepts of learning outcomes (f=189), assessment (f=132), higher education (f=87), professional development (f=53), education (f=52).

DISCUSSION and CONCLUSION

Trends of Concepts

Out of 96 themes in the five main titles obtained in this study, only five themes with the highest number of articles from each main topic were analyzed. Discussions were made on the analysis of a total of 25 themes.

In this context, interest in the keywords under the title of Application, especially Game, Simulation, Massive Open Online Courses, Social Media (Facebook), and Augmented Reality, has increased significantly. In research on the games, game-based learning, serious games, interactive learning environments, video games, and gamification concepts were mostly discussed. These studies show that the concepts of the game, serious games, game-based learning, and gamification are inseparable elements in the field of education (Kim, 2015; Seaborn & Fels, 2015). These concepts may have caught the attention of researchers because of increasing motivation in the education process (Burguillo, 2010), problem-solving as well as other high-level thinking skills (Kim et al., 2018), increasing students' attitudes, behaviors, and learning achievements (Gros, 2007), strengthening existing conceptual knowledge (Ritterfeld et al., 2009).

Similarly, in the studies on simulation, the concepts of education, simulations, nursing education, patient simulation, and nursing students were mostly discussed. Simulation applications in nursing education may be considered to provide effective learning in many areas such as students ' cognitive knowledge acquisition, critical thinking (Kaddoura, 2010), self-confidence and self-sufficiency (Bambini et al., 2009), leadership, communication, and teamwork skills (Fletcher, 1995), clinical decision-making (Lasater, 2007), clinical skills (Ballard et al., 2012) and patient care (Kaddoura, 2010). Therefore, the concept of simulation may have become a popular topic for researchers in recent years.

In the studies on Facebook, the concepts of social media, higher education, social networks, social network, and social networking sites were mostly discussed. Baran (2010) stated in his study that the easy adoption of Facebook among young students caused its use in education to become widespread. This situation may have enabled Facebook to be widely used in higher education. It was also stated that there are studies on Facebook's integration into higher education (Callaghan & Fribbance 2016). Studies have indicated that the concepts of social media and social network are used in the same sense (Adraoui et al., 2019; Chugh & Ruhi, 2017).

Along with the massive open online course subject, the concepts of MOOC, MOOCs, higher education, online learning, learning analytics, distance education, and e-learning were mostly studied. In the MOOC definition made by Jansen and Schuwer (2015), the emphasis on an e-learning application that many people can participate in for distance education can be shown as the reason why the concepts of distance education, e-learning, and online learning are used so much. In addition, it can be said that higher education has become widespread due to the efforts to integrate MOOC applications into universities (Siemens & Baker, 2012) and the interest of many students and educators at universities (Kim & Chung, 2015). It may have attracted the attention of researchers due to the use of learning analytics as a MOOC assessment tool.

Mobile learning, interactive learning environments, virtual reality, education, and elementary education are the most used concepts together with the Augmented Reality (AR) theme. M-learning, AR, and interactive learning environments are interrelated, and thanks to their innovative features, they have become popular in researches to understand educational opportunities (Cabero & Barroso, 2016; Avila & Bailey, 2016). In general, the fact that AR and virtual reality are not completely different topics (Jaros, 2018) may be the reason why these two concepts are used intensively together. It was concluded that the Inquiry-Based Learning method was used more commonly at the elementary education level using AR (Pedaste et al., 2020). Therefore, the concept of AR may have become a popular topic for researchers in recent years.

Under the main title of Design and Environments, the prominent subjects of the study were the themes of the laboratory, the internet, the virtual world, and the hypermedia. The laboratory subject is mostly discussed together with the concepts of laboratory education, hands-on learning/manipulatives, upper-division undergraduate, second-year undergraduate, and organic chemistry. Providing students with problem-solving, conceptual understanding, and practical skills by arousing interest, creative thinking, and curiosity through laboratory training (Aydoğdu & Yardımcı, 2013) may have supported its popularization. The fact that laboratory courses take place at the upper-division undergraduate level in biochemistry, chemistry, and chemical engineering departments is seen as an important turning point for the education of students. These courses are important in terms of giving students access to use laboratory tools and equipment independently (Tsaparlis & Finlayson, 2014; Jolley et al., 2016). Since the concepts, models, theories, methods, and tools of chemistry are being seen in all chemistry courses, the second-year undergraduate can be seen as an important process (Tsaparlis & Finlayson, 2014). Students' difficulties in understanding organic chemistry (Anderson & Bodner, 2008) may have increased the interest in the concept of organic chemistry.

The subject of the Internet has been studied mostly with the concepts of internet addiction, secondary education, computer-mediated communication (CMC), education, and media in education. In particular, internet addiction has been stated as the negative aspect of internet use (Boniel-Nissim & Sasson, 2018). It has been seen in researches that the Internet is widely used by adolescents and young people (Park, 2015). Because CMC is a method that enables people to communicate over the internet (Hrastinski, 2008), it can be considered a common research subject. It can be assumed that the internet is a medium that can be used in education and that studies have been carried out on the most beneficial integration of this media into education (Lin & Choy, 2015).

Along with the virtual world(s) theme, the subjects of Second Life (SL), virtual reality, interactive learning environments, and 3D virtual worlds were mostly studied. Many researchers have discovered

that the SL can be used for educational purposes (Hudson et al., 2019). Besides, as a result of a study, it was emphasized that the SL can be used in education as a 3D virtual world for interactive learning environments (Huang et al., 2019). Additionally, Huang et al. (2010) clearly stated in their study that virtual reality applications can be used to provide real-world experiences for students. Considering this framework, the reasons why these concepts are widely used in research can be listed.

Along with the hypermedia theme, the most of studies have been conducted on multimedia, multimedia/hypermedia systems, self-regulated learning (SRL), adaptive hypermedia, and science. The concept of Hypermedia has been defined as a system in which multimedia materials are organized as network-like information structures, information pieces are stored in interconnected nodes and can be accessed by electronic bridges (Rouet et al., 1996). Accordingly, Hypermedia systems can be controlled by students in various ways. However, Zimmerman (2008) sees SRL as processes that students use to gain academic skills such as goal setting, strategy selection, and implementation, and self-monitoring of one's effectiveness. Within the framework of this definition, it can be said that SRL is an important skill that should exist in students using hypermedia. In the light of all this information, it can be seen that these concepts have become a very active research area for academicians interested in cognition and teaching.

It can be said that studies on design-based research (DBR) and instructional design (ID) issues are mostly carried out with the theme of design principles. DBR method is generally used to examine innovative learning environments including new educational technologies (Sandoval & Bell, 2004). However, the theoretical knowledge included in the design principles is used in the DBR process (Koivisto et al.2018). ID was defined by Dick et al. (2009) as a reflective process that translates the principles of learning and teaching into plans to produce predetermined learning outcomes efficiently and effectively. Within the framework of these definitions, so DBR and ID concepts are indispensable options for developing learning environments and applications. Therefore, it can be said that they are indispensable study subjects for researchers.

Feedback, Competencies, Reflection, Systematic Review and Questionnaire subjects were the prominent study subjects under the main title of Measurement and Evaluation. The feedback issue is mostly handled with the concepts of assessment, peer feedback, higher education, formative assessment, corrective feedback. Studies have shown that feedback is the most effective factor in higher education (Gibbs & Simpson 2005). Moreover, it has been stated that in addition to the fact that feedback affects the whole assessment process by creating an environment that is student-centered and suitable for influencing the learning process (Dawson et al., 2019), well-designed formative assessment can close the gap between the current situation and the desired state (Lizzio & Wilson 2008). Nicol et al. (2014) argue that peer feedback helps their peers first to make judgments about the quality of their work and then to develop their work. Therefore, it is an important feedback process. The literature on corrective feedback shows that they have different views. Truscott (2009) and Lee (2008) think that corrective feedback can be harmful, Chandler (2003), Ferris (2006), Hartshorn et al. (2010) reached conclusions that it would be beneficial. Therefore, intensive studies are carried out on corrective feedback.

The subject of competence(s) is mostly discussed together with higher education, evaluation, digital competence, teacher education, and communicative competence. The concept of assessment can be considered to cover studies related to the assessment of the competencies gained by the learner (Sołtysik et al., 2020; Chi et al., 2020). The importance of gaining digital competence for learning and teaching individuals to participate in the global digitalization process (Ilomäki et al., 2016) may have led to an increase in studies on this concept. Additionally, examining teacher training and teachers' competencies from different perspectives (Barber et al., 2022; Virkkula, 2022) may have popularized this concept among researchers. Communicative competence may have been a widespread subject of study, as the communication skill of the learner and instructor is the most important element in both the social and business worlds (López et al., 2020).

Along with the theme of reflection, most researches have been conducted on reflective practice, teacher education, higher education, education, and professional development. Reflective practice has been accepted as an active thinking process that aims to evaluate, understand and change applications consciously and continuously (Meierdirk, 2016). Also, reflective practice greatly helps educators to overcome the theory/practice gap (Barber, 2021). With the researches, it has been concluded that reflective practices have positive effects on teachers' professional development (Dervent, 2015; Bleach, 2014). For years, reflection and reflective practice have been discussed and promoted as an important part of teacher education programs (Minott, 2019). Therefore, the concepts mentioned can be said to be indispensable study subjects for researchers.

Along with the questionnaire theme, most studies were conducted on validity, reliability, assessment, validation, factor analysis. Studies conducted to determine and verify the validity and reliability of the questionnaires prepared are quite common (e.g. Balgiu, 2020; Yurtseven, 2020). Since these concepts are the most used in survey development studies, they may have yielded results as the most common concepts.

Along with the comparative study theme, studies have mostly been carried out on higher education, teacher education, comparative education, education, and China. The subject of higher education may have gained popularity due to the prevalence of studies on the comparative study in higher education (e.g. Herodotou et al., 2020; Hong, 2020). Studies conducted with the concept of teacher education constitute studies on the analysis and comparison of teacher training curricula of countries (Madsen et al., 2018). In addition, studies conducted with the concept of comparative education have become widespread in research due to the comparison of the education systems or educational periods of countries, states, or cities, and as a result, suggestions for the development of education systems (Jayakumar, 2016).

The prominent study topics under the main heading of pedagogy were Experiment, E-Learning, STEM, Language Learning, and Professional Learning.

In the studies on the experiment, the concepts of laboratory instruction, hands-on learning/manipulatives, upper-division undergraduate, physical chemistry, second-year undergraduate were mostly discussed. Looking at the experiment theme, it is seen that the same concepts as the laboratory theme are widely used. This situation emphasized that the concepts of experiment and laboratory in education cannot be separated from each other.

The subject of e-learning has been handled together with the concepts of higher education, blended learning, distance education, distance learning, education in the researches. Since e-learning is one of the two most important learning methods of blended learning (Lin & Wang, 2012), these two concepts may have become popular research topics. At the same time, E-learning platforms are seen as the major element of distance education and distance learning methods (Hamidi & Chavoshi, 2018). Mostly, the use of the e-learning method in higher education may be the reason why the concept of higher education is widespread (Bøe, Sandvik, & Gulbrandsen, 2021; Torun, 2020).

Along with the theme of language learning, most studies have been conducted on motivation, language learning strategies, foreign language learning, learner autonomy and higher education. Causes affecting motivation in language learning (Iwaniec, 2020) and the effects of motivation on learning (Bailey et al., 2021) can be seen as the reason why the topic of motivation is a common topic of research. Decades of extensive research have shown that language learning strategies play a key role in foreign language learning (Griffiths, 2015). Since the concept of Learner autonomy is a basic dimension required by language learning (Iamudom & Tangkiengsirisin, 2020), it can be cited as the reason why it is popular in language learning studies. The most widespread study of the subject of language learning in higher education may be the reason why the concept of higher education is widespread (e.g. Hoi, 2020; Nami, 2020).

Along with the STEM theme, STEM education, gender, science, science education, and higher education were studied. The aim of combining STEM education studies with the discipline of Science, Technology, Engineering, and Mathematics to solve problems that students may encounter in the real world and to cooperate and learn these four disciplines together (Mutambara & Bayaga, 2021) may be the reason why this subject was widely used. Since the concept of science is the first of the four disciplines of STEM theme, it has been inevitable that the concepts of science and science education are widely used in research. The widespread study of STEM subject in higher education may be the reason why the concept of higher education is widespread (Maldonado et al., 2020; Shukla et al., 2020).

Along with the Professional Learning theme, most studies have been carried out on professional development, professional learning communities, teacher learning, teacher education, teacher professional learning. Teachers' professional learning paths have changed throughout history from learning only for the course to improving teacher skills and abilities (Bergmark, 2020). This situation may have caused the concepts of teacher education, teacher learning and teacher professional development to be widely studied. The reason why the concept of professional learning communities is popular can be considered as the professional learning communities offering environments that support teachers' professional development (Feldman & Fataar, 2014).

The prominent topics of study under the title of Teaching and Learning were Reading, Teaching / Learning, Environments, Communities and Outcomes. Along with the theme of reading, the topics of reading comprehension, literacy, comprehension, dyslexia and vocabulary were mostly studied. Reading comprehension may have been studied extensively, both because of the academic success of individuals (Levine et al., 2000) and because it is an important skill in daily life (Farhady, 2005, p. 1). Also, vocabulary, which is the most important element of reading comprehension in academia and daily life, has been seen as an significant concept (French et al., 1995). However, since dyslexia is also a brain-based reading disorder (Arrington et al., 2019), it may be normal to work intensively with the reading theme.

Along with the Instruction theme, most researches have been conducted on professional development, teacher education, instructional design, mathematics, and higher education. Teacher education may have increased the research on these concepts due to the positive effects of student performance (King, 2014) and the continuation of teachers' participation in professional learning, and the increase in student success (Desimone, 2009). On the other hand, to examine the content-oriented aspects of mathematics teaching, to better understand the relationship between teacher knowledge and teaching practice, and the relationship between teaching characteristics and student outcomes (Charalambous & Litke, 2018), prospective mathematics teachers need to observe more than one experienced teacher in one semester (Ulusoy, 2020). This situation may indicate that intensive studies have been carried out on the concept.

The issue of environments is mostly discussed together with the concepts of environmental education, higher education, learning environment, education and e-learning. Environmental education is seen as an important element that helps students gain environmental awareness (Borges, 2013). Students' learning processes may be an indication that the concept of learning environment is being studied widely, as it is deeply connected with the safety and comfort of the learning environments they are in (Prashanti & Ramnarayan, 2020). The concept of e-learning as an educational environment (Aquino & Shell, 2020) can be assumed as a popular study topic. The concept of higher education may have been widely used, since studies on environments are generally carried out at higher education (e.g. Schaeper, 2020; Caliskan et al., 2020).

The issue of communities has been mostly addressed with the concepts of the community of practice (CoP), professional development (PD), higher education, learning communities, community college. The reason why CoP is widely researched is that learning takes place in the background of community activities (Wenger, 1998). The concept of PD may have been widely used due to the more successful professional development training provided as a community (Admiraal et al., 2021; Bond & Lockee, 2018). It can be said that learning communities are one of the most researched concepts because they

expand the collective knowledge of the group (Barber, 2020) and additionally "learn how to learn" (Collins, 1998). The reason why the community college is widespread can be seen as the fact that students living in the USA who have financial difficulties or who live in rural areas can easily go to these places and get an education after secondary education (Bahr et al., 2017; Ezarik, 2017).

The subject of outputs is mostly handled with the concepts of learning outcomes, assessment, higher education, professional development and education. Investigating the effects of different teaching methods on learning outcomes (e.g. Lim & Richardson, 2021; van Alten et al., 2020) may be the reason for the high interest in the concept of learning outcomes. The issue of assessment (Chen et al., 2021) may have gained popularity due to the studies on the evaluation of the outputs obtained as a result of the trainings provided. Studies on examining the outputs obtained as a result of professional development trainings (Kowalski et al., 2020) may also have enabled the widespread use of the concept of professional development.

In the light of the data obtained in this study, it should not be overlooked that all these concepts and keywords will be more significant in the future and will guide researches that will further enrich the literature.

Researchers who will conduct similar studies to this study can scan other databases such as Scopus, Google Scholar or ERIC together with the WoS database and make international comparisons. It is recommended that researchers who will work in the future work on concepts and keywords that have a high number of leading journals, citations and articles.

It has been observed that researchers working in Turkey usually send their publications to journals with foreign addresses. It can be said that this is the reason why Turkey lags behind in terms of citation exchange. It is estimated that Turkey ranks higher in terms of the number of studies and citations in the field of educational technologies. This situation is also recommended as a study subject.

Ethics and Conflict of Interest

In the completion process of our above study, scientific ethical rules have been complied with. No changes were made during the data collection, compilation and editing phases. The study does not have a data set that requires "Ethics Committee Approval". We undertake that the International Online Journal of Primary Education (IOJPE) has no responsibility for all violations that may be encountered in this regard, all responsibility belongs to the relevant authors and this study has not been sent for publication on any academic platform other than the International Online Journal of Primary Education (IOJPE). We also declare that there is no conflict of interest between the authors in the study.

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APPENDIX A
Keyword List

Application	Design and Environments	Evaluation and Measurement	Pedagogy	Teaching and Learning
Artificial intelligence	Design principles	Benchmarking	Blended learning	Activity theory
Augmented Reality	Hypermedia	Comparative study	Collaborative learning	Communication
Courseware	Internet	Competences	Constructivism	Communities
E-mail	Laboratory	Discourse analysis	Cooperative learning	Communities of practice
Facebook	Virtual world	Experimentation	Distance learning	Creativity
Game	World-wide web	Feedback	E-learning	Dialogue
Learning management systems		Formative assessment	Experiential learning	Discourse
Learning resources		Learning Analytics	Experiment	Environments
Massively Open Online Course		Peer assessment	Flipped Learning	Groupwork
Open Educational Resources		Qualitative Analysis	Informal learning	Instruction
Simulation		Quantitative Analysis	Language learning	Interactivity
Social Media		Questionnaire	Mobile Learning	Interview
Tutorial		Reflection	Online learning	Learner centredness
Twitter		Summative assessment	Personalized learning	Learning Technology
Virtual laboratory		Systematic Review	Problem-based learning	Lecture
Virtual learning environment			Professional learning	Mentoring
Virtual reality			Project-based learning	Metacognition
			Security	Objectives
			Self-Regulated Learning	Observation
			Standardization	Outcomes
			STEM	Participatory Action
			Student-Centredness	Problem Solving
			Technology Acceptance Model	Reading
			Technological Pedagogical Content Knowledge	Reading motivation
			Web-based learning	Role play
				Scaffolding
				Special needs
				Strategies
				Student retention
				Teacher development
				Teacher perceptions
				Teacher Support
				Teacher Training

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DEVELOPMENT AND VALIDATION OF THE LANGUAGE BARRIER SCALE FOR PRIMARY SCHOOL STUDENTS

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Abstract

This study aims to develop a scale that examines the communication difficulties that migrant and refugee students face in the primary school period, the initial stages of their involvement in the educational process. As a result of a questionnaire administered to 271 primary school teachers via the simple random sampling method, the reliability of the measurement method was found to be .96. As a result of explanatory factor analysis, it was seen that 39 items constituted a four-factor structure (Deprivation, Labeling, Exclusion, and Acceptance). Data were then compiled by administering the scale to 112 teachers again for confirmatory factor analysis. According to the findings, the goodness of fit values were at good levels and the factor structure was validated. "Language-related difficulties" and "language barrier" were found to be two different phenomena. In order to understand the language barrier as a phenomenon that gives continuity to language-related difficulties, it is necessary to develop a perspective that puts students' school experiences at the center and evaluates them within the context of their own unique conditions. In this context, a perspective that questions the performance-based climate of schools is also needed.

Keywords: Language barrier, primary school students, immigrant students, refugee students, exclusion.

INTRODUCTION

Bourdieu and Passeron (2014) observed that culturally disadvantaged segments of society are never exposed to their disadvantages quite as much as when they are somehow relegated precisely because of their disadvantages. Here, Bourdieu and Passeron (2014) constructed the concept of "disadvantage" as a situation that is established or strengthened through relationships at school, beyond being situations that students carry to school themselves. In other words, they understood "deprivation" as a phenomenon that develops into a barrier as a result of relationships at school. Thus, a dynamic process emerges rather than a structural one. As a result, the following question arises: Under what conditions do language differences, which have been identified as the biggest problems experienced by immigrant children in almost all relevant studies, become barriers for those students? Taking these points into account, this study was undertaken to develop a scale that will allow us to evaluate the "language barrier" phenomenon, which refers to the language-related difficulties experienced by primary school students at school, not only as functional difficulties but also as situations of "relegation," as will be discussed in detail below. In this study, any form of relationship with the potential to reduce the contact of students who do not have the language capital required by the school was evaluated as building a language barrier. Practices of relegation, which serve as obstacles for the communication of disadvantaged students, were considered as conditions supporting language barriers.

Considering the research conducted to date on immigrant and refugee students, it can be said that the key obstacles to students' access to school and their ability to "hold on to" educational processes are

language-related difficulties (Cülha & Demirtaş, 2020; Koşar & Aslan, 2020; Sözer & Işıker, 2021; Biçer & Özaltun, 2020; Göçer et al., 2020; Işık et al., 2021; Türnüklü et al., 2021; Sarıer, 2020; Emin, 2019; First, 1988; Gülüm & Akçalı, 2017; Istanbul Bilgi University Child Studies Unit, 2015; Kaştan, 2015; Kaysılı et al., 2019; Levent & Çayak, 2017; OECD, 2015a, 2015b; Özer et al., 2017; Taşkın & Erdemli, 2018; Tosun et al., 2018; UNICEF, 2012). Despite this consensus, the question of what role the school plays in students' difficulties is often overlooked. In OECD reports (2015a, 2015b), it has been emphasized that, while the culture and education that students acquired before migrating have profound impacts on the students' achievements at school, the performance of immigrant students is even more strongly affected by the characteristics of the school system in the host country. According to such reports, students with a history of migration achieve different levels of success in different countries even if they are all individually equal in terms of their socioeconomic levels. Even within the same educational system, it is known that the academic achievements of immigrant children vary depending on the characteristics of the school (Ereş, 2015; OECD, 2015b). These different achievement levels of students with language-related difficulties in school indicate that the language barrier is generally experienced within the educational system of the host country and according to the characteristics of the specific school in particular. At this point, it is necessary to take into consideration not only the past experiences and knowledge of students who experienced these barriers but also variables such as the curriculum, program implementation, leadership, school climate, evaluation practices, staff competence, cooperation with families (Brisk et al., 2015), and opportunities and limitations in access to resources (Faltis & Ramírez-Marín, 2015).

The conceptualization of "cumulative disadvantages" can provide a perspective for understanding the multicomponent nature of the language barrier. The developers of this concept, Mohanty et al. (2009), depicted the language barrier in the form of a vicious cycle. They argued that cumulative disadvantages bring social and educational neglect for the students, contributing to their weaknesses in a vicious cycle, and those students are "stigmatized as weak and inadequate, justifying further exclusion" (p.281-287). In the research of Kaysılı et al. (2019), this situation was described as creating "reasonable ground for exclusion" (p.116). In a study by Cross (2009), language-based disadvantages were seen to have a fertile character. According to him, students without strong linguistic capital and those coming from disadvantaged backgrounds in terms of socioeconomic level form an intersectional set. Social exclusion and neglect make the language deprivation of these students more permanent at school and even worsen the barrier in some cases. Thus, a situation arises where language-related difficulties are both a cause and a consequence of exclusion. In other words, the reproduction of students' social disadvantage through distinction is experienced (Kaysılı et al., 2019).

The passive state of this cumulative cycle of disadvantages is seen when schools fail to recognize the difficulties that students experience and provide the necessary support. Block et al. (2014) described additional disadvantages and absenteeism for refugee students, who are less likely to realize their potential if schools do not make special effort on their behalf. It is known that immigrant students face more restrictions in terms of access to quality education (OECD, 2015b). According to First (1988), placing these students in low-achievement groups and labeling them accordingly are acts of "retention" (p. 208), as it is well known that students learn better if they are encouraged or receive additional support. Therefore, in order to develop a sound understanding of the reasons for the low achievement of immigrant students in school compared to the average achievement in the host country, it is necessary to take into account the fact that these students generally receive education in schools of the host country in which disadvantaged groups of students are commonly found (OECD, 2015b). In research conducted by Hilt (2017) regarding immigrant students living in Norway, it was found that students who spoke a different language were admitted to schools with special symbolic meaning, not being included in mainstream education and student groups. The lower a student is in the school hierarchy, the more barriers he or she faces. Thus, schools exclude students who do not meet their expectations linguistically, culturally, and academically. This situation also makes it difficult for students to position themselves at higher academic levels (Hilt, 2017). This attitude toward immigrant students can be read as an intervention that strengthens their possibility of failure. Garcia and Markos (2015) suggested that the

evaluation of data on bilingual students in the United States should not only be performed on the basis of comparisons; there is also a need for analyses that take into account the complexity of their situations instead of considering preconceived results. According to some studies, the language-related difficulties experienced by students are key factors in exclusion processes at school (Paget et al., 2018). Students are under the influence of a domino effect created by the school's exclusion practices (Hilt, 2017). Marginalization within the host country's educational system (Johns, 2001), separation from other students within the school, prejudice and discrimination (IOM, 2019), exposure to hatred and prejudice or violence, the reluctance of the school administration to cooperate with parents or encourage their participation (First, 1988; Özer et al., 2017), and fixation on certain statuses (Hilt, 2017) are among the mechanisms of schools' exclusion practices.

This progression, wherein the development of language-related difficulties is understood as constructing a barrier for students, can also be followed through the course of changes in students' achievement. Walt (2015) stated that these students are faced with a phenomenon of recurrent failure in the new conditions that they face; although they may have been successful in their home countries, they suffer from a loss of motivation after being placed in low-achieving schools and classes in the country to which they have migrated (p.360). According to Grubb (1974), the ongoing negative attitudes in such classrooms do not allow students to internalize the lessons, even though they have knowledge and skills, and ultimately prevent them from enjoying the results of their efforts. The multiple exclusions that immigrant students are exposed to in their host countries thus pave the way for them to lose the high academic levels and expectations they had in their home countries (Hilt, 2017). It is possible that the state of loss that they experience in the early years of their education will leave a lasting mark on their future educational lives (Paget et al., 2018).

Restrictions on access and exclusion practices make the language barrier a factor in the "school dropout" phenomenon, as well. Walt (2015) described this phenomenon as being accompanied by repetitive failures due to language barriers (p.360). In the study conducted by Ergün and Demir (2017), who interviewed students who had dropped out of school for various reasons, it was seen that all of those students experienced language-related difficulties in school and were simultaneously exposed to forms of exclusion. Therefore, in that study, the experiences of the students were described as "school push-out" phenomenon.

Arias (2015) argued that the way in which educators look at immigrant children and their families as problems rather than focusing on the shortcomings faced by different segments of society transforms the educational system into a mechanism that erects additional barriers (pp.285-291). The criticisms presented by Ricento (2015) support that viewpoint. He criticized any form of analysis that ignores the needs of students and the extent to which those needs are met in the educational system. Similarly, he criticized any approaches that tend to blame minority students, whether directly or indirectly (pp. 467-468). It is a common finding of not only Arias (2015) and Ricento (2015) but also of many other studies that teachers and administrators regard students who have language-related difficulties in school as problems (Baltacı et al., 2019; Coşkun & Emin, 2016; Istanbul Bilgi University Child Studies Unit, 2015; Ergün & Demir, 2017; First, 1988; Grubb, 1974; Gözübüyük Tamer, 2017; Hilt, 2017; Kaysılı et al., 2019; McBrien, 2015; Mohanty et al., 2009; Özer et al., 2017; Paget et al., 2018; Sakız, 2016; Tosun et al., 2018; Taylor & Sidhu, 2012; Uzun & Bütün, 2016). Sakız (2016) found that the underlying reason for the exclusion practices that impact refugee students with language-related difficulties in school is concern about deterioration of the established order in the school. Yaylacı et al. (2017) concluded that schools hosting refugee students act with the idea that they are doing those students a favor rather than the idea that education is a right of those students, and this view lays the groundwork for the exclusion of the students. Grubb's (1974) expression of the "frustrating and humiliating language barrier" (p.89) is better understood when all these components are considered together. In light of the relevant studies and considering schools as a "sociological and psychological context" in which learning takes place (Pysarchyk & Yamshynska, 2015, p.75), it can be said that students face unique situations due to language-related difficulties complicated by skill deprivation.

Based on this review of the literature, the following problem areas are seen: When students do not have the language capital demanded by their schools, they are faced with a loss of status or relegation in school. Thus, these students' language-related situations of "deprivation" are reproduced in school, combined with experiences of "labeling" and "exclusion," and evolve into a reaction of "acceptance" that drives them out of education. Considering these problem areas, this study aims to develop a scale to measure the structural mechanisms that transform language-related difficulties into language barriers for primary school students.

METHOD

This section presents the design of the research, participants, data collection method, and data analysis.

Research Method

This study utilizes quantitative methods with the aim of developing a scale to measure the various language barrier problems that migrant and refugee children face after being forced to leave their home countries for various reasons, continue their elementary education in Turkey, and receive that education in a language other than their mother tongue.

Target Population of the Study Group

The target population of this study, conducted in Turkey, consisted of primary school teachers in Mardin and Diyarbakır. According to statistics published by the Ministry of National Education (Turkish acronym: MEB) for the educational year of 2019-2020, a total of 4.246 teachers worked at the primary school level in Mardin and 8.345 teachers in Diyarbakır (MEB National Education Statistics Report 2019-2020). According to these data, the target population of the study thus comprised 12.591 observation units. Considering the methodological recommendations of Bartlett et al. (2001), it was decided to distribute approximately 500 questionnaires to randomly selected teachers after obtaining the necessary permissions, considering that a sample size of 292 individuals (with 95% confidence level) would be sufficient for the target population of 12.591. However, because of the closure of schools due to the COVID-19 pandemic, some of the questionnaires were delivered by hand, some had to be delivered to teachers via online platforms, and about 300 questionnaires were completed. As a result of the examination of these obtained questionnaires, incomplete questionnaires were removed from the analysis and a total number of 271 units was reached for explanatory factor analysis (EFA).

After EFA, confirmatory factor analysis (CFA) was applied to test the validity of the obtained factor structure. For CFA, the opinions of 112 people were collected with an online form. These test results are presented in the next section of this study. Data regarding the demographic information of the participants are given in the Table 1.

Table 1. Demographic information of the participants

Demographic Information		f	%
Place of Employment	Diyarbakır	81	29.9
	Mardin	190	70.1
Grade	First grade	16	6.0
	Second grade	80	30.1
	Third grade	44	16.5
	Fourth grade	57	21.4
Gender	Male	144	53.7
	Female	124	46.3
Years of Experience	1 year or less	20	7.4
	2 to 5 years	63	23.2
	6 to 10 years	32	11.8
	11 to 15 years	67	24.7
	16 to 20 years	27	10.0
	21 years or more	56	20.7

Table 1 (Continued). Demographic information of the participants

Demographic Information		f	%
Age	24 years or younger	10	3.8
	25 to 30 years	97	37.2
	31 to 35 years	56	21.5
	36 to 45 years	74	28.4
	46 years or older	24	9.2

As seen in Table 1, 70.1% of the participants were teachers working in Mardin and 29.9% worked Diyarbakır. While 53.7% of the participants were male, 46.3% were female. Almost 60% of the teachers were under the age of 35.

Development Process

A questionnaire form was used as a data collection tool in this scale development study. Demographic information about the participants was collected in the first part of the questionnaire and the second part included statements from the Language Barrier Scale. Demographic information was provided as descriptive data, expressions for the Language Barrier Scale were evaluated with a five-point Likert-type scale as follows: 1=never; 2=rarely; 3=sometimes; 4=frequently; 5=always.

While determining the expressions related to the concept of language barriers, books, theses, and articles addressing similar subjects in the literature were first examined and efforts were made to produce a conceptual framework addressing how being educated in a different language creates difficulties for primary school students. In the first stage, a pool of 80 items was created. The opinions of two expert pedagogues and two academics from the Department of Primary School Education were obtained and a draft of 45 items was established. That draft form was forwarded to approximately 20 teachers; they were asked to examine it in terms of language, expression, and understandability and provide their opinions and criticisms, if any. As a result of their feedback, some expressions were revised and the form was finalized and sent to about 50 teachers for a pilot study. Reliability testing was conducted with Cronbach's alpha test for the questionnaires that were returned, and it was decided to continue administering that questionnaire based on an examination of the total correlations related to the items.

Analysis of Data

For the analysis of data, a mixed-methods model of scale development and validation analysis were applied. This method supports exploratory instrument design and embraces validation phases. It consists of five steps (Creswell et al., 2011):

1- Qualitatively investigating the scale construct, which is also a qualitative validation process for collecting evidence of content validity;
2- Converting qualitative findings to scale items, which is an integration strategy in mixed-methods research;
3- Conducting mixing validation to review the items' content-based validity;
4- Administering the test items and collecting responses;
5- Conducting quantitative validation to analyze properties of the items and examine the evidence of construct validity.

SPSS 23 and LISREL 8.5 were used for data analysis. The level of significance for statistical tests was accepted as .05.

RESULTS

Reliability and Validity Tests

Cronbach's alpha test was applied to evaluate the reliability of the measurement method for the questionnaires obtained from a total of 271 primary school teachers. As a result of the analysis, the reliability of the measurement method was found to be high at a level of .961. For the item-total correlations examined for validity, the coefficients took values between .346 and .690. Cristobal et al.

(2007) stated that a value of .3 or higher would be sufficient for item-total correlations. Accordingly, it can be said that reliability and validity were ensured in this study.

Explanatory Factor Analysis

EFA was conducted for the construct validity of the items selected for the Language Barrier Scale. The Kaiser-Meyer-Olkin (KMO) sampling adequacy test and Bartlett's sphericity test were applied to test the adequacy of the sample size and whether the data fulfilled the sphericity condition, respectively, before moving on to EFA. The KMO and Bartlett test results are given in Table 2.

Table 2. KMO and Bartlett test results

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		.932
Bartlett's Test of Sphericity	Approx. chi-square	7925.116
	df	741
	Sig.	.000

As seen in Table 2, the KMO test statistic was found to be .932. Kaiser (1974) stated that a value of .6 or above is sufficient for confirming the sample size. As a result of Bartlett's test, which is used to examine the possibility of high correlations (or sphericity) between at least some of the variables in a correlation matrix, it was found that the assumption of sphericity was achieved with 95% reliability ($p \leq .05$).

Based on the models and rotations tried in the examination of the factor structure, it was decided to use principal component analysis and the varimax rotation method, providing the optimum solution for the existing data. It was seen that there were four factors with eigenvalues greater than "1" and the scree plot of the eigenvalues is given in Figure 1.

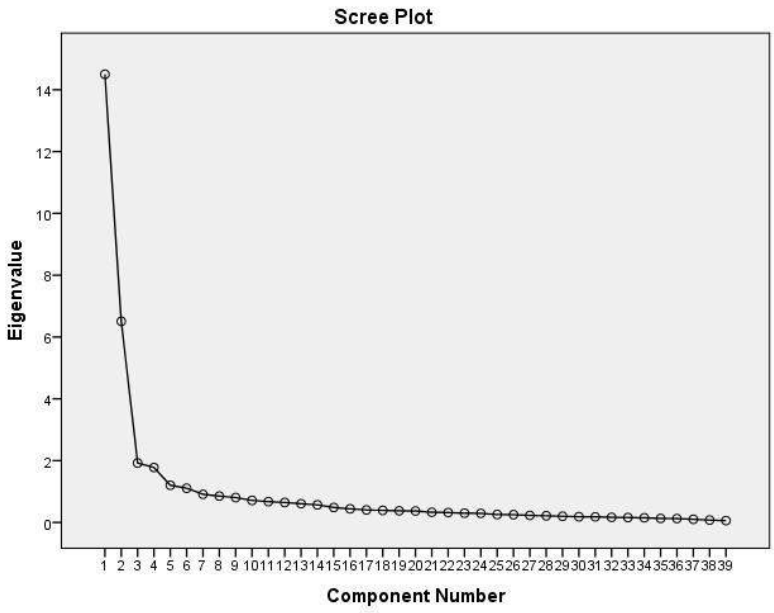

Figure 1. Eigenvalue scree plot for EFA

It is clearly seen that the graph becomes flatter after the fourth eigenvalue. According to this graph, it can be said that the four-factor structure is valid.

Total explained variance and eigenvalues are given in Table 3.

Table 3. Total explained variance and eigenvalues

	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	14.50	37.180	37.180	14.500	37.180	37.180	7.208	18.483	18.483
2	6.506	16.683	53.862	6.506	16.683	53.862	6.407	16.428	34.911
3	1.923	4.930	58.792	1.923	4.930	58.792	5.701	14.617	49.528
4	1.778	4.560	63.351	1.778	4.560	63.351	5.391	13.824	63.351
5	1.203	3.085	66.437						
6	1.108	2.840	69.277						
7	.911	2.336	71.613						
8	.853	2.187	73.800						
9	.806	2.066	75.865						
10	.713	1.829	77.694						
⋮	⋮	⋮	⋮						
39	.059	.152	100						

Extraction Method: Principal Component Analysis.

It was seen that 63.35% of the variance was explained for the four-factor structure. According to Table 3, one factor explains 37.18%, two factors explain 53.86%, and three factors explain 58.79% of all variance.

Factor loads were also calculated for the four-factor structure. The factor scores of each variable were then examined and it was decided to exclude six items that did not meet the criterion of the factor score being above .3 (Jöreskog, 1969). The factor structure with factor loads is given in Table 4.

Table 4. Item-factor scores

Factor	Item No.	Item	Factor Score
Labeling	Q24	Teachers feel uncomfortable when students speak a "foreign" language	.512
	Q25	Teachers may judge students who have challenges communicating in Turkish	.677
	Q26	Teachers show tolerance to students who have difficulties communicating in Turkish	.810
	Q27	Teachers may more easily blame students who have Turkish communication difficulties when students encounter problems	.829
	Q28	Teachers may humiliate students who have Turkish communication difficulties in front of their friends	.842
	Q29	Teachers expose students to verbal abuse	.839
	Q30	Teachers tend to give low grades to students who have difficulty in Turkish communication	.808
	Q42	The school administration may not be willing to get in touch with the parents of students who have a Turkish language barrier	.616
Deprivation	Q1	Turkish communication difficulty is an effective factor for students' school success	.444
	Q2	Students find it difficult to focus on the lesson	.757
	Q3	Students have difficulty understanding what is said in class	.853
	Q4	Students have difficulty understanding textbooks	.852
	Q5	Students misunderstand assignments	.795
	Q6	Students have difficulty understanding exam questions	.868
	Q7	Students have difficulty expressing themselves while answering exam questions	.861
	Q8	Students are not able to complete their answers to questions on exams	.735
	Q9	Students find it difficult to express themselves verbally	.697

Table 4 (Continued). Item-factor scores

Factor	Item No.	Item	Factor Score
Acceptance	s10	Students have self-confidence problems	.506
	s11	Students are not willing to participate in the course	.608
	s12	Students are not willing to participate in activities	.605
	s13	Students are concerned about being ridiculed among their friends while speaking	.576
	s14	Students avoid presentations in class	.624
	s15	Turkish communication difficulty is an effective factor for student absenteeism	.629
	s16	Students tend to drop out of school	.610
	s17	Turkish communication difficulties negatively affect students' creativity	.508
	s18	The social relations of students are affected by Turkish language barriers	.599
	s19	Difficulty in Turkish communication affects student-teacher relations	.695
	s20	Students have a lack of trust in teachers	.584
	s21	Students have difficulty communicating with teachers	.700
	s22	One of the reasons why students are afraid of teachers is Turkish communication difficulty	.686
	s23	One of the reasons why students avoid communicating with teachers is difficulty in Turkish communication	.698
Exclusion	s32	Students may be discriminated against by their peers	.668
	s33	Students may be more exposed to peer bullying	.695
	s35	Students may be excluded from games by their friends	.836
	s36	Students may be excluded from social activities by their friends	.837
	s38	Students may be excluded from student clubs by their friends	.722
	s40	Students may be excluded by other parents of students	.725
	s41	Students' parents may be excluded by other parents	.713
	s43	Parents of students who have difficulties in Turkish communication cannot take an active role in school-family collaboration	.559

According to Table 4, the items are distributed among the four factors of Labeling, Deprivation, Acceptance, and Exclusion. When the findings were examined, it was seen that these four factors could explain 63.3% of the total variance. This rate is sufficient for EFA (Jöreskog, 1969). When the factor loadings were examined, it was seen that they ranged between .444 and .868. Consequently, this factor structure provided the necessary conditions for factor loadings.

According to the findings of related research, students who have language-related difficulties in school lack the opportunities that their peers have in both in-class and out-of-class practices such as reading/writing/listening, comprehending, expressing oneself, communicating, following lessons, actively participating in class, participating in classroom activities, being understood correctly, completing exams on time, and enjoying access to resources (Aydın & Kaya, 2017; Baltacı et al., 2019; Emin, 2019; Ergün, 2014; Gözübüyük Tamer, 2017; Gülüm & Akçalı, 2017; Kaysılı et al., 2019; Mohanty et al., 2009; Tosun et al., 2018). Considering those points while developing this scale, the concept of "deprivation" was preferred to express the dimension related to the performance difficulties experienced by students who do not have the language skills required by the school in comparison to their peers who know the required language.

It is understood that situations of "deprivation" cause additional disadvantages for both the language and the speakers of that language in what becomes a vicious cycle, being included in the schools in a different way and with a different symbolic meaning than mainstream students (Hilt, 2017), being placed in groups with low achievement (First, 1988), being seen as a temporary or extraneous member or an unessential element of the school (Özer et al., 2017; Sakız, 2016), and experiencing exclusion by

administrators, teachers, students, and parents of students (Baltacı et al., 2019; Coşkun & Emin, 2016; Emin, 2019; Hilt, 2017; Mohanty et al., 2009; Uzun & Bütün, 2016; Yaylacı et al., 2017). On the other hand, studies have also revealed that students who lack the language skills necessary for school have negative experiences including, exposure to prejudice (Baltacı et al., 2019; Emin, 2019; First, 1988; IOM, 2019; Özer et al., 2017), labeling (Ergün & Demir, 2017), marginalization (Arias, 2015; Coşkun & Emin, 2016; Kaysılı et al., 2019; Özer et al., 2017), discrimination (Emin, 2019; Ergün & Demir, 2017; IOM, 2019, Özer et al., 2017), isolation (Faltis & Ramírez-Marín, 2015), bullying (Coşkun & Emin, 2016; Tomozawa & Majima, 2015), material or symbolic violence (First, 1988; Paia et al., 2015), insults (Emin, 2019; Ergün & Demir, 2017), humiliation (Emin, 2019), hatred (First, 1988), being ignored (Aydın & Kaya, 2017; Cross, 2009; Uzun & Bütün, 2016), being seen as a source of trouble or a burden and a waste of time (Emin, 2019), being seen as a potential criminal (Kaysılı et al., 2019; Sakız, 2016), being under pressure (Mohanty et al., 2009), being ridiculed (Emin, 2019), and being labeled as weak or unsuccessful and inadequate (First, 1988; Hilt, 2017; Mohanty et al., 2009). In addition to those experiences, these students do not receive support for school attendance (Emin, 2019; Ergün & Demir, 2017), and teachers are reluctant to allocate time to these students (Emin, 2019; Özer et al., 2017) and behave more intolerantly towards them (Uzun & Bütün, 2016). These experiences that contribute to the maintenance of deprivation shape the Labeling and Exclusion dimensions of the present study.

The dimension of Acceptance was included in the scale to reflect situations such as lack of self-confidence, low motivation, withdrawal from communication, absenteeism, and dropping out of school, which are described in the literature regarding students with language barriers. For this dimension, the idea that the aforementioned feelings and behavioral patterns are not independent of the experiences of the students in school was determinant. Suárez-Orozco and Suárez-Orozco (2001) argued that students who are exposed to discrimination in school will continue to experience continuing effects of segregation in areas such as self-perception, social relations, motivation, and success. Arias (2015), on the other hand, drew attention to the link among lack of self-esteem, alienation, and disadvantages due to language deficiencies (p.287). Hilt (2017) determined that students who experience challenges regarding language are marginalized for this reason and thus have difficulties in positioning themselves at higher academic levels, which supports the general hypothesis. Studies have also pointed out the importance of considering situations such as loss of motivation, failure, unwillingness to attend school, absenteeism, and dropping out of school in relation to experiences in school for students without language capital (Block et al., 2014; Coşkun & Emin, 2016; Istanbul Bilgi University Child Studies Unit, 2015; Emin, 2019; Ereş, 2015; Özer et al., 2017; Taştan & Çelik, 2017; Tomozawa & Majima, 2015; Uzun & Bütün, 2016; Walt, 2015). Ergün and Demir (2017) preferred the concept of "school push-out" while considering the same ideas in their study to describe the conditions that cause students to drop out of school. Furthermore, students who do not have sufficient language backgrounds as required by the school face challenges triggering behaviors such as hesitating to develop communication (Cross, 2009; Gözübüyük Tamer, 2017; Kaysılı et al., 2019; Uzun & Bütün, 2016) or abstaining from school activities (Emin, 2019; Tosun et al., 2018). These challenges are not only caused by the lack of language skills; they can be read as states of feeling or behavior that develop with the effect of the labeling and exclusion experiences to which these students are exposed for the same reason. According to this analytical framework, it was thought that the word "acceptance" would be most appropriate to describe the situations that these students experience.

Confirmatory Factor Analysis

To test the validity of the factor structure that was formed after EFA, CFA was applied and the results are given in Figure 2 and Table 5.

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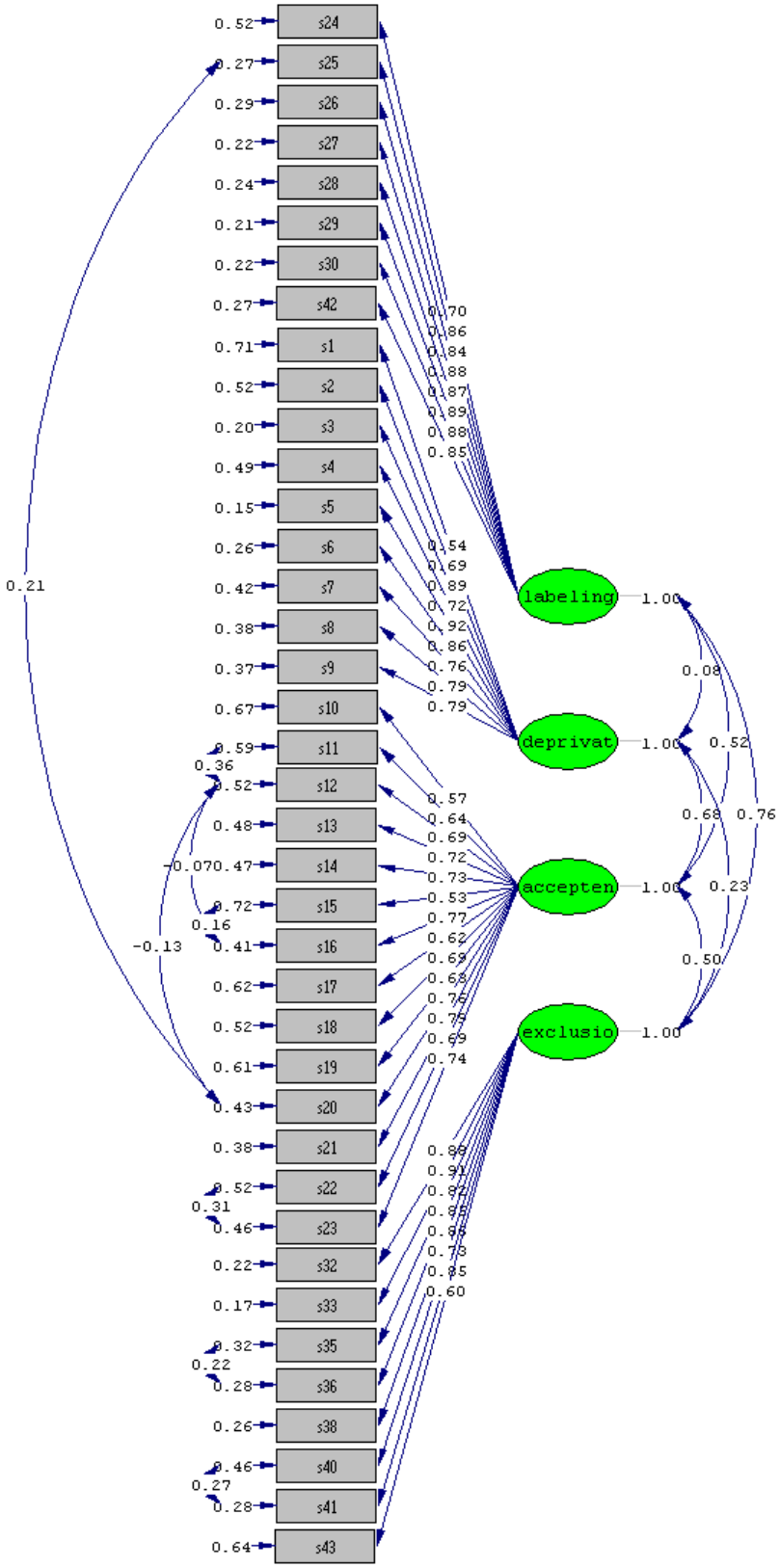

Figure 2. Confirmatory factor analysis path diagram

Table 5. Goodness of fit values for CFA

Fit Indexes	Statistics	Acceptable Fit Values	Good Fit Values
RMSEA	.092	.05 ≤ RMSEA ≤ .10	0 ≤ RMSEA ≤ .05
χ^2/df	1.942	2 ≤ χ^2/s.d. ≤ 5	0 ≤ χ^2/s.d. < 2
SRMR	.086	.05 ≤ SRMR ≤ .10	0 ≤ SRMR ≤ .05
NFI	.99	.90 ≤ GFI ≤ .95	.95 ≤ GFI ≤ 1.00
GFI	.96	.90 ≤ GFI ≤ .95	.95 ≤ GFI ≤ 1.00
AGFI	.96	.85 ≤ AGFI ≤ .90	.90 ≤ AGFI ≤ 1.00
PGFI	.85	.85 ≤ AGFI ≤ .90	.90 ≤ AGFI ≤ 1.00
CFI	.99	.90 ≤ CFI ≤ .95	.95 ≤ CFI ≤ 1.00
Degrees of Freedom = 688			
χ^2 = 1336.56			
P-Value for Test of Close Fit (RMSEA < .05) = .00			

RMSEA: Root Mean Square Error of Approximation, **NFI:** Normed Fit Index, **GFI:** Goodness of Fit Index, **AGFI:** Adjusted Goodness of Fit Index, **CFI:** Comparative Fit Index

When the indices were evaluated, the following criteria were taken into account: 0 ≤ χ^2/df ≤ 2, good fit; 2 ≤ χ^2/df ≤ 5, acceptable fit; .90 ≤ CFI ≤ .95, acceptable fit; .95 ≤ CFI ≤ 1.00, good fit; .05 ≤ SRMR ≤ .10, acceptable fit; 0 ≤ SRMR ≤ .05, good fit; .05 ≤ RMSEA ≤ .08, acceptable fit; 0 ≤ RMSEA ≤ .05, good fit; .90 ≤ GFI ≤ .95 acceptable fit, .95 ≤ GFI ≤ 1.00, good fit; .85 ≤ AGFI ≤ .90, acceptable fit; and .90 ≤ AGFI ≤ 1.00, good fit. While evaluating the standardized factor loads, the criterion of values being equal to or higher than .30 was taken into consideration. When the factor loads and goodness of fit values given in the figures were examined, it was observed that the full fit and goodness of fit of the factor loads reflected good fit values.

In order to test the reliability of the scale in its current form, Cronbach's alpha test was applied. When the results were examined, it was seen that the reliability values calculated for the new factors were all over 90%. The results of Cronbach's alpha test are given in Table 6.

Table 6. Results of Cronbach's alpha test for the determined factors

Factor	Number of Items	Cronbach's Alpha
Labeling	8	.915
Deprivation	9	.934
Acceptance	14	.932
Exclusion	8	.914
Whole Scale	39	.955

As seen in Table 6, the reliability of the whole scale is 95.5%. For all dimensions of the scale, reliabilities are also above 90%. These results show that the reliability levels of the scale and its dimensions are high.

For the item-total correlations, the t-test results for differences between each item's means of the upper 27% and lower 27% group statistics are given in Table 7.

Table 7. Item-total correlation t-test results for differences between each item's means of upper 27% and lower 27% group

Item No.	Corrected Item-Total Correlation	t-Value	Cronbach's Alpha If Item Deleted
s1	.346	5.236*	.954
s2	.538	8.410*	.953
s3	.564	8.339*	.953
s4	.486	7.4230*	.953
s5	.524	8.106*	.953

Table 7 (Continued). Item-total correlation t-test results for differences between each item's means of upper 27% and lower 27% group

Item No.	Corrected Item-Total Correlation	t-Value	Cronbach's Alpha If Item Deleted
s6	.584	8.868*	.953
s7	.521	6.936*	.953
s8	.614	10.390*	.953
s9	.584	9.149*	.953
s10	.592	10.454*	.953
s11	.634	12.380*	.953
s12	.637	13.317*	.953
s13	.648	12.648*	.952
s14	.613	10.982*	.953
s15	.549	11.084*	.953
s16	.667	13.451*	.952
s17	.531	11.893*	.953
s18	.664	13.515*	.952
s19	.558	11.040*	.953
s20	.627	11.466*	.953
s21	.658	13.891*	.952
s22	.645	13.946*	.952
s23	.690	14.079*	.952
s24	.422	6.804*	.954
s25	.576	9.296*	.953
s26	.517	7.887*	.953
s27	.590	8.646*	.953
s28	.523	6.994*	.953
s29	.543	6.557*	.953
s30	.579	8.819*	.953
s32	.632	11.437*	.953
s33	.660	14.77*	.952
s35	.632	11.819*	.953
s36	.615	11.372*	.953
s38	.584	9.215*	.953
s40	.591	9.598*	.953
s41	.579	9.244*	.953
s42	.569	9.257*	.953
s43	.446	7.826*	.954

The corrected item-total correlations of the scale were between .346 and .690 considering the differences of t-values (df=111) calculated for the upper 27% and lower 27% group statistics. The total points specified for items ranged from 5.236 ($p<.05$) to 13.946 ($p<.05$).

After determining the factor structure, the total score for the scale, consisting of 39 items, was obtained and quartiles were calculated in order to determine the intensity of the language barrier problems experienced by students. Because the data did not conform to normal distribution, the quartile scores were calculated by taking medians from central tendency measures, as given in Table 8.

Table 8. Quartiles

Median		118
Quartile	25	100
	50	118
	75	131.62
N	112	

The median of the sample consisting of 112 people was calculated as 118 and the arithmetic mean as 115.27. For the 39-item scale, the lowest score could be obtained as 39 and the highest as 195. Considering the dimensions, the score for Labeling can be 8 at lowest and 40 at highest, while for Withdrawal it can 9 at lowest and 45 at highest. The score for Acceptance can be calculated as 14 at

lowest and 70 at highest, while for Exclusion it can be calculated as 8 at lowest and 45 at highest. In this case, 25% of the Language Barrier Scale total scores of the participants were distributed within a range of 100 points, with 50% being below 118 and 75% below 131.62 points. The number of participants in each group was calculated for the relevant quartiles as given in Table 9.

Table 9. Number of participants per group determined for perception of language barriers

Language Barrier Perception Level	f	%
Low Perception of Language Barriers	31	27.7
Moderate Perception of Language Barriers	27	24.1
High Perception of Language Barriers	28	25.0
Very High Perception of Language Barriers	26	23.2
N	112	100

According to Table 9, 31 participants with a total score of 100 or below had low levels, 27 participants with scores between 102 and 118 points had moderate levels, 28 people with scores between 118 and 132.62 points had high levels, and 26 people with scores above 132.62 had very high levels of perception of language barriers. It should be kept in mind that these scores may vary according to the samples applied in future studies by the researchers.

DISCUSSION and CONCLUSION

In this study, which was undertaken to develop a scale to describe how difficulties due to limited language capital present different challenges for students, both the functional deprivation of the students and the in-school processes that perpetuate that deprivation were taken into consideration. As a result of EFA conducted for the 45-item scale administered to 271 primary school teachers, the KMO test statistic was found to be .932, and the sphericity assumption was met with 95% reliability according to Bartlett's test ($p \leq .05$). Based on the model and rotations that were applied in the examination of the factor structure, it was observed that there were four factors with eigenvalues greater than 1 by using principal component analysis and the varimax rotation method. These four factors could explain 63% of the total variance. When the factor scores were examined, it was seen that they ranged between .444 and .868. Accordingly, the obtained factor structure provided the necessary conditions in terms of factor scores. It was concluded that the considered statistics revealed sufficient values for EFA and CFA analysis was then undertaken.

As a result of the CFA analysis, the RMSEA (0.092), χ^2/s.d. (1.942), CFI (.99), and GFI (.96) values were found to meet the criteria for goodness of fit. According to these criteria, it was decided that the validity of the factor structure created as a result of EFA was confirmed. Taking into account the quartile scores obtained from the participants, scores were divided into four groups as participants with low perceptions of language barriers, moderate perceptions of language barriers, high perceptions of language barriers, and very high perceptions of language barriers. When the numbers of teachers in each of these groups were examined, it was seen that 48.2% of the participants (54 out of 112) thought that children whose first languages are not Turkish are exposed to high and very high levels of problems due to language barriers.

In the process of scale development, the Cronbach alpha reliability coefficient (.955) obtained for the overall scale showed that the reliability was high. The reliability coefficients obtained for the four dimensions of the scale varied between .914 and .934. Thus, it was concluded that each dimension had acceptable reliability.

Although language-related difficulties in school as an accompanying problem of migration have entered the agendas of educational circles in recent years, studies that evaluate migrant and refugee students only in the context of their past lives and traumas or that compare their academic achievements to those of other students reproduce incomplete narratives. In this sense, even studies on "inclusive education" threaten to reinforce the same deficient view indirectly. Studies that illustrate the transformation of difficulties into insurmountable barriers in school for students who do not have the language

backgrounds required by their schools, rather than simply focusing on the "shortcomings" of the students, are still greatly lacking. Although studies on migrant and refugee students, bilingual or multilingual education, and inclusive education offer solutions to these problems, there is still a need for studies that assess what conditions students face in school in order to obtain a better understanding of the nature of language barriers.

Bourdieu and Passeron's relevant analyses can be considered while discussing the findings of this study. Bourdieu and Passeron subjected the problems faced by disadvantaged groups in school processes to a multilayered analysis. According to that analysis, students who differ in terms of the initial tendencies and preliminary information that they have obtained from their environments are only formally equal in school. Students who do not inherit the cultural capital that the school demands are eliminated from educational processes. The elimination mechanism becomes stronger and more visible moving towards lower social classes. Groups from the lower classes, who tend to expect and demand the most from the educational system, are the first to suffer in any case. For example, success in education, which is a necessity of remaining in school, is tightly linked to the ability to use the local language. Linguistic capital, which provides returns in an educational sense, and its unequal distribution among social classes is one of the most hidden factors shaping the relationship between social origin and success in school (Bourdieu & Passeron, 2014, pp.16-121; Bourdieu & Passeron, 2015, p.155). Language-related "deprivation," in the above analysis, indicates differentiation among students speaking the same language based on their competence in delivering the styles and expressions expected by their teachers. Among disadvantaged groups such as that considered in the present study, the same state of deprivation is obvious, not hidden, as it is also relevant to basic understanding and expression competencies.

Blindness to the inherent social inequalities in progressive processes, specific censorship of the field (Bourdieu, 1995, p.97), *doxa*, accepted as fact by everyone (Bourdieu, 1995, p. 136), and immanent regularities (Bourdieu, 1995, p.176) impart continuity to the screening system and provide the basis for ongoing difficulties. Schools make students feel that they "do not belong" through the tendency of adaptation to the expected models, thus making the situation appear similar from the outside, as well (Bourdieu & Passeron, 2014, pp.31-32). The established order creates a perception of inequalities as "natural inequality" (Bourdieu & Passeron, 2014, p. 109). In the eyes of teachers who interpret formal equality as real equality, students are classified as "talented" or "incompetent" instead of "having cultural capital" or "lacking cultural capital." Teachers complaining about the inadequacies of their students and their low levels of performance may fail to ask themselves why this is the case and avoid drawing pedagogical conclusions from the situation (Bourdieu & Passeron, 2014, p.110). If there is a problem, the fault is immediately assigned to the inadequate student, with no blame attributed to the teacher (Bourdieu & Passeron, 2015, pp.148-151). While the educational system in its current form fails to meet the "unexpected" and "inappropriate" expectations of students who are not equipped to meet the expectations of the school, it also reveals that the institution demands a student body that will increase "efficiency" and meet the demands from the outset (Bourdieu & Passeron, 2015, p.136). The social value and hence the economic and symbolic returns of different language codes (Bourdieu & Passeron, 2015, p. 115) gain importance at this point. Language is no longer just a communication tool; it is part of the elimination system. Even measurement and evaluation processes are components that help to reinforce the difficulties originating from deprivation. Teachers' tendencies to give better grades to students who meet their expectations is a relatively hidden element of discrimination mechanisms (Bourdieu & Passeron, 2015, p.160; Aktay, 2010, p.482).

A school that does not take given social situations into account and attributes educational failure only to a lack of skills doubles the influence of social determinations. Children from the lower classes, as "appointed perpetual and consenting victims of substantive definitions," start to see "what they do" as a simple result of "what they actually are" over time, as everything pushes them to judge themselves by reference to "charismatic ideology" for their successes or failures (Bourdieu & Passeron, 2014, pp.115-116). In this state of "acceptance," the beliefs of these students regarding their social destinies strengthen the possibility of failure by not following logical conclusions. Thus, the future expectations of students

who do not have the ability to consciously evaluate the situations that they experience are shaped (Bourdieu & Passeron, 2014, p.17), and the educational process essentially dies. As one moves to the social classes most distant from the school's language of instruction, the rate of educational mortality increases (Bourdieu & Passeron, 2015, p.110). Formal equations serve not to prevent this "death" but to legitimize it (Bourdieu & Passeron, 2014, p.51).

Maxwell's demon metaphor, which Bourdieu uses to reveal discrimination mechanisms, summarizes the same process. Accordingly, this demon, which suspends the effect of the second law of thermodynamics, separates particles whose temperatures or mobilities are unequal and throws the fastest into a container with increasing temperature while separating the slowest into a container with decreasing temperature, thus preserving the difference that would have disappeared otherwise. The school system, which works like Maxwell's demon, serves to maintain the differences among students equipped with unequal amounts of cultural capital; it is programmed to distinguish those who have inherited cultural capital from those who lack it through a series of sorting procedures (Bourdieu, 1995).

On what grounds is it possible for a lack of skills to evolve into a barrier considering the dimensions of labeling, exclusion, and acceptance? When the findings of the present study are evaluated in light of Bourdieu and Passeron's analyses cited above, a three-layered "expectation" emerges that allows that transformation to take place. The first layer corresponds to the school's focus on the ability of students to meet the expectations of the school while raising its standards rather than focusing on their needs. In this performative climate, the lack of linguistic capital is considered an anomaly in the sense of not responding to expectations, turning the situation into a loss of status for the student. The second layer corresponds to the stereotypical views of students' immigration and trauma stories compounding their language-related difficulties. Views of students as victims of past traumatic experiences do not recognize the possibility of new futures (Correa-Velez et al., 2010). The third layer entails the first two layers gaining the functionality to legitimize additional disadvantages faced by students in school, namely "labeling" and "exclusion." Students who are faced with deficiencies that arise due to expectations of deficiency thus experience deprivation that is "paid for" rather than "remedied deprivation." Therefore, small-scale difficulties that could otherwise be overcome will mutate, turning into multi-layered barriers for students. The school's interpretation of these situations as "destiny" and the students' ideas of problems being "the natural result of what they are" make the barrier all the more powerful. In a vicious cycle, the social groups that have more expectations of the school due to their situations will pay for "not meeting expectations."

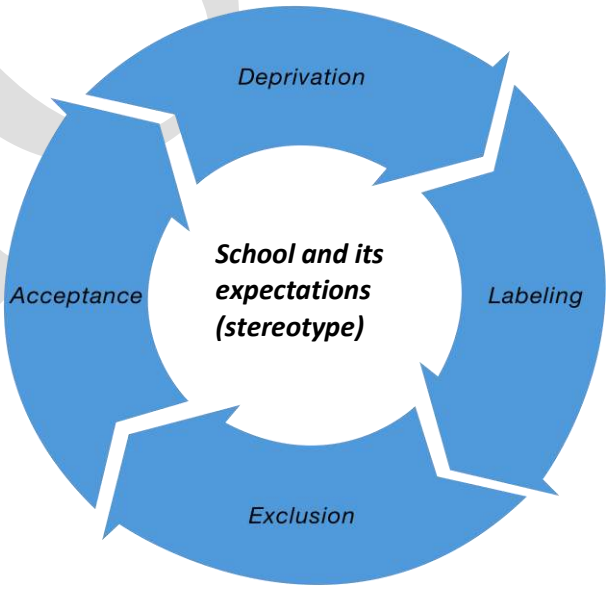

Figure 3. Vicious cycle of language barriers

This study has demonstrated that the nature of language barriers that gives continuity to language-related difficulties cannot be understood with a perspective that ignores the context in which these barriers develop or the situations that students encounter in school, as well as the possible view of these students as "deficient." Analyses that center trauma and migration stories or cultural differences of immigrant and refugee students as natural reasons for possible failure do not yield meaningful results. The language-related difficulties experienced by immigrant and refugee students turn into barriers under circumstances in which these students' migration and trauma stories and cultural capital differences are interpreted as justifications for their failure rather than being evaluated as data that determine the services and support that the school must provide. These barriers cannot be overcome without considering the question of what would change in students' achievement if the requirements of the school were more attuned to the language skills, cultures, and competencies of the students (Hilt, 2017, p. 599). Furthermore, in order to overcome these barriers, it is very important to note that students learn better when they are encouraged and receive additional support (First, 1988). In light of these points, an increase in the number of studies centered on students and evaluating them within their own contexts and conditions, as well as questioning schools' stereotypical demands, will hopefully allow for more solutions for overcoming language-related difficulties before they reach the level of barriers for students.

Limitations

The biggest limitation encountered in the process of this research was the COVID-19 outbreak. There were difficulties in delivering the questionnaires to teachers due to the closure of schools. Furthermore, administering the questionnaires in schools in the regions in which immigrant children live was another challenge. Achieving a sufficient sample size was a time-consuming problem. It took a long time to obtain the necessary permissions due to the pandemic. As face-to-face meetings were not feasible during the pandemic, the collection of the distributed questionnaires again took longer than was planned. Due to the self-criticism required by some of the questions, the difficulty in finding teachers who volunteered to participate should be noted as an additional limitation, as well.

Suggestions

This scale can be administered to teachers with different education levels. Longitudinal studies based on observations and in-depth interviews can be conducted to determine the nature of language barriers and further scales can also be developed by taking into consideration the data collected in the course of such field work. Studies questioning the relationship between stereotypical expectations of schools and the emergence of language barriers in those situations are necessary to clarify the nature of these barriers, as well.

Ethics and Conflict of Interest

All authors of this study confirm that they have contributed sufficiently to the project to be included as authors. They also acted in accordance with ethical rules at all stages of the research as stated in the approval granted by the Ethics Committee of Mardin Artuklu University (Date: 17.04.2020, number: 2020/01-12). We also declare that there is no conflict of interest, financial or otherwise, exists.

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