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Message from the Editor,

I am very pleased to inform you that we have published the second 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 The articles should be original, unpublished, and not in consideration for publication elsewhere at the time of submission to International Online Journal of Primary Education (IOJPE).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): Cyprus, France, Germany, Ghana, Italy, Philippines, Thailand, Turkey, and United States.

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Table of Contents

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STEM LEARNING AND LOOSE PARTS IN EARLY ELEMENTARY CLASSROOMS: A SCOPING REVIEW

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Abstract

When elementary students learn STEM topics (especially science) early in their educational journey, they have the opportunity to develop a passion to promote their future academic, personal, and professional success. With many resources claiming to be STEM, it can be overwhelming and difficult finding specific classroom activities to establish an interest in the subjects. The use of loose parts can address challenges teaching STEM and meeting curriculum standards in elementary schools. To better understand STEM best practices, a scoping review was implemented. The key words "STEM," "elementary," and "science" yielded 1,955 publications, which were then narrowed down to 20 articles for in-depth review. The selected publications were analyzed for STEM activities using loose parts principles. This study establishes successful science activities, discusses challenges, and shares how loose parts could be used to improve learning and student engagement in science and STEM.

Keywords: STEM, elementary, science, loose parts, experimentation.

INTRODUCTION

Teaching STEM in the beginning elementary grades can be rewarding and challenging. There are numerous resources available to classroom teachers, but educators often find that choosing activities can be overwhelming and puzzling. Exploration and experimentation using loose parts can be an opportunity to address the challenges and obstacles educators face. Gull, Bogunovich, Goldstein, & Rosengarten (2019) explain Nicholson's theory of loose parts as "an opportunity for children to express creativity through use of materials that can be manipulated, transformed, and created through self-guided play" (p. 37). A loose parts mindset, types of loose parts in STEM, the 4 C's (communication, collaboration, critical thinking, creativity), assessment methods to meet early education standards, student engagement and motivation, loose parts principles, and being a scientist concept were analyzed. There are few, if any, other research studies exploring the concept of loose parts in a STEM context in early elementary classrooms. Therefore, the goal of this scoping review was to establish successful science activities, address challenges, and share how loose parts could be used to improve learning and student engagement in science and STEM. This research contributes to the field of education with the potential to introduce a loose parts mindset and exploratory approaches

to learning in STEM early education settings, adding to the overall body of knowledge of student experiences.

METHOD

For this research study on early STEM education, a scoping review was conducted. This type of academic review focuses on the amount of information that is available, rather than the quality of each article that was reviewed (Arksey & O'Malley, 2005). A scoping review is pertinent when exploring the current span of literature and research available on a specific topic (Arksey & O'Malley, 2005).

To conduct the scoping review the key words used in this search were: "STEM," "elementary," and "science." Initially, the term "loose parts" was included, yet yielded little to no results with the other parameters, causing the researchers to exclude loose parts as a key word. A literature review was conducted using the University of Phoenix Library which contains EBSCOhost, ProQuest, and Gale databases. To choose appropriate publications related to the research focus, inclusion criteria were further established. The search criteria included using the full text, a loose parts mindset, focusing on Kindergarten through Third grade, written in English, plus current and relevant publications, from January 2012 through December 2021. This set of criteria (see Figure 1) was created to make sure the articles were best related to the purpose of the study. While English language was a limiting factor in pairing down articles, the researchers did not exclude international articles and research as STEM is a global concept.

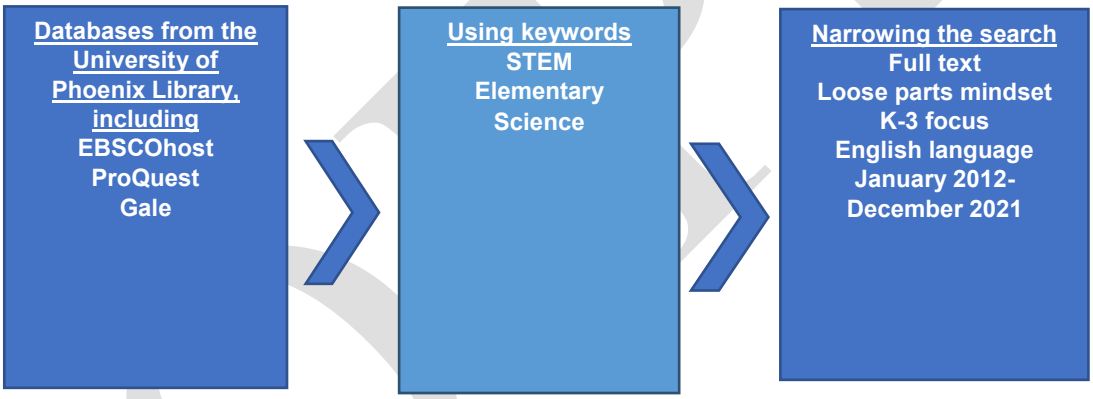

Figure 1. Process for scoping the literature. This figure represents the steps and inclusion criteria used to choose appropriate articles for the study.

Using the key words (STEM, elementary, science) to conduct an initial search discovered that the University of Phoenix Library yielded 1,955 results from academic journals, magazines, reports, books, and news articles. Then 1777 publications were removed using a title review, yielding 178 publications to review using the title and abstract. Of the 178 selected publications, seven were found to be duplicates; therefore, 171 were remaining. After a review using the title and abstract or skimming and reading the first paragraph of a news article, a total of 111 publications were removed, leaving a total of 60 publications to review in depth (see Figure 2).

The researchers reviewed and analyzed each abstract for relevancy to the key word search. The 60 remaining publications were assessed using the information provided within the abstract to ensure relevancy to the specific search criteria. Twenty-nine additional publications were removed, leaving 31 applicable publications. Upon further review, one more was deleted due to being an advertisement. An additional review of the publications focusing on a loose parts mindset within the STEM learning approaches narrowed the publications to 20 which were analyzed using a full article review process (see Figure 2).

This study used a total of 20 publications that were significantly related to the search criteria: STEM, elementary, and science. See Figure 2 for a breakdown of the search process using a PRISMA (2009) diagram.

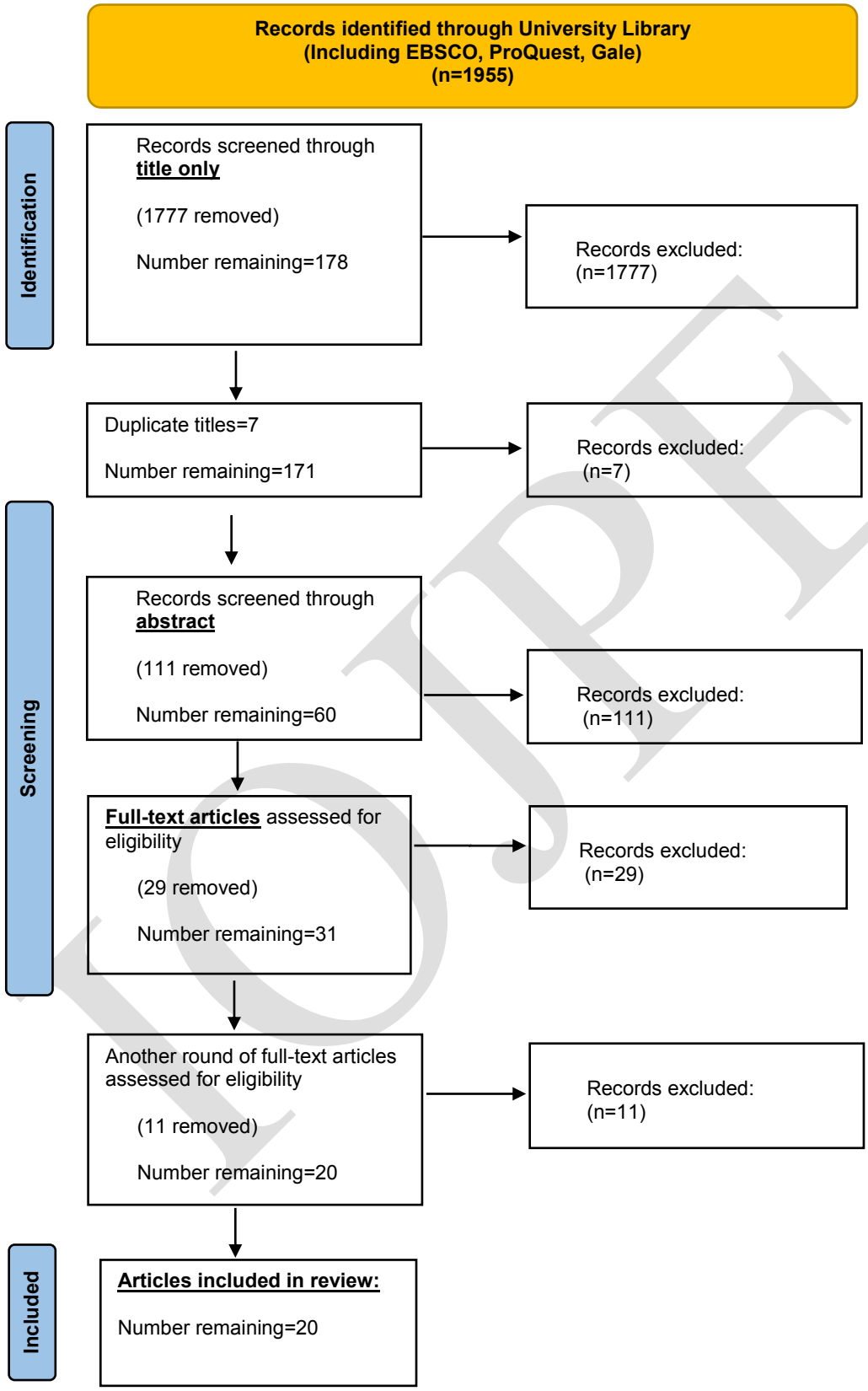

Figure 2. Article search. This figure represents the breakdown of the search process using a PRISMA (2009) diagram.

Using an author-created template, the selected publications were reviewed based on the following concepts: a loose parts mindset, types of loose parts, the 4 C's (communication, collaboration, critical thinking, and creativity), assessment methods to meet early education standards, student engagement and motivation, loose parts principles, and being a scientist. The template further prompted the researchers to analyze each publication for verbs, connections to standards and evaluation, different educational approaches, STEM related skills, and relevant quotes that exemplified the inclusion of a loose parts mindset in the learning environment. Additionally, specific loose parts concepts: a "Yes" mentality, the involvement of children in utilizing, planning, and building of spaces, blurring the lines between inside and outside, creating a lab-like environment, solving real life problems, children being part of their learning process through experimentation, applying a variety of approaches to loose parts, using what we have naturally, and the concept of play were investigated (Gull, Levenson Goldstein, & Rosengarten, 2021).

RESULTS

The final 20 selections for more in-depth study included one news article, one book, one curriculum, four trade journals, four periodicals, and nine research articles for a diverse mix of representation within science and STEM. Table 1 provides a summary of the publication and relevant information taken from each source. The publications were placed in order based on the established search parameters and the results that were yielded.

Table 1. Summary of publications

Title/Publication	Publication	Summary	Relevancy
Crossing the Amazon by LEGO: An interdisciplinary STEM adventure. *Science and Children*	Trade Journal	Lesson summary of using LEGO WeDO 2.0 as part of a STEM interdisciplinary unit around bridge building.	"We hope this highlighted experience ignites in you a passion to attempt a challenge such as this one—transforming student learning" (Edelen, Bush, & Nickels, 2019, p. 36). "Because students have often been conditioned as passive learners and receivers of knowledge, it can be difficult for them to persevere in solving authentic problems. Nevertheless, we must persist in preparing students as problem solvers and critical thinkers" (Edelen et al., 2019, p. 31).
Supporting elementary pre-service teachers to teach STEM through place-based teaching and learning experiences. *Electronic Journal of Science Education*	Research Article	In this study, data was collected on elementary preservice teachers' perceptions of their experiences as they participated in, planned, and enacted integrated place-based STEM education lessons.	"Ballantyne and Packer (2009) identified experience-based instruction that occurs in the natural environment as a productive pedagogy, providing engaging, and enduring learning" (Adams, Miller, Saul, & Pegg, 2014, p. 2).
Invention everywhere: How STEM educators can spread the makerspace mentality throughout schools and districts. *District Administration*	Periodical	Teachers have seen student excel in STEM when they are able to experiment with tools and technology. Using makerspace can help to bridge the gap between curricular demands and student engagement.	"You have to be resourceful. Makerspaces can be done in a budget-friendly way" (Crist, 2019, p. 4).

Table 1 (Continued). Summary of publications

Title/Publication	Publication	Summary	Relevancy
A blueprint for bridging classrooms: Strategies to encourage collaboration within the school. *Children's Technology and Engineering*	Trade Journal	The article presents engaging strategies to incorporate STEM education in elementary classrooms.	"Integrated STEM activities are more engaging and increase student interest in the topics" (Hills, 2017, p. 9).
America's children: providing early exposure to STEM (science, technology, engineering and math) initiatives. *Education*	Research Article	Capturing students' interest in STEM subjects at an earlier age, a proactive approach can help students stay are on track and have preparatory measures to enter STEM degree programs at institutions of higher learning.	"While students are engaged in STEM activities, they will also gain experience with 21st Century skills such as critical thinking, collaboration, and communication that will help prepare them to compete on the global level" (DeJarnette, 2012, p. 82). "Science classes in schools need to promote more problem solving, critical thinking, and open-ended inquiry. These types of classroom activities develop process skills in students rather than simply learning content knowledge" (DeJarnette, 2012, p. 79). "Elementary students often learn about scientific theory and the nature of science rather than doing scientific investigations for themselves" (DeJarnette, 2012, p. 80).
Engineering encounters: No, David! But yes, design! Kindergarten students are introduced to a design way of thinking. *Science and Children*	Trade Journal	Design-thinking is being used to integrate STEM into the learning spaces and address 21 century skills.	"As with all design thinking steps, there are opportunities to also work on 21st-century skills, such as character, collaboration, creativity, critical thinking, and communication" (Douglass, 2016, p. 73).
Implement STEM literacy in the elementary school curriculum. *Journal of Education Research*	Research Article	Research studies have demonstrated that the early elementary years are the most effective time to build foundational knowledge in the STEM disciplines.	"Relating STEM topics to the world beyond the classroom also provides the opportunity to spark students' interest in discovering, doing, and researching. Innovation can lead students to create new products and processes that sustain the national and global economies" (Huang, 2017, p. 8).
Early-grades science: The first key STEM opportunity; Effective teaching in grade school is a make-or-break factor for future STEM success. *Education Week*	Periodical	STEM instruction is often overlooked in early elementary classrooms due to elementary teachers not being trained adequately, lack of confidence, the topics not being on standardized testing, and other reasons. However, modeling teaching, co-teaching, and having STEM courses embedded in teacher prep can make a difference. Children are ready to learn and experiment if we let them and support teachers.	"Effective teaching in grade school is a make-or-break factor for future STEM success" (Will, 2018, para. 1).

Table 1 (Continued). Summary of publications

Title/Publication	Publication	Summary	Relevancy
Facilitating an elementary engineering design process module. *School Science & Mathematics*	Research Article	The Engineering Design Process can be an integral tool in STEM education to help students develop 21st century skills, tackle challenges, and see themselves as engineers.	"Engineering represents the application of science and mathematics concepts to make life better for people" (Hill, Mott, & Hunt, 2018, p. 53). "Engineering design challenges often ask students, even young students like the second-graders in the following example, to think about using materials and how materials work together to solve the problem" (Hill et al., 2018, p. 56).
From static to circuits: Inquiry-based STEM explorations of electricity. *Young Children*	Periodical	STEM options in the classroom can help students build knowledge and creativity. Different ideas for inquiry-based STEM are shared, with a large focus on electricity and circuits.	"Using an inquiry-based approach to introduce electricity helped children build an understanding of basic science concepts, increase their vocabulary, and reinforce skills related to communication, critical thinking, and collaboration" (Deaton, 2017, p. 93).
Tinker kit educator's guide. *Boston Children's Museum and National Grid*	Curriculum	A curriculum guide of activities to introduce early childhood educators to tinkering, aligned with PreK STE standards. After introductory material to provide the rationale for tinkering, a series of activities are included with needed materials, reflections, extensions, reading suggestions, etc.	"Encouraging children to tinker gives them the skills to be creative problem solvers out in the world" (Boston Children's Museum and National Grid, n.d., p.3).
A talent for tinkering: developing talents in children from low-income households through engineering curriculum. *Gifted Child Quarterly*	Research Article	Low-income Grade 1 students were introduced to engineering through biographies and an EiE curriculum after summer teacher training and continued support. Researchers found this intervention effective for identifying gifted and talented students.	"Young students improved both their knowledge of engineers and their reported engagement in engineering activities" (Robinson, Adelson, Kidd, & Cunningham, 2018, p. 139).
Valuing the process and product of inquiry-based instruction and learning. *Journal for the Education of the Gifted*	Research Article	Researchers looked at a year-long intervention on inquiry explorations for in 3-5th grade gifted programs. Balancing process and product for students was a challenge.	"In the end, this focus on thinking and creation of a product, even with flaws, allowed for persistence for both the teacher and for the students" (Barone & Barone, 2019, p. 59).
Engineering at the elementary level: students need the educators of today to prepare them for a world we cannot even imagine at this moment. *Technology and Engineering Teacher*	Research Article	After a review of current research, a teacher assessed what her school could do to improve STEM instruction at the elementary level.	"It seems everything in the world has been innovated, with perhaps the school classroom less so. Students need the educators of today to prepare them for a world we cannot even imagine at this moment" (McGrew, 2012, p.19).

Table 1 (Continued). Summary of publications

Title/Publication	Publication	Summary	Relevancy
Perusing the past to propel the future: A systematic review of STEM leaning activity based on activity theory. *Sustainability*	Research Article	Researchers set out to explore that STEM could be achieved through inquiry-based learning, problem-based learning, and project-based learning which engage students through scientific processes.	"Science and engineering education activities are paramount to preparing students for the 21st-century industrial revolution termed Industry 4.0. STEM" (Gyasi, Zheng, & Zhou, 2021, p. 14).
Supporting STEM success with elementary students of color in a low-income community. *Distance Learning*	Trade Journal	Students worked in collaborative groups to create a final product to present at the end of the year using the 21st century skills.	"According to the Partnership for 21st Century Learning (2011), students need to move beyond the basics and embrace the four Cs, otherwise known as "superskills": collaboration, communication, creativity, and critical thinking" (Molina, Borror, & Desir, 2016, p. 23).
Implementing joyful learning in science and math *Association for Supervision & Curriculum Development (Chapter 3).*	Book	Chapter 3 explored how to engage students in collaborative groups to complete activities that allow students to think like scientists.	"For joyful learning to occur in whole-group instruction, students need to be engaged in meaningful and interesting activities or discussion with appropriate challenge" (Brunsell & Fleming, 2014, p. 39). "To engage students in whole-group instruction, incorporate activities that require students to think like scientists or mathematicians" (Brunsell & Fleming, 2014, p. 39). "To solidify their understanding and engage students, we need to provide students with independent opportunities for hands-on experiences, choice, and creativity" (Brunsell & Fleming, 2014, p. 45).
Five principles to encourage science inquiry. *Teacher Advocate*	Periodical	The article discusses five strategies to promote scientific inquiry and encourage out-of-the-box thinking in students.	"Take time to discover what interests your students. Through meaningful, higher-level questioning you can uncover some interesting ideas" (Varano, 2015, p. 16). "When students learn science through inquiry, they gain ownership of their learning" (Varano, 2015, p. 17).
Science club makes splash at the local school's family STEM night. *Targeted News Service*	News Article	Members of the U.S. Merchant Marine Academy (USMMA) Science Club provided interactive hands-on science activities and fun math challenges to over 150 students.	"The themes provided an opportunity for the local youth to experience the fun of making slimy slime, growing instant snow, and creating colorful artwork. Through a hands-on approach, students also learned about solar energy, light emitting diodes and water solution conductivities. The activities were prepared to educate the students about the importance of using and searching for green and alternative energy and products" (Science Club, 2016, para 4).
Artful teaching and science investigations: A perfect match. *Gifted Child Today*	Research Article	This article examines how elementary teachers can create interesting science investigations for students.	"Science can be one of the most engaging content areas for students because it touches their curiosity and allows them to explore earth, physical, life, and space phenomenon" (McGee, 2018, para 4). "Teachers are encouraged to develop engaging science lessons within units of study focusing on inquiry" (McGee, 2018, para 4).

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In addition to collecting information on the title, publication, and summary of relevant information, each publication was further analyzed to gather information on how students can learn STEM topics (especially science) early in their educational journey. Evaluating current research based on approaches to STEM activities using loose parts to enhance student learning was collected. The publications were further reviewed for a loose parts mindset, based on Gull, Levenson Goldstein, and Rosengarten's (2021) work around loose parts in early elementary classrooms. A loose parts mindset, types of loose parts in STEM, the 4 C's (communication, collaboration, critical thinking, creativity), assessment methods to meet early education standards, student engagement and motivation, loose parts principles, and being a scientist were aggregated in the results below.

Loose Parts Mindset

One aspect of a loose parts mindset is the actions children take when interacting with materials and concepts. Gull et. al (2021) suggest that children apply this loose parts mindset to "build, construct, play, experiment, invent, explore, discover, evaluate, modify, study, think, consider, measure, draw, model-making, calculate, destruct, slide, fold, hide, paint, and bounce" (p. 11). Student action verbs noted (see Figure 3) in the selected articles were extracted and analyzed for frequency. Verbs were standardized for similar endings and repeats were consolidated. Associated nouns in verb phrases were taken out.

Figure 3. Student action verbs from selected publications with frequency analysis

Types of Loose Parts in STEM

Most selected publications included loose parts as the variables students interacted with in the STEM classroom. Loose parts in the publications were aggregated and categorized in Table 2, grouping like items, such as electronics, toys, office, and paper supplies, connecting materials, tools, nature, and food.

Table 2. Loose parts noted in selected publications

Category	Loose Parts Noted
Electronics and Electricity	robotic kits (LEGO Wedo 2.0 Robots), computers, 3D printers, laser cutters, robots, virtual reality headsets, drones, smartphone, magnets, solar panels, consumables, electrical materials, Snap Circuits, littleBits, Makey Makey, Sphero, Scratch, conductive/computational materials--such as LEDs, bulbs, wires conductive thread, sewable microcontroller with sensors and sound buzzer, AA batteries, FunFly stick, LightUp Edison magnetic circuit blocks, Energy Sticks, tinsel, hair, steel wool, glass container, metal box, sandpaper, furry and silky cloth, wood scraps
Toys	LEGOs, K'nex, Tinkertoys, marbles, ping pong balls, miniature car

Table 2 (Continued). Loose parts noted in selected publications

Category	Loose Parts Noted
Office and Paper Supplies	paper, tissue paper, newspaper, construction paper, paper towels, paper strips, recycled paper craft sticks, pipe cleaners, clothespins, golf tees, large beads, textiles—fabric, thread, lab coats, cotton balls, straws, rubber bands, toothpicks, paper clips, clipboards, baggies, bubble wrap, foam, Styrofoam peanuts pencils, markers, crayons, ink pad, scissors
Recycled Materials	repurposed or recycled materials, plastic from old plastic bag, toilet paper rolls old electronics, old car toys, old electronic toys, old wires, old tennis balls, cardboard, cereal boxes, egg cartons
Connectors	string, yarn, shoelaces, narrow ribbons, tape
Tools	wire cutters, stopwatches, tape measures, tools, rulers, field study tools, protective eye gear/goggles, screwdrivers, hammer, pliers, tweezers, screws, nails, aluminum foil, Styrofoam plates, painter's tape, glue stick, washi tape, colorful tape, stickers tubs, buckets, hands
Nature	artifacts, soil, ponderosa pine, materials from nature, sponges, water
Food	pizza, pies, candy bars, carrots, vinegar

Four C's and Other Skills

Certain skills are helpful for engaging in STEM activities. The selected publications were analyzed for the 21st century skills. "While students are engaged in STEM activities, they will also gain experience with 21st Century skills such as critical thinking, collaboration and communication that will help prepare them to compete on the global level" (DeJarnette, 2012, p. 82). Critical thinking, problem solving, communication, and collaboration were highly noted in the articles. While not as frequent, creativity was also noted, which is essential as noted in "The leaders of tomorrow must develop and maintain a sense of curiosity and inquisitiveness that will help them solve key challenges like the energy challenges that employees across the company are currently working to address" (Boston Children's Museum and National Grid, n.d., p. 1). Additional skills and competencies from the article included: engagement, experimenting, inquiry, perseverance, curiosity, inquisitiveness, fine motor skills, process skills, using tools, brainstorming, learning from mistakes, observation, making comparisons, visualization, using things in other ways, planning, divergent viewpoints, making revisions, sustainability mindset, information literacy, technology literacy, consuming information, leadership, productivity, flexibility, social skills, forming questions, academic conversation skills, scientific questioning, collecting evidence, and finding connections. Persistence is also an essential skill.

> Every maker, every engineer, every scientist tries and fails . . . and tries again. It is the only path to real success. If children are not allowed to learn how to fail, what will they do when they encounter the inevitable obstacles in their lives? (Boston Children's Museum and National Grid, n.d., p. 8).

Standards, Educational Approaches, and Evaluation

The reality of most STEM science classrooms is that grade-level standards should be the basis of most exploration. In looking at the selected publications, the Engineering Design Process was frequently used as both a process and a standard to meet. Additionally, several other approaches were acknowledged, which generally have a more hands-on, experiential approach to learning. Terms used to describe these approaches included: inquiry-based learning, hands-on, place-based pedagogy, project-based learning, a problems-based approach, authentic outdoor science activities, constructivist, Engineering Design Process, systems thinking, the 5E (engage, explore, explain, elaborate, and evaluate) model for inquiry-based instruction, and the concept of tinkering, engineering, making. "These practices help develop students' skills for the 21st century and create a sustainability mindset" (Gyasi et al., 2021, p. 14).

Evaluation may look different with this type of learning, so options were also examined. Rubrics, observations, and final projects were noted in three of the selected publications as evaluation formats. Open-ended questions, final product, reflections, and some type of gallery/museum walk or tour were noted in at least two of the selected publications as evaluation methods in the selected publications. Additionally, more open-ended types of evaluation were mentioned in the articles, including explanations, demonstrations, key questions, preassessment, action plans, blueprint evaluations, planning sheet, photo, video, display, discussion, worksheets, and recording sheets. Multiple choice questions and standardized assessments were also briefly mentioned.

Student Engagement and Motivation

Young children learn by exploring and discovering using manipulating materials, objects, and many different types of loose parts. Hands-on and problem-based learning activities are highly motivating for elementary students. Gyasi et al. (2021) indicated "The learning materials and methods implemented in STEM activities are significant to arouse student interests, engagement, and learning outcomes" (p. 2).

The Boston Children's Museum and National Grid (n.d.) further emphasized that motivation and engagement are high when children are encouraged to play and investigate rather than having passive instruction by completing worksheets. "This kind of learning early in life builds skills and interests that serve children throughout their school years and later in life" (p. 1). In addition, the Boston Children's Museum and National Grid (n.d.) affirmed that

> Tinkering is an active process—it is all about doing, discovering, creating. This level of creativity and activity can help shift the relationship that children have with learning, as they view learning as engaging and enjoyable. Tinkering encourages children to use their hands, senses, tools, and skills to investigate, understand, and even change their world. It builds children's capacity and enthusiasm about using their own ingenuity to create, to use tools, and to make (p. 7).

Loose parts are open-ended and afford children the ability to problem solve and practice independent thinking. Huang (2017) found that "STEM activities provided hands-on and minds-on lessons to make STEM more fun for students" (p. 2). Brunsell (2014) asserted that "To solidify their understanding and engage students, we need to provide students with independent opportunities for hands-on experiences, choice, and creativity" (p. 45). Loose parts provide the students with the opportunity to be creative problem solvers.

Loose Parts Principles

Simon Nicholson (1971) coined the term "loose parts" by stating "In any environment, both the degree of inventiveness and creativity, and the possibility of discovery are directly proportional to the number and kind of variables in it (p. 30)." As part of the publication reviews, the researchers looked specifically at aspects of loose parts principles within the science and STEM classrooms. Gull et al. (2021, p. 7) list ten loose parts principles after rethinking Nicolson's intent:

1. Limit the restrictions.
2. Involve children in using, planning, and building spaces and learning.
3. Blur the lines between inside and outside.
4. Create a lab-like environment.
5. Solve real-life problems.
6. Allow children to learn through experimentation.
7. Use a variety of approaches to loose parts play.
8. Just add water.
9. Use what you have.
10. Play.

Frequency of use of these principles was noted from within the publications (see Table 3).

Table 3. Number of articles indicating the subsets of a loose parts principles

Number of Articles	Loose Parts Principles
15	Children part of their learning process through experimentation
7	Lab-like environment
6	Involves children in using, planning, and building of spaces
5	Solve real life problems
4	Use a variety of approaches to loose parts
3	"Yes" mentality
3	Use what we have naturally
3	Play
2	Blur lines between inside and outside
0	Just add water

Being a Scientist

Children are natural-born scientists. They enjoy experimenting and tinkering with a variety of loose parts including those found in nature and manufactured. "Children who are encouraged from an early age to tinker and solve their own problems develop a different way of thinking about the world" (Boston Children's Museum and National Grid, n.d., p. 3). Students who tinker tend to persevere, think outside of the box, are creative problem solvers, and are self-sufficient (Boston Children's Museum and National Grid, n.d.).

Children are curious, ask questions, and enjoy exploring materials. Will (2018) stated "If we can capitalize on that natural way they think and process information, we're just preparing them for the future development of those skills" (para 31). Adams et al. (2014) specified "In order to prepare teachers to meet the challenges of a rapidly changing human landscape, we, as teacher educators, need to provide authentic, and meaningful experiences" (p. 18). Science curriculum should be authentic with no one possible solution (Hills, 2017). Edelen et al. (2019) detailed ways students can be like a scientist by:

- Explaining and supporting thinking
- Recording the questions
- Brainstorming
- Solving real life problems

"As teachers, we have the daunting task of preparing our students for jobs that do not yet exist. We must cultivate a sense of wonder and excitement as students learn about their world" (p. 36).

DISCUSSION and CONCLUSION

Discussion

After a systematic review of thousands of articles related to STEM activities used in early elementary and analysis of the findings, there are several common themes, emerging trends, limitations, and recommendations for implementation and future research on this topic. Assessing the use of loose parts in STEM subjects enables better implementation in elementary classrooms and improved program development and teacher training. Hands-on science activities can engage and motivate elementary students; however, teachers are often reluctant to use loose parts in the STEM activities. Nicholson (1971) shared an expansive view of loose parts, which includes many scientific and STEM principles.

> There is evidence that all children love to interact with variables such as materials and shapes; smells and other physical phenomena, such as electricity, magnetism and gravity; media such as gases and fluids; sounds, music and motion; chemical interactions, cooking and fire; and other people, and animals, plants, words, concepts and ideas. With all these things all children love to play, experiment, discover and invent and have fun. All these things have one thing in common, which is variables or 'loose parts' (p. 30).

In Gull et al. (2019), definitions around loose parts included a focus on "manipulating, experimenting, and interacting with a variety of objects for promoting imagination and creativity" (p. 47). Leaning into experimentation in STEM and these scientific principles could enhance creativity, critical thinking, collaboration, and communication. Establishing what science activities are successful, discussing challenges, and sharing how loose parts could be used to improve learning and student engagement in science curriculum are discussed.

Several principles of merit were pulled from the articles when considering STEM and/or science learning experiences:

- Embrace cross curricular teaching with a connection between students and the surrounding world. Solving real life problems in the community around them is essential for both STEM and loose parts.
- Build upon a constructivist learning approach influenced by Dewey, Vygotsky, and Piaget.
- Tinker, manipulate, and play around with the materials early in the design process. Think of the verbs in standards and reported in the chart above.
- Encourage creativity and divergent thinking more fully in the STEM classroom, as it is an essential part of the 4 C's that was lacking in the selected publications.
- Explore lower cost, low-tech alternatives if needed and make learning accessible to all students.
- Include place-based activities, using outdoor spaces and outdoor classrooms for rich sensory experiences.
- Create dynamic and rich learning environments.
- Use inquiry experiences to engage student curiosity and increase student interest—capitalize on students' interests.
- Involve students in the design process, including the selecting of variables and establishing parameters of STEM encounters.
- Match makerspace and/or other materials with potential uses for the space or challenge. Consider students' interests when selecting materials.
- Establish constraints as needed, including planning parameters for safety. "Constraints are limits put on the design, for instance, the materials may be only those specified, or inventors have a specified amount of time" (Hill et al., 2018, p. 58).

As noted in Table 3, a variety of materials can be loose parts in the STEM classroom, not limited to the list above. Anything can be a loose part for creativity and experiments. "Tinkering is about open-ended creativity, and in that regard, almost any materials and tools can be used to engage children to create" (Boston Children's Museum and National Grid, n.d., p.11). The Tinker Kit also quoted a German scientist, Paul Erlich who mentioned, "The first rule of tinkering is to save all the parts" (Boston Children's Museum and National Grid, n.d., p. 10), as they can be used for other projects. Recycled items can be powerful as well. "Resnick (2011) noted that tinkering and the more formal domain of engineering are a good match for low-income children whose life circumstances have presented them with the need to dismantle, redesign, and repair everyday objects or to improve processes that are necessary for day-to-day living within the constraints of scarce resources" (as cited by Robinson et al., 2018, p. 131).

Encouraging students to identify themselves as scientists is very important (Brunsell & Fleming, 2014). Teachers should promote the idea of "doing science instead of just reading about it" (Boston Children's Museum and National Grid). McGee (2018) suggested that children "'take risks,' make mistakes, and ask questions during investigations. In addition, students need to learn to 'think like scientists,' realizing that their investigations and predictions sometimes fail, and that failure informs their learning, sometimes more than their successes" (p. 42). Furthermore, when students look like

scientists, wearing white lab coats, protective eyewear, writing about investigations, and use real science materials, it helps them to assume the role of scientists.

As educators, we can encourage students and help supply needed materials. Notice the students' needs as stated in the Tinkering Kit, "As you are tinkering with the children, think of other tools that you might introduce. Pay attention to the tools that they ask for—and get them if you can" (Boston Children's Museum and National Grid, n.d., p. 9). Encouraging experimenting with the materials is essential as noted, "Encourage the children to fully explore different ways to work with their materials. Ask, "Can you change the shape of the Play-Doh, paper clips, pipe cleaners, or toothpicks to create new shapes and structures? What can you do if you break your toothpicks into smaller pieces? Can you try just bending them without fully breaking them? Can you roll the Play-Doh into a snake and create a line of structures sticking up from that base?" (Robinson et al., 2018, p. 131). Changing the nature of the material and experimenting with what is available gives additional possibilities for solving problems and encourages creative and flexible thinking.

Limitations

Limitations of this study include the search terms and requirements established for the scoping review. For this research, the search terms "STEM," "elementary," and "science" were used. Using a variety of search terms and looking in different educational environments, grades, subjects, and/or approaches to learning could have produced different results. Even beyond STEM, STREAM subjects and standards would benefit with additional research.

Future Recommendations

Future recommendations involve embracing more of a loose parts mindset, utilizing outdoor spaces for enhanced learning opportunities, improved teacher training and support, and creating better assessment tools to observe and evaluate student performance. Providing opportunities for students to actively play outdoors in their natural environment is important for healthy child development and increases the chance for children to take part in self-directed play in all environments (Tremblay et al., 2015). In addition, multiple assessment options provide educators the ability to promote student engagement while ensuring key standards and learning outcomes are occurring. With additional research and training, effective evaluation tools can be implemented in elementary classrooms.

Conclusion

When elementary students can learn STEM topics (especially science) early in their educational journey, they are able to develop a passion to assist in their future academic, personal, and professional success. Hands-on science activities engage and motivate the young learners; however, teachers are often reluctant to use loose parts in the STEM activities. The goal of this scoping review was to establish teaching science methodologies, address challenges of teaching STEM, and share how exploration and experimentation of loose parts could be used to improve learning and student engagement in science and STEM curriculum across the globe.

Ethics and Conflict of Interest

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 among the authors.

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EXPERIENCES OF QUALIFIED TEACHERS OF THE FUTURE IN THE SCOPE OF AN INTERNATIONAL ETWINNING PROJECT

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Abstract

The aim of robust social learning networks such as eTwinning, which is a part of Erasmus internationality programs, is to foster and promote the creation and development of awareness for respect, tolerance, and understanding by ensuring the integration of young people from different countries and cultures through dialogue. Phenomenological research design, one of the qualitative research methods, was used in this research in which the experiences of teacher candidates regarding the eTwinning project were analyzed. The focus of the transnational collaboration was that student teachers from different cultures use eTwinning's secure and safe digital platform, Twinspace, to contribute to their cultural, personal, and professional development and competences through eTwinning activities. The study group of the research represents 30 (4 males, 26 females) student teachers studying in Turkey (2 universities), Italy (1 university), Germany (1 university), and France (1 university). Participants were between the ages of 18-24. A semi-structured interview form (Google Form) developed by the researchers was used as the qualitative data collection tool. The content analysis method was used for data analysis. The student teachers researched, analyzed, and compared their teacher training systems of the four project countries, to identify the skills and cultural differences required as a pre-service primary school teacher in the 21st century.

Keywords: eTwinning, 21st-century skills, pre-service teacher, transnational collaboration.

INTRODUCTION

Initial Teacher Training stands for one of the most crucial stages of teachers' career-long professional development, and it represents the entry point into the continuum of teacher education. It aims to provide future teachers with competences supporting "their capacity to lead and facilitate successful student learning" (European Commission, 2015, p. 10).

Training of qualified teachers is mostly the responsibility of teacher training institutions or organizations. As these institutions train teachers who will train qualified manpower and who will adapt to society and develop society itself, the success of teacher training is directly related to the quality of faculty members (EUA, 2018; 2019; Milner, 2021).

While trainees may seem preoccupied with course content and classroom management, educators must ensure that these future teachers acquire the skills to help them move beyond core pedagogic concerns and adapt to a world where disruptions and innovative approaches through technology become the rule rather than the exception (Ryan et al., 2020; Grossman, 2021). In short, future teachers should be equipped with the knowledge and skills to work in an increasingly multicultural, digitalized school able to pivot to synchronous and asynchronous modalities (Rowan et al., 2021). To this end, two academic researchers from Turkey started an eTwinning project called "Qualified Teachers of the Future" and formed a team with two professors from Palermo, Italy, and Stuttgart, Germany, and two teacher educators from northern France. Prior to this project, academic researchers from Turkish and Italian Universities ran the eTwinning ITE project "What kind of World Do We Want?" which started in October 2021 involving 13 prospective teachers. This first project allowed the professors and student teachers to get to know each other and learn how to manage the eTwinning Live platform and the Twinspace. Indeed, this first experience led the way to a second project involving more professors, ITE ambassdors and future teachers to experiment with new collaborative tools and transnational processes. In this context, primary school student teachers researched and compared the teacher training systems of the countries involved in the project to discuss the effects of the skills and cultural differences that classroom teacher candidates in the 21st century in the teaching profession require. As a result of this project carried out on the eTwinning platform online, student teachers from different cultures came together digitally for a common project to cooperate among cultures. The academic team observed and coached the student teachers as they developed their digital skills and identified what skills and competences are needed for teachers in the 21st century. Using project-based learning, student teachers researched, analyzed, and determined the necessary criteria for teachers at primary education levels in four different countries (Turkey, France, Italy, and Germany). The experience confirms that initial intercultural competence is essential for undertaking international collaborative projects such as this etwinning ITE project. It also validates the need for blending professional preparation of primary school teachers. The very first results emphasize the importance of equipping students with 21st-century skills and the important role eTwinning plays in this challenge.

Literature

The 21st-century global citizen is defined as having "high-tech skills, broad interdisciplinary knowledge about the contemporary world, flexibility, and world-mindedness" (Kirkwood, 2001, p. 14). For this reason, some skills that individuals should have are discussed in different studies (Partnership 21, ISTE). Castek et al. (2007) emphasize that the competencies to be possessed in the 21st century are the steps to a successful future in a global society. Educators are researching on how they can prepare students for the next decades of the 21st century, and especially "how will the citizens of the future be?" Current research investigates how intercultural project studies can contribute to the question (Camilleri, 2016). As stressed by Darling-Hammond (2006), Initial Teacher Education must be powerful enough to break student teachers' conditioning – helping them understand that teaching is different from what they remember from being students. Thus, future teachers need effective guidance to come to terms with the increasing rate of change and find their way in this complex world (Darling-Hammond, 2006; Popova et al., 2022).

According to the latest report of UNESCO (2021, p. 86), "21. Considering the changing conditions, contexts, learning environments, and diversity of learners in 21st-century education, it is mentioned how the teaching profession should be in pre-service and in-service periods. Especially in recent years, it has become important for senior teachers at all levels of education and new teachers to produce projects. One of the online platforms where these projects can be done is eTwinning." Launched in 2005 as the main movement of the e-learning Program of the European Commission, eTwinning has been integrated into the "Lifelong Learning Programme" since 2007. The program is run by the Central Support Service (CSS) in Brussels, and managed by the European Schoolnet, an international collaboration of 38 European Ministries of Education that develops education for schools, teachers, student teachers, and students throughout Europe. Intercultural, transnational projects involving eTwinning help increase interaction and direct communication among participants and help them gain intercultural perspectives. When eTwinning was launched, it aimed to provide "school matching" as an opportunity for all young people to learn and practice information and communication technology (ICT) skills and to promote awareness of the multicultural European model of society (Făt, 2012).

eTwinning has been funded by the European Commission under the Erasmus+ program since 2014 (Kearney & Gras-Velasquez, 2015). It is well-known as a safe and good starting point for strategically planned long-term cooperation between schools, including student exchange in the future under the Erasmus+ mobility program (Gajek, 2018). eTwinning is a web-based, networked social learning management platform where teachers, school administrators, and students in schools all over Europe can meet safely online, communicate and collaborate to realize projects as part of their curricula. eTwinning guides teacher educators in the early stages of their education to develop future-qualified teachers in many fields (https://www.etwinning.net/en/pub/benefits/learning-opportunities/teacher-training-institutes.htm). Teachers, teacher candidates, and teacher educators who are registered members of the platform can carry out various projects collaboratively. European projects between institutes, which include the creation of an eTwinning collaboration project with student teacher trainers from one or more institutes in Europe by an Initial Teacher Education (ITE) trainer, enable trainees to become increasingly autonomous through project-based learning. The final stage is when pre-service teachers responsible for their students' design and implement their own projects under the guidance of their trainers and/or peers from Europe. This shift to flexibility and autonomy is reassuring for students who can succeed under the helpful guidance of their instructors or peers.

eTwinning contributes to the development of participants' ICT skills and language skills (Demir, 2019), the development of high-level skills such as creativity, teamwork, decision making and problem-solving (Avcı, 2021), and the increase in interest in technology (Çetin Cengiz and İzci, 2021). Teachers and ITE trainers increase their pedagogical and technological knowledge and competencies and develop innovative perspectives (Acar & Peker, 2021; La Marca & Gulbay, 2021). Collaborative tasks in projects not only encourage student teachers to develop the professional skills they need to set precise goals, be extremely specific in planning, programming and documenting their work, but also in with teamwork, more specifically listening to the perspectives, perspectives and suggestions of international partners (Tonner-Saunders & Shimi, 2021). They also support the development of soft skills, such as international teamwork, which includes respect, understanding, kindness, and consideration. Project-based problem-solving and troubleshooting are also experienced through time management, addressing technical issues, and mirroring each country's goals and perspectives.

Earlier studies about eTwinning have laid the foundation for research. Manfredini (2007) finds that eTwinning is an opportunity for students to get to know new cultures, for teachers to increase their motivation for new approaches in education, and to continue their professional development. Demir (2019) carried out a project between Turkey and Azerbaijan with eTwinning, revealing that participants improved in subjects such as English language skills, increased their ability to use Information Technologies, improved their intercultural communication skills, values education, and established good friendships. Research conducted by Sergeant, Balçın, and Yılmaz (2021) about eTwinning with science teachers determined teachers participated in these project studies to teach

activity-based lessons and contribute to their professional development. All of these findings show that eTwinning activities allow undergraduate students, particularly future teachers, to act from a common EU perspective.

Indeed, through eTwinning, pre-service teachers can explore and apply project teaching as well as multi-disciplinary work that helps them develop deep content knowledge as well as critical thinking, creativity, and communication skills. eTwinning is important for all the reasons mentioned above: versatility, flexibility, innovation, differentiation, self-empowerment, peer collaboration, interculturality, multilingualism, open-mindedness, skills development and recognition, and European partnerships. All pupils in primary, secondary and higher education can benefit from eTwinning. In-service teachers and educators can teach and learn through the platform. However, it would be unfair to limit the benefits of eTwinning to education and training, as its scope goes far beyond that. eTwinning also contributes to the championing of European values such as European citizenship, and UNESCO values such as inclusion, diversity, and environmental sustainability. Digital education is undoubtedly an asset. For various political, social and/or economic reasons, not all children can meet their European friends face-to-face. eTwinning helps overcome these barriers as it facilitates collaboration and cultural exchange while having fun. Aligned and anchored in each country's curriculum, eTwinning projects offer a real-world, authentic application of what pupils are learning in the classroom. It is no exaggeration to say that eTwinning makes school happiness a reality for every child, teenager, and young adult.

In addition, the latest Erasmus+ plans and budgets (2021-2027) encourage and facilitate blended, short-term mobility/travel projects that bridge gaps between various social, cultural, and national communities. Indeed, "Incorporating international placements into the curriculum means more than just offering credit hours. It means making culture a part of the lessons that students will take at home" (Masel Walters, Garii, & Walters, 2014). Promoting virtual, mixed and physical settlements through eTwinning and Erasmus+ mobility trips equips students to experience different cultures and to deal with multilingualism and multiculturalism at home and then through travelling. These intercultural skills should be part of the qualifications of any future qualified teacher.

Before student internships abroad, eTwinning provides future mobility candidates with important online training, not only by sharing didactic, pedagogical, and disciplinary content but also by discussing themes of interculturality, otherness, or multilingualism to deflate stereotypes with colleagues abroad. As stated by Masel Walters, Garii, and Walters (2014), training should also continue during and after placement. An online platform is a unique tool that can accompany students through their mobility projects and help them prepare for multi-class situations on their own (Walters, Garii & Walters, 2014).

Under the Erasmus+ plan (2021-2027), eTwinning will contribute to creating and expanding the European Education Area, the strengthening of European citizenship, the universal values of tolerance and fraternity, and the strengthening of ties between school communities, both locally and internationally (https://erasmus-plus.ec.europa.eu/programme-guide/part-b/key-action-1/mobility-school).

As Tutkun and Aksoyalp (2010, p. 361) state as a result of their research, in the 21st century, teaching will be a specialized profession; their findings emphasize the teacher training system must be at an international level and teachers must be trained in an understanding of intercultural education and building a democratic society. As Vanderberghe (2002) maintains, it is very important for teachers to communicate with their colleagues on both professional and social issues.

Considering that learning and teaching activities take place in a social context resulting from interaction, pre-service teachers must be able to analyze and evaluate different cultures so they can teach pupils 21st-century skills. The aim of social learning networks such as eTwinning, part of Erasmus, is to support the creation and development of awareness of respect, tolerance, and understanding by ensuring young people from different countries and cultures are integrated through

dialogue. To this end, the 30 primary school pre-service teachers involved in the four-country transnational Qualified Future Teacher Project, carried out on eTwinning, researched, and designed activities to help them identify skills and competences that the qualified teacher of the future should have. The project, which lasted for 6 months, investigated the experiences of teacher candidates graduating from different countries according to different teacher training systems. The academic framework surrounding the project evaluated the project's process and results. For this purpose, answers to the following problems and sub-problems were researched:

What is the experience of pre-service primary school teachers participating in an international eTwinning project?

1. What are the views of pre-service teachers about participating in the eTwinning project?

2. What are the opinions of pre-service teachers about the primary school teacher training systems of the countries involved in the project?

3. What are the opinions of pre-service teachers about the skills and competencies that should be possessed in the 21st century?

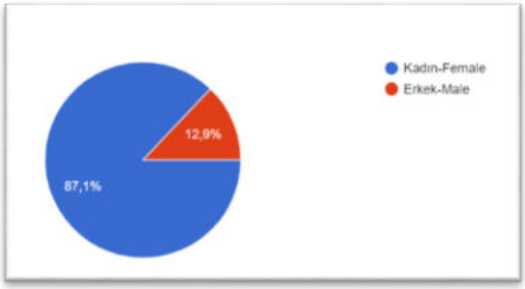
METHOD

Model of the Study

Phenomenological research design, one of the qualitative research methods, was used in this research in which the experiences of teacher candidates regarding the eTwinning project were examined. Phenomenology is the description of a phenomenon in terms of the experiences of a particular group. Researchers try to reach the life world of each participant. The phenomenological research method asks each participant to describe their own experiences in their own terms (Christensen, Burke Johnson & Turner, 2015, p. 408-409). The researcher collects data from people who have experienced the phenomenon and develops a unified definition of the essence of the experience for all individuals. This definition includes "what" they experience and "how" they experience it (Moustakas, 1994). In this research, we aimed to express the experiences and perspectives of pre-service teachers who participated in the eTwinning project for the first time to take part in an international online project. We put forward the experiences of student teachers by collaborating in transnational teams and discussing the teacher training systems of different countries and the skills that a teacher should have in the 21st century.

Study Group

The study group of the research consisted of 30 (4 male, 26 female) students studying in Turkey (2 universities), Italy (1 university), Germany (1 university), and France (1 university). Figure 1 (see below) was conducted with the classroom teacher candidates. Participants were between the ages of 18-24. Participants 1-2-3-4-5 represent the grade level the pre-service teacher is studying. The participants were students attending the classroom who had not been involved in an eTwinning project before (Figure 2). There were 3rd- and 4th-grade student teachers from Turkey, and 5th-grade students from France, Germany, and Italy. In Turkey, primary school classroom teaching is completed in education faculties in a period of four years, and four of the participants in the other countries, except Turkey, were students who took part in the project within the scope of an unfinished degree thesis. Participants' digital competencies were generally at intermediate and higher levels (Figure 3).



IOJPE
ISSN: 1300 – 915X
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International Online Journal of Primary Education 2022, volume 11, issue 2

Figure 1. Gender distribution of participants

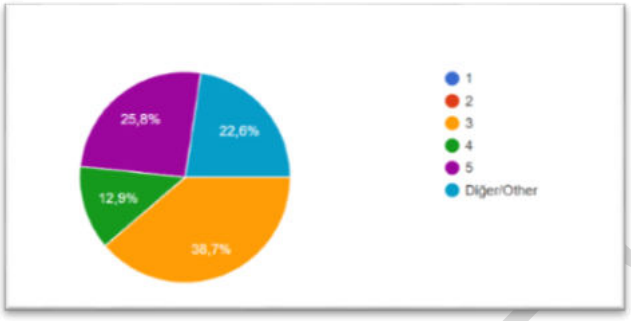

Figure 2. Distribution of participants by grade level

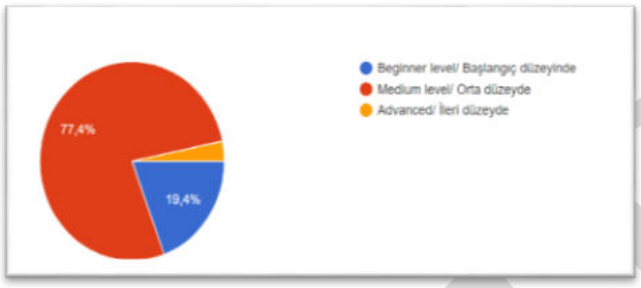

Figure 3. Participants' digital competencies

Research Instruments and Procedures

Semi-Structured Interview Form: In the study, a semi-structured interview form developed by the researchers was used as a qualitative data collection tool. According to Merriam (2018), semi-structured interview forms allow participants to express the world they perceive with their own thoughts. In this study, it was deemed appropriate to use the semi-structured interview form as a data collection tool because how the study group perceived their experiences was analyzed based on their own statements. For the content validity of the form, opinions were received from five field experts working in the classroom teaching department. As a result of these expert opinions, it was found thatthe questions were understandable and suitable for the research purpose. In addition, the activity examples prepared by the pre-service teachers as mixed, transnational teams throughout the project also contributed to the research. Open-ended questions prepared for the sub-problems within the scope of the research are as follows:

Table 1. Questions

Subproblem Topics	Interview Questions
What are the opinions of pre-service teachers about participating in the eTwinning project?	What did you gain from taking part in the eTwinning project? What do you think about this project?
What are the opinions of pre-service teachers about the primary school teacher training systems of the countries involved in the project?	What did you learn about the entry requirements to the primary school teaching program in countries (Turkey-Italy-France-Germany)?
What are the opinions of pre-service teachers about the skills teachers should have in the 21st century?	What do you think are the skills and competencies that a primary school teacher should have in the 21st century?

Research Procedure

The research process is detailed below. You can follow the online process by clicking the links here.

ISSN: 1300 – 915X
www.iojpe.org
2022, volume 11, issue 2

Table 2. Research process

	Tasks	Descriptions
1.	**First Meeting**	An online meeting with project partners
2.	**Second Meeting**	Planning the project and assigning tasks
3.	**Registration**	Each teacher trainer made preservice teachers a member of the portal by getting approval from their respective National Support System.
4.	**Permission Documents**	Permission documents were sent to preservice teachers, who were asked to sign. Each teacher trainer collected the documents of their own country and forwarded them to the project coordinators
5.	**Meeting Activity**	All teacher trainers and preservice teachers introduced themselves on a Padlet by adding a photo and introductory comments (https://padlet.com/umitizgi1/TR_FR_IT_GE)
6.	**Videos**	Each preservice teacher talked about himself/herself (via Vimeo, Flipgrid). Each country's group prepared a video promoting their university (in English). These introductory videos were shared on a Padlet. (https://padlet.com/umitizgi1/promotionalvideos_universities)
7.	**Project Logo**	Pre-service teachers prepared a logo for the project. The logos prepared by each country were subject to voting. Voting was done with a Google Form, and the project logo was determined.
8.	**Task 1: Teacher Training Systems of Each Country**	Transnational groups were formed from all participating countries. **Group 1:** The group researched the *teacher training system* of **Turkey.** **Group 2:** The group researched the *teacher training system* of **Italy.** **Group 3:** the group researched the *teacher training system* of **France** **Group 4:** The group researched the *teacher training system* of **Germany.**
9.	**Task 2: Valuable Educator of Each Country**	Transnational groups were formed from all participating countries. Each group prepared presentations reflecting the cultural characteristics of their assigned countries and discussed their reflections on education. For this activity, each group prepared a video that introduces the life and contributions of a significant educator from the specified country. Group 1: The group identified and introduced an educator in**Turkey.** Group 2: The group identified and introduced an educator in **Italy.** Group 3: The group identified and introduced an educator in **France** Group 4: The group identified and introduced an educator in **Germany.**
10.	**Task 3: 21st-Century Skills of Teachers**	Each country's group prepared videos or animations describing the skills to be acquired in the 21st century as a prospective primary education teacher. The images of the activities performed by the pre-service teachers within the scope of three main tasks are presented in Figures 8-11.
11.	**Closing Meeting**	A final online meeting was held to evaluate the project process. Pre-service teeachers were asked to reflect on and share their experiences and feelings.

Figure 4. Project logo chosen by the votes of teacher candidates

12.	**Google Form**	Participants were asked post-project interview questions (with Google form)
13.	**Dissemination**	An Erasmus+ meeting was held in Italy with all teacher educators. Some preservice teachers attended online; some face-to-face.

The images of the activities performed by the pre-service teachers within the scope of three main tasks are presented in Figures 4-7 (see below). Country groups consisting of transnational teams researched the life of an important educator for one of the countries in the project and prepared animation and videos. They prepared content such as biographies, education, background using digital tools for their presentations about teaching skills and competencies that are important in the 21st century.

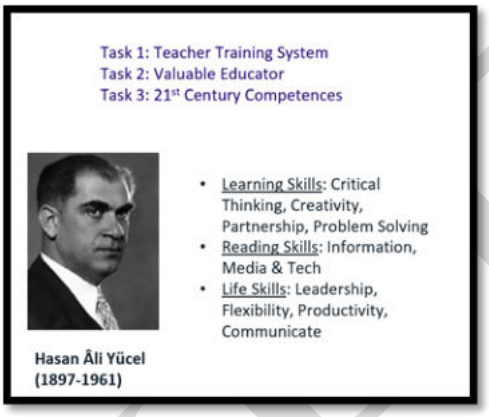

Figure 4. The educator researched by the first mixed group, "Hasan Ali Yücel: Turkey."

Figure 5. The educator researched by the second mixed group, "Maria Montessori: Italy."

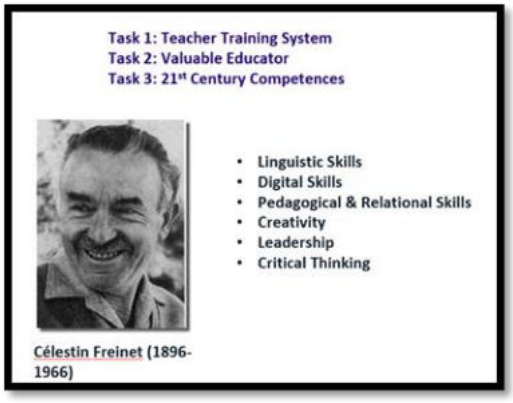

Figure 6. The educator researched by the third mixed group, "Célestin Freinet: France."

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International Online Journal of Primary Education 2022, volume 11, issue 2

Figure 7. The educator researched by the fourth mixed group, "Friedrich Fröbel: Germany."

Data Analysis

Content analysis was used in the analysis of the qualitative data obtained from the interviews. Content analysis gathers similar data within the framework of certain themes and organizes and interprets them in a way that the reader can understand (Yıldırım & Şimşek, 2006). The data obtained from the interviews were analyzed according to the determined themes and codes, and direct quotations were included from time to time.

Validity strategies used in qualitative studies were taken into account according to the research of Joseph Maxwell (2005, cited in Christensen, Burke Johnson & Turner, 2015). In the study, researcher diversity was taken into account for descriptive validity, and therefore more than one researcher (6 teacher educators) was included in the study. Having multiple researchers prevents a single researcher from reflecting their point of view. We provided data diversity by using multiple data sources – all the activities prepared by pre-service teachers (interview questions, infographics equipped with Web 2.0 tools, animations, and PowerPoint presentations). All researchers contributed to the collection, analysis, and interpretation of data for researcher diversity. Interpretive validity, that is, whether the analyses were the same from the perspective of the participants, was shared and discussed with the participants. The statements of the participants were presented by making direct quotations. For reliability, the coders shared the analyses by meeting at regular intervals. Continuous comparison of codes and data was made. The reliability among coders was calculated according to Miles and Huberman's (1994) formula and was determined to be 92%.

Ethics and Conflict of Interest

The data used in this study were collected anonymously as directly identifying information was never obtained or used. Also participating in the google form was ensured voluntarily. “The research was approved by Mersin University Social and Human Sciences Ethics Committee in line with the decision numbered and date 01/08/2022-305.” 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.

RESULTS

First level subtitle about the research question

Within the scope of the first sub-problem, the opinions of pre-service teachers about participating in the eTwinning project were examined.

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2022, volume 11, issue 2

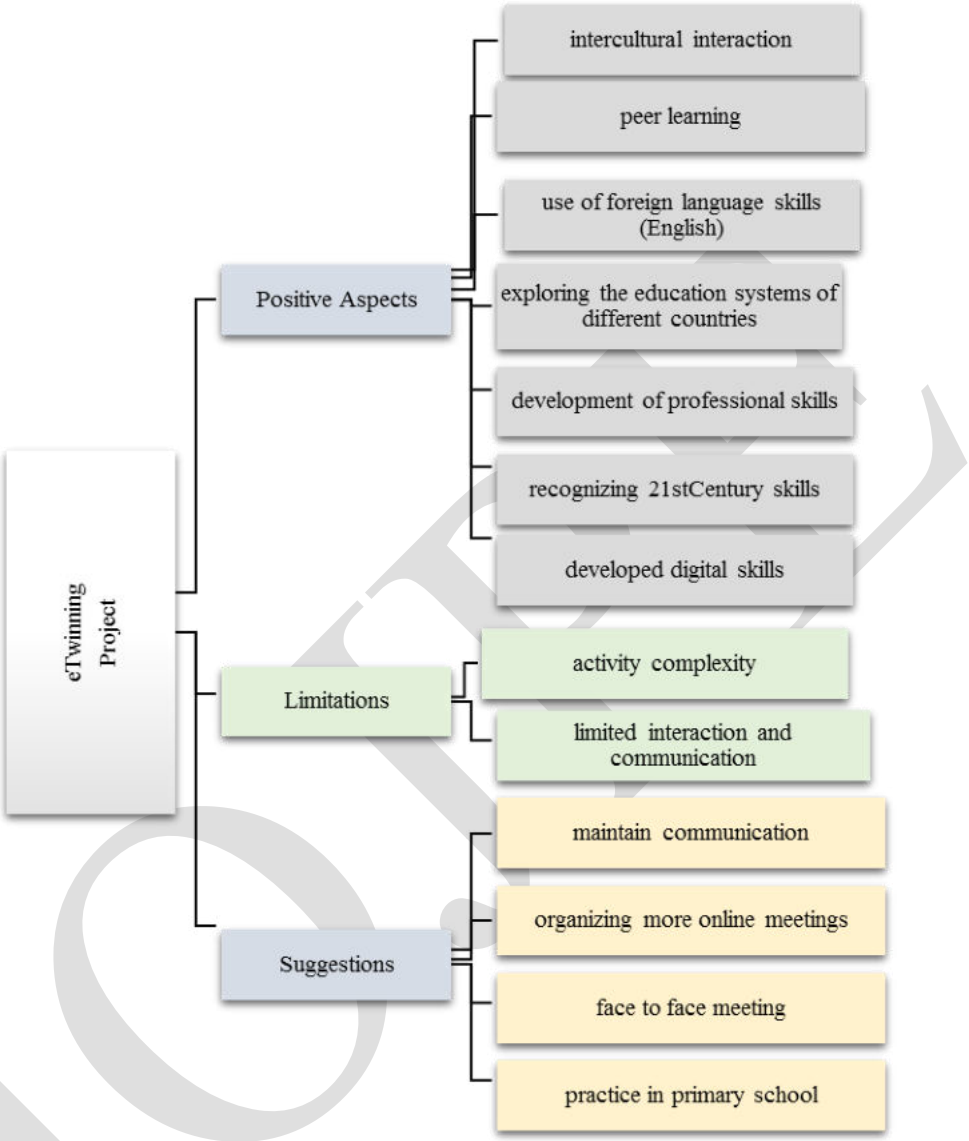

Figure 8. Opinions of teacher candidates about the eTwinning project.

As Figure 8 shows, the views of the pre-service teachers about participating in the eTwinning project were gathered under three main headings: "positive aspects," "limitations," and "recommendations." Participants mentioned the positive aspects of participating in the eTwinning project, especially by mentioning the importance of skills such as the recognition of these 21st-century skills: creative thinking, critical thinking, developing problem-solving skills, empathy, cooperation, and teamwork. Also, for the topic "advanced digital skills" (they stated they gained experience using these Web 2.0 tools: Padlet, Google Meet for the first online meeting, Canva for infographics, Flipgrid for University videos, Powerpoint for the presentation of the teaching system, Sketches for the logo, Moviemaker for the video of the educator's country, Google docs, and Zoom for complete project teleconferencing.

Some of the participants' views on the ***positive effects*** of the project are as follows:

K1: "It allowed me to look at the teaching profession from a different perspective with students from other countries."

K2: "I learned different things about the teacher training system in several countries. Also discovered other cultures and people.

K4: "This project offers me new information that can be used in the business world; it is a very constructive experience for me on a personal, ***educational and professional*** *level. I developed my language and* ***digital*** *knowledge,* ***creativity,*** *and ability to work in a team in a* ***multicultural*** *context. Thanks to the exchange with the students of the universities of Turkey, France, Italy, and Germany, I got to know new ideas, approaches, and experiences within the logic of practice and* ***peer learning*** *thanks to the didactic activities."*

K5: "The eTwinning project represents for me one of the important and preparatory stages of my educational path: to question oneself and to learn to communicate and interact with others means to grow; facing challenges and solving them is a tremendous personal wealth."

K10: "Working in collaboration with friends from different cultures has been an important experience for me."

K12: "It was important to monitor the teaching profession through different education systems and to carry out studies on this subject."

K20: "This project aimed to compare different education systems of European countries. We analyzed the teacher training processes of the relevant countries. We researched and identified the skills that 21st-century teachers should have. I think that the 'Qualified Teacher of the Future' project also aims to improve our empathy capacity."

Some of the participants' views on the ***limitations*** of the project and s*uggestions* are as follows:

K4: "*This project introduced me to people from Europe; the theme was quite complex, but we finally succeeded.*

K24: "*Maybe we can keep the project duration longer in order to develop the project in the future. More videoconferencing, I think, will be more interactive and important for learning."*

K5: "*Currently, in projects within the scope of eTwinning ITE, teacher candidates should be able to practice with pupils in schools. However, since it was our first project, our activities were limited to teacher candidates only. This is among the goals of teachers. It is one of our main targets in future projects as well."*

K15: "*Maybe to be able to meet in one of the candidate countries for an international weekly meeting among future teacher candidates."*

K16: "*I would like to stay in touch with the project participants to exchange ideas and advice for our future career as teachers."*

The participants stated that with this project, 21st-century skills were developed in different fields, and especially their examination of different education systems contributed to their personal and professional development. This situation can be considered as an indication that the project has achieved its purpose. Regarding the limitations of the project, they cited the complexity of the process for them and the fact that it proceeds in an online platform instead of face-to-face. Regarding future projects, they suggested the realization of the project in a situation where they can actively participate and work face-to-face. In this context, considering the suggestions of the participants, the project founders decided to participate in the Erasmus blended mobility project for the spring term of 2023.

Second level subtitle about the research question

Within the scope of the second sub-problem, the views of teacher candidates about the primary school teacher training systems of the countries involved in the project were examined.

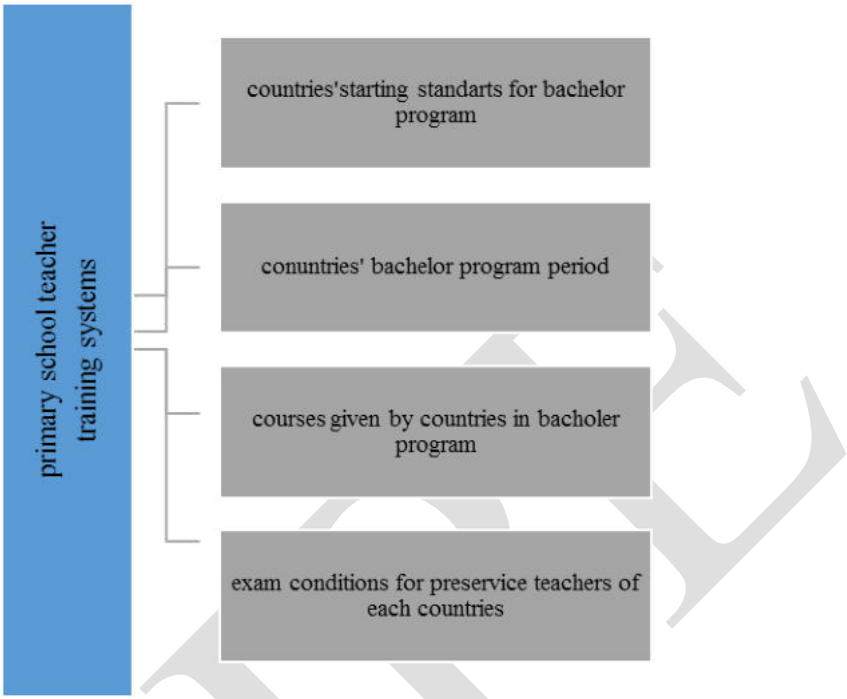

Figure 9. Opinions of Teacher Candidates About Teacher Training Systems.

As Figure 9 shows, the views of pre-service teachers about teacher training systems are gathered under five main headings: These five headings are countries' bachelor program starting standards, countries' bachelor program completion standards, countries' bachelor program period, the courses given by countries during their bachelor program, and the exam conditions for preservice teachers of each country. Participants generally stated that pedagogical education is compulsory for a bachelor program in primary school education in all countries participating in the project and that they can step into the primary school teaching profession after the final exam at the end of the theoretical and practical training.

Some of the participants' views on the countries' starting standards for bachelor programs are as follows:

*K12. "**Turkey**: Preservice teachers have to complete 240 ECTS in **4 years** and fulfill the graduation requirements of their universities. After graduation, they have to take the **KPSS exam**, which includes general culture, talent, field, and educational sciences. Interviews are held after a certain score is obtained from the KPSS exam. Teachers go through the nomination process before embarking on their first teaching career through written and oral examinations.*

***Italy:** The primary education course lasts for **5 years** and has a limited number of students, so you can access this course through a **national entrance examination**. The final exam at the end of the five-year course has the value of a state exam, which ensures that all disciplines found in kindergarten and primary school are taught.* Germany: *It is divided into 2 phases: a higher education course and practical pedagogical training in school classrooms. The basic entry requirement for teacher training courses is a higher education entry qualification obtained after 13 years of schooling and passing the secondary school leaving certificate examination. Education for primary school teachers lasts **3.5 years** at university. I am French, so there is nothing new in the French primary school teaching program!"*

Some of the views of the participants about the bachelor programs of the countries are as follows:

K5. "I learned that to become a teacher in Italy, you have to enter a 5-year curriculum and you have a limited number of places."

K12. "Germany: Education for primary school teachers takes 3.5 years at university"

K13: "Turkey: teachers of the future will graduate within 4 years."

Some of the views of the participants on the courses given by the countries during their bachelor program are as follows:

K6. "Pedagogical education is compulsory in most countries. Most of the theoretical and practical training must be completed in the country. Theoretical and practical training should be completed."

K2. "Turkey: The courses given in education faculties consist of three parts: ***general culture, talent, field,*** *and* ***educational sciences****."*

K4. "Italy: The five-year course combines the ***theoretical approach*** *of the courses and the* ***practical approach*** *through workshops and internships."*

K8. "Germany: Teacher training in Germany is structured in two phases: - ***University-based study*** *and - partially* ***supervised pedagogical training*** *in school classes (so-called Referendariat) lasting from one to two years."*

The opinions of the participants on the ***exam conditions*** for preservice teachers of countries are as follows:

K7. "In most countries, there is some kind of ***final exam*** *to be able to teach, to become a primary school teacher."*

K10. "The education systems of Turkey and France are ***similar in terms of exams and interviews****."*

K14. "Many countries have a ***difficult educational process****. Teacher candidates have* ***many qualifying exams*** *to take and many steps to take."*

K16. "To be a primary school teacher in Turkey, it is necessary to take the ***KPSS exam****."*

K10. "The ***most detailed*** *of these education systems belongs to* ***France****. There are many* ***written and oral exams*** *you take. Mainly your* ***French language skills*** *and* ***math skills*** *are important. You also need to know* ***a language*** *other than your mother tongue."*

With this project, it is seen that teacher candidates' ideas about teacher training systems in Italy, Turkey, Germany, and France are formed. This is an indication that the project has achieved its goals. Teacher training systems of countries; It was evaluated within the scope of student selection and training process and the conditions for teachers' appointment to the profession, and the evaluation of similarities and differences between countries was reflected in the views of the participants.

Third-level subtitle about the research question

Within the scope of the third sub-problem, the views of pre-service teachers about the 21st skills that primary school teachers must have were examined.

Figure 10 shows the opinions of pre-service teachers about the 21st skills that primary school teachers should have gathered under three main headings: learning and renewal skills; information, media and technology skills, and life and professional skills. Among these main categories, pre-service teachers expressed different opinions under the category of life and professional skills the most. In addition, when the activities carried out by the pre-service teachers as mixed groups were examined, the first group (see Figure 4) gathered the skills that teachers should have in the 21st century under three main headings in detail.

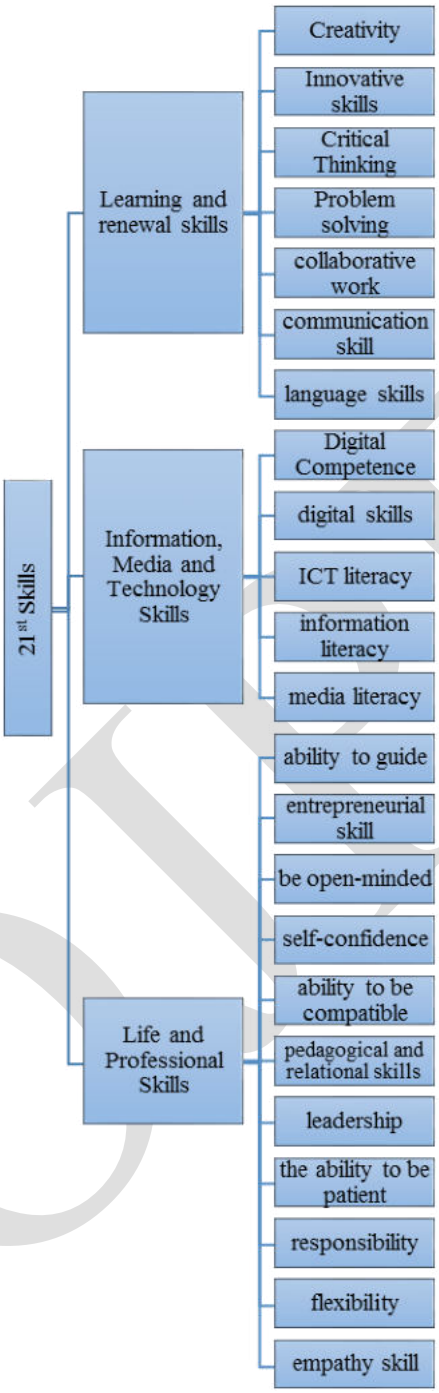

Figure 10. Opinions of teacher candidates about the 21st skills that primary school teachers should have were examined.

These headings parallel interview question analysis. Groups 2, 3, and 4 also defined 21st-century skills. However, instead of categorizing these skills, they mentioned some of them (see Figure 5-6-7). In addition, at the closing meeting at the end of the project, pre-service teachers were asked about the skills they should have in the 21st century through Mentimeter. Pre-service teachers shared their views with a word cloud. Here, pre-service teachers especially emphasized creativity, empathy, flexibility, and digital skills (See Figure 11).

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International Online Journal of Primary Education 2022, volume 11, issue 2

Figure 11. Voting results of teacher candidates on 21st century-skills

The skills that teachers should have in the 21st century are expressed by the participants as follows.

*K24. "Many qualities are necessary to be a teacher, like for example **patience** because every student have their own struggle and not showing a great amount of patience will put a lot of stress on them, and we show them a good role model. Knowing to question ourselves is great quality too because it allows us to advance in our experience in the teaching field and be more adaptable. We must invest ourselves in school life to give the student an environment that gives them the desire to learn and to be here, indeed **attitude is everything"**.*

*K11. "Skills a teacher must have in the 21st century: **linguistic skills**, digital skills, pedagogical and relational skills, creativity and innovation skills, leadership and responsibility skills, critical thinking and problem-solving skills, ability to cooperate and communicate, information technology literacy skills, entrepreneurial skills, flexibility, and compatibility skills".*

*K4. "I think that the skills a teacher should have in the 21st century are: **digital skills**, **relational** and **interpersonal skills**, **empathic** and **creativity skills"**.*

K30. "The skills and competencies that are important are creativity, partnership, productivity, and the ability to follow technological developments. The criteria to be a qualified teacher should be flexible".

*K22. "**Critical thinking, creativity, cooperation, communication, knowledge literacy, media literacy**, **technology literacy**, **flexibility,** leadership, enterprise, productivity and social skills. It seems that the teacher should be equipped with versatile and continuous self-improvement, reading, researching, **using technology** well, and gaining 21st Century-Skills."*

One of the most important aims of the project is to raise awareness of 21st century-skills by prospective classroom teachers and to be instrumental in the development of these skills. 21st century-skills are defined and classified differently by different groups. Partnership for 21st Century-Skills (P21), En Gauge North Central Regional Educational Laboratory (EnGauge/NCREL), Assessment and Teaching of 21st Century-Skills (ATCS), National Educational Technology Standards (NETS/ISTE), European Commission (EC), Organization For Economic Cooperation and Development (OECD) are some of the institutions and organizations that have worked on the identification and classification of 21st century-skills (Koltuk & Kocakaya, 2015). When the studies are examined, it is seen that many studies have been done especially on P21. The main skills defined by P21 are divided into 3 groups. These are "Learning and Renewal Skills, Information, Media and Technology Skills, Life and Vocational Skills". Among these, creativity and renewal, critical thinking and problem solving,

communication, and cooperation sub-skills are in Learning Renewal Skills; information literacy, media literacy, information and communication technologies, (ICT) literacy in Information Media and Technology Skills; flexibility and adaptability, entrepreneurship and self-direction, social and intercultural skills, productivity and accountability, leadership and responsibility are also included in Life and Professional Skills. It can be considered among the positive contributions of the project that the participants included all of their P21 skills in their opinions.

Conclusion

The European Union Council Recommendation on Key Competencies for Lifelong Learning (2018) states it is more necessary than ever to invest in basic skills, and that quality education supported by extra-curricular activities contributes positively to the development of competencies. In addition, the Council emphasized that innovative teaching practices must be explored for an increasingly mobile and digital society, stressing the importance of developing more flexible learning environments compatible with the needs of society able to respond to crises of disease and war. The rapidly changing world conditions have led to transformations in learning environments as well as in many other fields. Learners and teachers are the most important actors in this transformation (Dağhan, Nuhoğlu Kibar, Menzi Çetin, Telli, & Akkoyunlu, 2017). Innovations in teaching practices include using digitalization best practices for transnational collaboration and communication, particularly at the primary school level, when pupils are beginning to learn about the world around them. Project-based learning, Universal Design for Learning (UDL), and Social and Emotional Learning (SEL) are important learner-centered frameworks for 21st-century skills and competencies for both pupils and student teachers preparing for their careers. Innovative theories such as these, combined with innovative digital collaboration such as eTwinning are models for educators all over the world to foster global citizenship while at the same time improving skills such as listening, reading, writing, and collaborating.

Our research shows, the EU's eTwinning platform is one of the most effective, secure, safe virtual learning environments to prepare teachers, student teachers, and pupils for the demands of the fast-paced and ever-changing 21st century. The social constructivist methods, techniques, and digital tools used in eTwinning projects align with the important digital transformation in education (Gençtürk, Başar, Toktay, Yayğaz & Küçüksüleymanoğlu, 2021). Our research updates and validates Velea's (2011) conclusion that teachers' competencies improved through transnational learning technologies by connecting with eTwinning's over 1 million users. Educators and students mastered digital competencies, experiencing the strengths and limitations of online transnational collaborative projects. For future teachers, such collaboration leads to international connections and networks they will take with them as they become teachers and are able to rapidly find partners for future projects. In addition, our research validates Sammorda's (2021) theory that eTwinning projects should be handled in multicultural contexts, not limited to simply using communication technologies to practice a foreign language but to practice the process of solving difficult problems with global importance, providing crucial added value because it comes in the first stages of future teachers' education. Our findings from interviews with student teachers participating in the project validate Gazjek's (2018) theory that the eTwinning experience online is so pervasive and transformational that people may not even realize the changes in their beliefs and attitudes towards openness to other cultures, social inclusion, and tolerance. While these results may not be apparent, they represent an important foundation for student teachers.

In conclusion, since the integration process of digital online collaborative educational approaches such as eTwinning into Professional educational faculties and teacher training universities curricula is new, studies conducted with pre-service teachers at the university level must be continued.

Our findings validate earlier and current eTwinning research showing that eTwinning has positive effects on the professional development of teachers, their professional skills, and the development of students. Acar (2021) concluded that classroom teachers who completed eTwinning projects improved international competencies, learned Web 2.0 tools, became inspired by innovative

approaches to teaching, and inspired their pupils to see themselves as global citizens apart from regional identities.

The contribution of eTwinning projects in gaining vital professional skills has shown itself in our project with Turkey, Italy, France, and Germany. Student teachers increased digital competencies, evaluated transnational communication and collaboration, and established networks they can use over their careers. We stand with Gülbay (2018), finding that eTwinning contributes to increasing teachers' leadership skills, cooperation, motivation, and social skills, as well as increasing their pedagogical knowledge.

The following suggestions are for researchers who will conduct research on this subject:

1. Teachers have to guide their students according to the conditions of the 21st century. For this reason, the selection and training of people who will choose the teaching profession, that is, teacher candidates should be in accordance with the conditions of the century. The courses given in universities may need to be revised when necessary according to the requirements of the century. The authorities responsible for the education systems of the countries should take the necessary precautions in this regard.
2. In the education of pre-service teachers in universities, the education-teaching process should be planned by considering skills such as problem-solving, creativity, critical thinking, and empathy. It should be ensured that they take part in projects that are more practical than theoretical. It should be ensured that the awareness of teacher candidates about the rapid transformations in education should be increased. It should be ensured that teacher candidates follow not only the education systems of their own countries but also the developments in the whole world. Because, in the conditions of the present century, teachers should be able to train and guide their students according to 21st-century skills.
3. There is a need for more practical projects such as eTwinning, where there will be intercultural interaction, in order to develop the skills that teacher candidates should have.
4. International publications on eTwinning have been increasing in recent years. The number of master's theses and articles published in this field is limited. In this sense, in-depth studies are needed. It is very important for the education systems of the future to understand the eTwinnning pedagogy well and to analyze and deal with its reflections all over Europe (Kampylis et al., 2012).
5. In future research, in-depth studies should be planned with teachers and students who have not taken part in the eTwinning project before. Research can be conducted on the benefits and problems experienced by such projects for both teachers and students.
6. ITE studies at universities should be increased. Comprehensive studies can be designed in which especially professors in education faculty, teachers, and teacher candidates can be involved. Its effects on primary school students should be investigated.
7. eTwinning projects should be done across different age groups, starting from pre-school to higher education. By considering qualitative and quantitative research designs together, in-depth analyzes can be made using mixed designs.

The limitations of the research and potential for further study

Because our project and research were conducted completely online with student teachers who had no access to pupils in schools, the research is limited to the first of two ITE eTwinning models: student-teacher-to-student-teacher transnational projects. In future projects, carrying out projects in internship schools with pupils shows much promise and potential. Therefore, this project can be expanded to embrace the ITE eTwinning second model (student teacher-pupil) (https://school-education.ec.europa.eu/tr/about/initial-teacher-education-page).

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. The research was conducted with ethical principles of the Human Research Ethics Committee of Mersin University (05.07.2022 - 01/08/2022-305). The authors declared no potential conflicts of interest.

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ENHANCING UNDERSTANDING ABOUT THE NATURE OF LOCAL SCIENCE: AN ACTION RESEARCH IN PRIMARY EDUCATION

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Abstract

Through local scientific learning, this action research attempts to improve primary school students' understanding of the nature of science. The target group consisted of nine grade 6 students from a school in Thailand's northeast. The observational tools were the understanding of nature of science test, understanding of nature of science questionnaire test, and interviewing. The research tools were action plans based on local science and observational tools were 1the understanding of nature of science test, understanding of nature of science questionnaire test, and interviewing. Mean, standard deviation, and percentage were used as descriptive statistics. According to the data, students improved their knowledge of science by 62.96 percent after the first learning cycle. Students achieved 92.59 percent of their grasp of science during the second learning cycle. Qualitative data could be used to help future research discussions.

Keywords: Local science, nature of science, primary science, traditional science.

INTRODUCTION

Since it has an impact on everyone's everyday activities and employment, science plays a significant part in daily life. In order to simplify their lives and work, humans use a range of tools, combining scientific knowledge with creativity and other efforts (Tortorella et al., 2021). Science may help people strengthen their reasoning, creativity, analytical skills, and critical thinking (Darling-Hammond et al., 2020). It also helps people to learn, approach problems in a methodical way, and base conclusions on a range of facts and verifiable evidence. It is a byproduct of modern civilization as well.

As a consequence, everyone ought to study science. One goal of science education is to develop students into scientifically literate people who can derive ideas and information from the results of experiments, as well as acquire processes and knowledge through observations, surveys, investigations, and experiments (Olson, 2018; McComas & Clough, 2020). A person who is scientifically literate may use scientific methods and knowledge to do research, provide views, make judgments, answer probing questions, and explain events (National Research Council, 1996). A person who is scientifically literate must be capable of understanding not just scientific content but also scientific techniques, nature, and restrictions (Nuangchalerm, 2009).

While science has provided mankind with an astounding level of technical prowess and a wonderful comprehension of nature, it has also muffled and even endangered other cultural ideas and values via local and global understandings. There is a growing understanding that the multiplicity of knowledge systems demands respect; some people refer to them as alternative information banks in the language

of conservation. One of many is the scientific viewpoint. Many of the local scientific and cultural practices that were earlier considered to be "primitive" and in need of development are now abundantly shown to be sound. However, this study goes beyond establishing the reliability of local science and supporting the use of outside information in development to make the case that we should question the underlying assumptions of science and continue to fight its hegemony.

For learners to become scientifically literate people, it is necessary for them to acquire scientific understandings. Three concepts make up the conceptual foundation for scientific literacy: the nature of science, scientific principles, and scientific ethics, all of which students may meet in the future. These are actual problems that people in science, society, and individuals deal with every day (Roberts, 2007). Science education should stress the essence of science by concentrating on the connections between science and modern society. The texts also amply demonstrated the connection between scientific literacy and the nature of science. Scientific viewpoints that hold that science is not independent and objective but rather is impacted by people and society are necessary for scientific literacy (American Association for the Advancement of Science, 1994; Abd-El-Khalick & Lederman, 2000; Holbrook & Rannikmae, 2007; Callahan, 2009).

This idea is in line with that of Clough (2011), Häyrynen et al. (2021), and Parmiti et al. (2021) claimed that the nature of science supports science education by enabling students to recognize the value of scientific discoveries and by enhancing their understanding of the fundamentals, the advantages, the drawbacks, and the social roles played by science as well as the operational procedures of scientists. The shift to sustainability depends on environmental citizenship as a force for transformation. According to our point of view, a contextual resource doctrine offers a framework for people's environmental values, which includes both the ability to adhere to the doctrine's standards and the capability to critically evaluate them using reasonable and scientific reasoning. Therefore, it is important to emphasize location-specificity and feeling of place in civic science teaching. These may help students grasp scientific ideas, make them aware of the value of science, and serve as the most fundamental building blocks for understanding the sources of scientific information (Bell, 2008).

Although educating the students to understand the nature of science is a goal of Thailand's education, there are problems about teaching the nature of science. Since the teachers considered that teaching the students to understand the nature of science was difficult and the education did not focus on learning the nature of science by using teaching materials, these were the causes of the misunderstandings. The educational institution that had close relationships with the family institution and the religious institution that develop the young people's ethics and knowledge for living with others in the societies focus on academic certificates instead of applicable knowledge (McComas, 2020). The education emphasizes on memories instead of understandings and applications. It is not connected to the lives of the people in the societies (Hillen, 2020).

Consequently, the communities did not transfer wisdoms because the education did not include the local wisdoms in order to make the young people proud of the wisdoms and their cultures. To explain the things or phenomena about the people's lives in local areas with scientific knowledge surrounding us, we must study science in order to adapt ourself to the situations in the areas. This is considered as the origin of local science. Regarding the education with the local science, the students must practice or interact with environments. The contents must be the local contents that are consistent with the basic education curriculum instead of the other contents from other areas because the other contents will not be applied and meaningful to their lives (Gandolfi, 2021). The drivers of the education with the local science that cooperate with the teachers are local philosophers who have experiences. For this education, the students will achieve the goals of the curriculum and learn with their parents and local elders. They will love, understand, protect and improve their local areas with virtues.

American Association for the Advancement of Science [AAAS] (1990) explaining that the framework of the nature of science consisted of various concepts that could be classified into three main groups: the scientific world view, the scientific inquiry, and the scientific enterprise. It covered and consistent

with the education about the nature of science. Hence, it was used as the conceptual framework for developing the research instruments for the students' understandings about the nature of science. This study aims to enhance understandings about the nature of science for the grade 6 students being educated about the local science.

Problem Statement

The relationship between indigenous, local, and scientific knowledge systems has received a lot of attention over the last several decades, notably in the domains of ecology and natural resource management. With a focus on effective communication between members of various communities and cultures, we evaluate the body of literature in this monograph to develop a practical framework for the representation of knowledge systems in general (Parmin et al., 2019; El Islami & Nuangchalerm, 2020; Wheeler & Root-Bernstein, 2020; Tengö et al., 2021; Phoopanna & Nuangchalerm, 2022). In order to show existing and potential applications of the knowledge paradigm, we include these essential concepts into a wide framework for operationally characterizing local scientific knowledge as an important advance in the ecology and natural resource management literature.

We concentrate on offering succinct, actionable definitions and explanations of the core ideas pertaining to information, knowledge, wisdom, and data. We evaluate previous uses of sociocultural knowledge system thinking, concentrating on system structure and function, as these concepts become more clear. We identified a set of core knowledge system functions and actor roles that are common across several academic fields. Even if each story has some truth, they all contradict one another and are completely inadequate (Bush & Doyon, 2019; Frantzeskaki et al., 2019; Marginson, 2022).

Particularly in light of the extremely ambiguous global future of ecology and natural resource management, members of various knowledge systems engage in reciprocal and meaningful discussion with representatives of local science and global scientific knowledge. The findings would be advantageous for the educational activities conducted by scientific instructors and employed as instruments for molding students into persons who can successfully use knowledge in the learning societies of the twenty-first century. Furthermore, the outcomes may serve as guidance for science instructors or those in charge of creating student-friendly scientific curricula to improve learning activities.

METHOD

Research Model

This study employed action research method (Figure 1) in order to enhance the understanding about the nature of science for the Grade 6 students being educated with the local science. The digestive system was significant topic in local community. School area located in northeast of Thailand, rich and entire years of cultural sustaining.

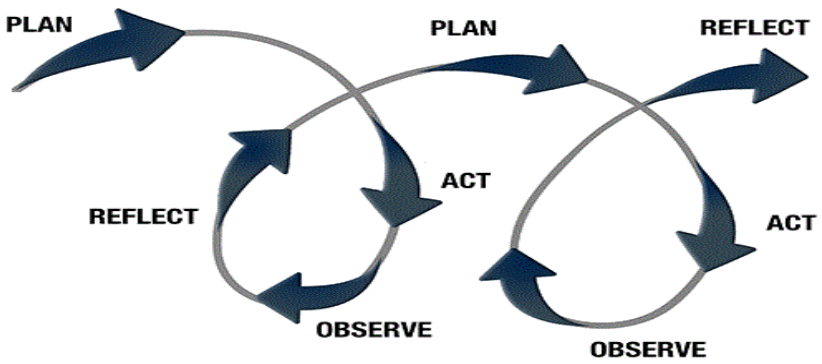

Figure 1. Action research

Target group

This study employed and action research to investigate understanding about nature of science. Nine of Grade 6 students as target group, they were studying science in the academic year of 2021. The target group was purposive selection due to whole class required enhancing understanding about nature of science. The school context, small school-sized elementary level where located in the northeast of Thailand. Learning resources about local knowledge and scientific knowledge claimed that rich and concerns local culture, science can be incorporated into school curriculum, and nature of learners' learning can be developed.

Research Instruments

The research instruments were the two operational plans using the local science as an innovative lesson plan. The data collection instruments were the two sets of the writing tests about the understandings of the nature of science. Each set had three items, the evaluation form about the understandings of the nature of science with the five-point rating scale and 12 items, and the interview form about the education with the local science. The research instruments were validated by 3 experts in each cycle. The index of consistency was reported ranges between .67-1.00 with qualitative comments. Then, authors revised and corrected its appropriateness before collecting data and made its reflection.

Data Collection

The action research employed 2 cycles by each cycle can be procedure with planning, acting, observing, and reflecting. The details in each cycle can be shown as in Table 1.

Table 1. Details of action research

	Cycle 1	Cycle 2
Planning	The documents and research studies about the nature of science were studied in order to create the data collection instruments, including the six educational plans with the local science about foods and digestive system. Each plan took two hours, the total time period was 12 hours. Two sets of the tests about the understandings of the nature of science, each set had three items. The evaluation form with the five-point rating scale and 12 items, and the interview form about the education with the local science.	The plan for enhancing understanding about nature of science were made and the teaching were revised and improved according to the analysis results and the summary understanding about nature of science from the cycle 1. The reflection can as a primary source of lesson plan design. Each plan took two hours, the total time period was 12 hours. The evaluation form with the five-point rating scale and 12 items, and the interview form about the education with the local science use for discussion and plan in the current cycle.
Acting	The learning activities were conducted according to the 1st – 3rd lesson plans. After the activity periods were completed with local science learning organization, teachers and the students had to discuss about the problems and the obstacles in the learning activities.	The learning activities were conducted according to the 4th - 6th lesson plans. After the learning activities were completed, teachers and students had to discuss about the problems and the obstacles in the activities. The suitable ways in the process of scaffolding their understanding about nature of science performed.
Observing	The observation tool and techniques were used in order to observe the students' understanding about of the nature of science, the operations and discussions were implemented. The questionnaires and the interviews about the understanding were used.	The observation tool and techniques were used for observing the students' understandings about the nature of science, operations and discussions. The evaluation form and the interview form for the understandings about the nature of science were used.
Reflecting	The results from evaluating the learning activities with the local science were used by the researchers for analyzing, explaining, and reflecting the evaluation results and the summaries in order to improve the learning activity plan in the cycle 2.	The results from evaluating the learning activities for developing the understanding about the nature of science according to the scientific, technological, social, and environmental concepts from the observation. Data collection and analysis were used for reflection.

Data Analysis

The data analysis of this study used the basic statistics including percentage, mean and standard deviation, and it was compared to the specified criteria. However, the understanding about nature of science can be interpreted through the procedure of action plan and its reflection in each cycle.

RESULT AND DISCUSSION

By empirical data, it can be considered that there were the students who did not pass the criteria for developing the understandings of the nature of science by criteria of 70% in the following aspects: there were 9 students in the aspect of the scientific worldview, 7 students in the aspect of scientific inquiry, and 7 students in the aspect of scientific enterprise (Table 2).

Table 2. Understanding about the nature of science in Cycle 1

Student	Nature of science								Understanding Level	
	Scientific worldview		Scientific inquiry		Scientific enterprise		Total (9)	%		
	Total score (3)	%	Total score (3)	%	Total score (3)	%			Mean	Interpretation
1	1	33.33	2	66.67	2	66.67	5	55.56	2.78	Moderate
2	2	66.67	3	100	3	100	8	88.89	4.44	High
3	1	33.33	1	33.33	1	33.33	3	33.33	1.67	Low
4	2	66.67	2	66.67	2	66.67	6	66.67	3.33	Moderate
5	2	66.67	2	66.67	2	66.67	6	66.67	3.33	Moderate
6	2	66.67	3	100	3	100	8	88.89	4.44	High
7	2	66.67	2	66.67	2	66.67	6	66.67	3.33	Moderate
8	1	33.33	1	33.33	2	66.67	4	44.44	2.22	Low
9	1	33.33	2	66.67	2	66.67	5	55.56	2.78	Moderate
Mean	1.56	51.85	2.00	66.67	2.11	70.37	5.67	62.96	3.15	Moderate
Std.Dev.	.50		.67		.57		1.56			

According to Table 2, it was found that the mean score for the understanding about the nature of science in the three aspects was 62.96%. The scores in each aspect were as follows: the score of the understandings of the nature of science especially scientific worldview was 51.82%, the score for scientific inquiry was 66.67%, and the score of the scientific enterprise was 70.37%. The reflection in the Cycle 1 can be used for discussion, it can be considered that all students pass the criteria 70% of understanding about nature of science through local science learning as well (Table 2). Students no. 2 and 6 showed their level of understanding nature of science were at high level, so the other students should be developed their learning and understanding more level. The Cycle 2 was established and conducted, level of understanding in the next Cycle can be shown in Table 3.

Table 3. Understanding about the nature of science in Cycle 2

Student	Nature of science								Understanding Level	
	Scientific worldview		Scientific inquiry		Scientific enterprise		Total (9)	%		
	Total score (3)	%	Total score (3)	%	Total score (3)	%			Mean	Interpretation
1	2	66.67	3	100	3	100	8	88.89	4.44	High
2	3	100	3	100	3	100	9	100.00	5.00	Highest
3	2	66.67	2	66.67	3	100	7	77.78	3.89	High
4	3	100	3	100	3	100	9	100.00	5.00	Highest
5	3	100	3	100	3	100	9	100.00	5.00	Highest
6	3	100	3	100	3	100	9	100.00	5.00	Highest
7	3	100	3	100	3	100	9	100.00	5.00	Highest
8	2	66.67	3	100	2	66.67	7	77.78	3.89	High
9	2	66.67	3	100	3	100	8	88.89	4.44	High
Mean	2.56	85.19	2.89	96.30	2.89	96.30	8.33	92.59	4.63	Highest
Std.Dev.	.50		.31		.31		.82			

According to Table 3, it was found that the mean score for the understanding about the nature of science in the three aspects was 92.59%. The scores in each aspect were the score of the scientific worldview was 85.19%, the score for scientific inquiry was 96.30%, and the score of the scientific enterprise was 96.30%.

According to the aforementioned statements, the education with the local science could develop the understanding about nature of science of the students in all mentioned aspects. Learning environments in the new era, online, on site, and real-life situation are integrated approach which help students learn to deal science in contexts. However, the misunderstandings of the nature of science in the aspects might be the learning activities that did not focus on integrating the nature of science with the scientific contents (Abd-El-Khalick & Lederman, 2000; Khishfe & Abd-El-Khalick, 2002). A guideline to develop the understanding about the nature of science was the learning activities with the local science by mixing the local wisdoms that consisted of the local stories and contents. Focusing on the students and their learning local science to meet requirements of understanding about nature of science (Phoopanna & Nuangchalerm, 2022). They can gain also appreciation, rationale, empathy, abilities to apply the scientific knowledge to their societies and lives, living skills that would be applicable and related to environments, societies, cultures and local factors (Jumriani et al., 2021).

This was consistent with the curriculum focusing on developing students into good and happy persons with educational and potential potentials. They should have the awareness of the conservation of local wisdom and cultures, environmental development as well as public minds (El Islami et al., 2018; Nuangchalerm & El Islami, 2018; Mesci et al., 2021; Nuangchalerm et al., 2022). This was also science must not be separated from lives and the ways of lives, but it should be the local education related to the mental processes and empathy of learners as well as natural and cultural facts. Science has locality and it is a process to obtain knowledge that are specific, theoretical, usually used for examinations or believed to be true as stated in texts without considering the steps while using visible tools.

However, there are many things that cannot be measured. This was the origin of the local science. The aim is to make Thai people know science as the process for developing knowledge by themselves. The science created by Thai people is not a western science or trend that used to be, but it is an opened-ended science that considers social relationships and spirits. The local science is the process for learning holistic knowledge from rational processes; records; systematical skills; environmental, social and cultural contents; and external factors affecting lives and environments as well as developing the understandings about locals leading to solving problems, self-reliance, sustainable developments and the ways of lives with natural balances (Sagala et al., 2019).

Therefore, it could be summarized that the education with the local science was the educational concept that could develop the understandings of the nature of science for the department of science and technologies. It allowed the students to learn their surroundings by having the communities and local cultures as the learning bases. It promoted the students to understand the nature of science, to learn the social and cultural processes and to appropriately apply the knowledge to their daily lives (Özyildirim, 2021).

Limitations of the study

Although this study descripts the understanding about nature of local science, it had some limitations. The school contexts in northeast of Thailand depends on school policy and administration. Local science knowledge requires community members' participation in transferring knowledge, understanding educational paradigm, and invitation science to informal education. In addition, an action research requires data from classroom observation, the period of time in COVID-19 outbreak may be made classroom activities in different.

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Ethics and Conflict of Interest

The authors acted in accordance with the ethical rules in the research. The authors declare that they have no conflict of interest.

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SUPPORTING YOUNG CHILDREN'S MATHEMATICAL DEVELOPMENT: THE ROLE OF PARENTS

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Abstract

Undeniably, parents remain one of the most important resources needed in children's mathematical development since children begin education from home. The part parents play in their children's math education are a largely untapped resource for improving the quality of mathematics education among Ghanaian children. In order to maximise this resource, there is the need for basic research on the nature of involvement of parents in their children's mathematical growth. In view of this, we employed case study design to explore ways by which parents involve themselves in their children's mathematical development and how these can be harnessed to improve students' mathematics achievement in Tano North Municipality. This study was guided by the Epstein's overlapping spheres of influence theory. A sample of 10 comprising 5 students and 5 parents was considered for the study. We employed a semi-structured interview to gather the required data which were analysed using inductive content analysis. Among the findings, it was revealed that some of the ways by which parents can help in the development of children's mathematical development is provision of learning resources and activity at home, helping with mathematics homework, encourage good study habits, monitor their school attendance, organize remedial classes, parents' participation in school activities, and teaching appropriate behaviour for academic success. Based on the findings of the study, we recommend the Tano North Municipal Directorate of Ghana Education Service to collaborate with headteachers at the basic schools to create family engagement programmes that highlight parents' role in the children's mathematics development and future success.

Keywords: Parental involvement, children's mathematical development, home and school support, post COVID-19.

INTRODUCTION

Since the COVID-19 pandemic's spread, students all across the world have lost a significant amount of instructional time as a result of unexpected school cancellations. In 2020, school buildings were entirely shuttered for an average of 15 weeks (4 months) over the world, according to UNESCO monitoring (UNESCO, 2021a). Worldwide, schools were closed for an average of 26 weeks (6.5 months), or over two-thirds of a normal school year, when partial closures are taken into account. To assure learning continuity in response, educational systems have implemented remote and hybrid learning modalities. Depending on the modalities, traits, and implementation strategies of the various education programs, these initiatives have produced a range of improvements and reductions in learning inequities for students.

Due to this, almost all students require some catch-up learning, making it imperative for educational systems to promptly deploy and scale up targeted interventions to close students' achievement gaps. It addresses the growing concerns of policy and decision-makers about students' loss of learning or disengagement from learning as a result of the pandemic, as evidenced by low achievement levels at checkpoints compared to expected learning levels, decreased completion rates, and/or widening achievement gaps (UNESCO, UNICEF, & The World Bank, 2020). Particularly for minority students,

the pandemic has widened access gaps to the settings and resources that foster learning and growth (Amoah et al., 2021; Azzi-Huch & Shmis, 2020; Darling-Hammond & Kini, 2020). This prompts questions regarding the necessity of challenging the status quo and reformulating the educational system to prioritize parental involvement in children's academic performance.

It is critical to stress that this is not unexpected. Prior to the pandemic, the baseline operational state of the educational system in Ghana and throughout Africa had significant issues with inclusion and equity. This offers exceptional chances to challenge the status quo (Darling-Hammond & Kini, 2020), i.e., address structural issues in the educational system and invest in cutting-edge strategies that clarify parents' roles and give them the power to actively participate in children's mathematical competence development.

Due to parents' important contributions to the environmental, social, and economic elements that have a significant impact on students' academic success, schools must work closely with families. In the midst of the COVID-19 pandemic, Sharp et al. (2020) did a study and found that the number of students who were supposed to learn remotely at home throughout the summer term was low, with teachers reporting that only 38% of pupils turned in their final assignment. The level of parental involvement, which is essential for student engagement, particularly among children in primary school, was also quite low. Sharp et al. stated that teachers assigning activities requiring group collaboration among children and schools having stronger parental engagement were characteristics linked with reduced estimations of curriculum learning loss. Additionally, schools where a significant portion of parents were actively involved in their children's at-home education were connected with pupils not falling behind. According to the study's findings, parents do not control their children's playtime after school because of the nature of their jobs. The study's findings showed how important parental involvement in their children's education is for their learning, behaviour, and academic success. Therefore, cooperation between parents and schools is necessary in order to advocate for children's welfare and academic performance.

A global outcry has emerged in response to inadequate parental involvement in children's learning processes, which has transcended national boundaries (Epstein, 2001; Nyamosi, 2013). This is very important since a child's education starts at home long before they enter a classroom and is only furthered there. Parents, who are seen as stakeholders in the school community, are extremely important in their children's education. The notion that parental participation is a crucial component of children's academic progress and social adjustment is one of the many pillars of educational reform attempts (Jeynes, 2012). It has been demonstrated that there are direct relationships between parental involvement – a multifaceted and bidirectional construct – and children's social and intellectual outcomes.

Parental participation has traditionally been characterized as involving parents in educationally related activities and events held at the child's school. According to Magwa and Mugari (2017), parental engagement is a broad spectrum of attitudes, behaviours, and activities that take place primarily at home but also in the school context. In American schools where a school representative claimed that more than half of parents engaged in parent-teacher conferences, it was seen that 90% of fourth graders attended those conferences (Christenson & Sheridan, 2001). The U.S. Department of Education's report lists a number of causes for the drop in interest as preschoolers get older (Mwirichia, 2013). Parents of high school students frequently express the opinion that their children should complete their homework independently and that they shouldn't attempt to assist if they are not subject matter experts (Kraft et al., 2011). Many schools' organizational systems can discourage parents from assisting students. A parent room should also be maintained, and parent-to-parent communication and events should be supported. Therefore, it is essential for academic achievement that parental involvement be genuinely incorporated into a school's programs and culture.

Parents can participate at home or in the school. The discussion of school activities, parental objectives and expectations, checking of assignments, home duties, and monitoring are prominent parts of parental participation at home. Contacting school employees, participating in parent-teacher

associations (PTA), going to school plays and sporting activities, and volunteering are all examples of notable parental participation in schools (Chowa et al., 2012; Nyarko, 2011; Won-Tack, 2021). For instance, Chowa et al. (2012) compared from parents who had never participated in their children's education to those who had both at home and in the classroom to study the nature and extent of parental involvement, including engagement and monitoring. The majority of parents report attending PTA meetings, indicating that parental involvement in the school environment is significant. The results also showed a high level of parental involvement with children at home, as most parents reported talking to their children' about expectations. However, the majority of parents claimed they never gave their children's direct homework help.

According to Kraft et al. (2011), the first step towards parental involvement in a child's education may be for parents to be willing to speak with teachers about their child's progress. The OECD (2019) study on parents' involvement in school activities found, among other things, that, on average across the OECD nations, roughly 41% of parents of students addressed their child's achievement with a teacher on their own initiative and 57% did so on the initiative of instructors. However, just 17% of parents took part in local school government and 12% gave their time to extracurricular or athletic activities. Additionally, in the nine OECD nations that circulated the parent questionnaire, the necessity to work (34%) and the lack of time were the two factors that parents most frequently cited as preventing them from participating in school activities.

According to some, the relationship between a child's family and school fosters a unique environment that is ideal for optimal learning (Maphanga, 2006). Parents are considered to have a particular edge over everyone else in that they may provide a more steady and consistently beneficial effect that could enhance and complement what the school develops in their children, notwithstanding the contributions made by students and schools. Parental participation is unquestionably crucial in this aspect (Amponsah et al., 2018). A body of research that gives proof that parents play a key role in their children's education has resulted from the emphasis on the role of parents in policy efforts and throughout the literature. Although it has been acknowledged that parents play a vital role, the specific elements of parental participation that affect academic achievement and the various outcomes of parental involvement for different populations are both subject to a paucity of research (Sheldon & Epstein, 2005).

Numerous studies have been carried out to investigate the elements that influence students' academic performance in various educational institutions. Most of these studies have concentrated on students' personal causative factors, teachers' academic causal factors, and parents' family causal factors (Fan & Williams, 2010). Even while a combination of these elements affects students' academic performance, they differ between academic environments, between groups of students, and between cultural contexts. Parental participation is thought to have a major impact on children's characteristics and behaviours, which in turn affect their aptitude for math. For instance, Chowa et al. (2013) found that parental participation (involvement at home, involvement at school, and communication between parents and teachers) was a predictor of children's school engagement and socioemotional adjustment. In a similar study, parental influences on Greek primary school students' mathematical identities were examined in a qualitatively by Kafoussi et al. (2020). Their study revealed that parental influences on how students built their mathematical identities at home were entwined with their interactions with their parents. In other words, when kids work with their parents at home in a secure atmosphere, their mathematics skills have a potential to increase exponentially. In their investigation of the mediating effects of Chinese students' mathematical self-efficacy, Huang et al. (2021) conceptualised the multifaceted construct of parental participation, comprising cognitive involvement, behavioural involvement, and personal involvement. The results demonstrate that various aspects of parental participation have various impacts on students' mathematical proficiency. There is therefore the need to differentiate between the many involvements that parents take part in.

The value of family involvement in students' education does not appear to be in question, however it is unclear what kind of parental activities are most productive. In the southwest of England, the study by

Jay et al. (2018) identified several particular drawbacks of school-centered methods and showed that these methods may actually limit parents' knowledge of how to encourage mathematics learning at home. This shows that it's important to differentiate between the various forms of parental involvement (Huang et al., 2021). From literature, it has been established that parental involvement in education is essential for children' academic success. Despite these important roles that parents play in their students' lives, parents' contributions to their children's arithmetic learning are still largely unexplored as a resource for raising their children' math grades (Syahadhata et al., 2021). But before that resource can be fully utilized, it is necessary to conduct study on how parents view and participate in their children's mathematical practices. Schools are creating initiatives to connect with parents in response to this in an effort to strengthen the bond that already exists between the school and the families of students (Garcia & Weiss, 2020).

The COVID-19 pandemic, which disrupted the regular operation of schools in Ghana and throughout the world with its associated effects, has contributed to bringing attention to the significance of this underutilized resource (the parent factor), which is frequently disregarded in the context of education. Policy makers and math educators in every educational economy have a duty to create chances for families to participate in their children's mathematical education at home and at school. Davis and Kelly (2017) contend that despite the fact that there some obstacles, policymakers and educators should not disregard the advantages, including improved achievement and favourable views toward arithmetic. Significant crises like COVID-19 offer exceptional chances for stakeholders in mathematics education to reconsider the present quo (Garcia & Weiss, 2020). Considering how parents view and participate in their children's mathematics development and how these might be improved to the benefit of children is necessary now that the pandemic has abated. Policymakers and implementers now have the chance to address structural issues in the educational system and make investments as a result of the study's conclusions.

There is research to support the idea that parental participation affects academic attainment (see, for example, Chowa et al., 2013; Gyamfi & Pobbi, 2018; Won-Tack, 2021). Gyamfi and Pobbi (2018), for instance, looked into the activities that parents engage in that comprise parental dialogue about children's education at home as well as the effects of that conversation on students' academic performance. Parents' discussions were proven to have a good and significant impact on their children's academic success. Studies on parental participation in student academic achievement in the Ghanaian setting (e.g., Chowa et al., 2012, 2013; Nyarko, 2011; Gyamfi, 2016, 2018) looked at the impact of parental involvement on student academic performance. It appears that there is little to no research, if any, that has been done to examine how parents view and participate in their children's mathematical practices. As a result, there is a void in the literature that this study aimed to fill. This study explores ways by which parents involve themselves in their children's mathematical development and how these can be harnessed to improve students' mathematics achievement in Tano North Municipality of Ghana. The study was guided by the following questions:

1. How do parents perceive their involvement in the children's mathematical development in Tano North Municipality?
2. How do parents involve themselves in their children's mathematical development in Tano North Municipality?

The findings of this study will assist the Ghana Education Service, headteachers, and teachers in evaluating the necessity of involving parents in the educational process. Together, schools and families can create a partnership that supports children. Education becomes a collaborative effort in which the value and influence of each participant are acknowledged and characterized by mutual respect and trust. Although teachers, schools, families, and students all gain from their collaboration, the educational process as a whole is improved. The study's findings might make basic school mathematics curriculum designers and implementers aware of the need of taking parental engagement in achieving educational goals into account when making curriculum selections. The findings may also assist parents in dispelling the myth that instructors are the only ones in charge of their children's

education. As a result, it makes parents aware of the various roles that they are expected to play in their children's academic success.

Theoretical framework

Epstein's overlapping spheres of Influence Model served as the basis for this investigation. The ecological model of Bronfenbrenner (1979) served as the basis for the paradigm that is currently used to view parental participation. Part of the ecological systems model proposed by Bronfenbrenner is covered by the theory of overlapping spheres (Harris & Goodall, 2008). Epstein developed a paradigm that puts the kid at the centre and emphasises the overlapping domains of impact that include family, school, and community on the developing child. The effect of the family, school, and community is shown by the circles. The youngster, who serves as the main conduit between each arena, is the factor that unites all circles.

Children's development is influenced by many "spheres of influence," including school, home, and community. When these three environments cooperate to achieve common objectives, children's educational development is improved. To increase the "overlap" between the school, home, and community, it is advised to implement activities that span the six categories of involvement: parenting, communication, volunteering, learning at home, decision-making, and collaboration with the community. By doing so, educators can enhance students' academic performance and school experiences (Epstein, 2001).

The overlapping spheres of influence approach acknowledges that families, schools, and the community engage in some activities alone and in other instances together to affect a child's development and learning (Epstein, 2001). The three spheres' cooperative efforts provide the biggest and most advantageous influence on a child's growth. Greater overlap results from parents becoming more involved in their children's schoolwork as well as from teachers include parents in their normal teaching practices. Accordingly, the theory offers a broad framework from which to understand parental engagement, as stated by Smith (2011). In order to have the maximum impact on the children for whom they share responsibility, schools, families, and the community must work together.

The Concept of Parental Involvement

By providing materials for their children to use in their academic careers, parents are said to be involved in their children's education (Dumont et al., 2012; Nyamosi, 2013). As a multifaceted topic, parental engagement cannot be fully examined by focusing on just one type of involvement. Consideration must be given to a number of elements that could point to parental involvement, including the parents' educational objectives for their kids, their help with homework, their encouragement of good study habits, their participation in school activities, their teaching of appropriate behaviour for academic success, and communication between the home and school.

Parental involvement is defined as parents getting involved in their children' education by giving them resources in a certain area, most notably in their academic careers (Dumont et al., 2012). Parents' educational goals for their children, helping with homework, encouraging good study habits, parents' participation in school activities, teaching appropriate behaviour for academic success, and communication between home and school are just a few examples of the many different types of measures that can be used to define "parental involvement" (Dumont et al, 2012). Due to all of these different factors, parental engagement should be viewed as a multidimensional concept since it is impossible to fully comprehend the relationship between parental involvement and children's education and development by focusing on just one type of contribution (Galindo & Sheldon, 2012). This supports the current study, which explores how parents perceive and involve themselves in the mathematical practices of their children at the junior high school level.

Epstein's Six Types of Parental Involvement

While there are several definitions of parental involvement, most educators concur that it is essential for students' academic growth. Typically, parental involvement is characterised as involvement in both school and home activities. Examples include volunteering at the child's school, communicating with

teachers, assisting with homework, and attending open houses, back-to-school activities, and parent-teacher conferences (Epstein et al., 2009). There are six different types of parental participation in the strategy created by Epstein et al. (2009). The primary responsibility of parents (Type 1) includes the responsibility of a family to ensure the health and safety of the child through parenting, child rearing, ongoing supervision, discipline, and guidance at each age level as well as the provision of conducive living conditions that promote learning and behaviour. To put it another way, this is assisting all families in creating nurturing settings for their children. The primary duty of schools (Type 2) is to inform students and parents about their academic development (e.g., memos, notices, report cards, conferences). It is a way to create two-way conversations about educational initiatives and children's development.

Schools' primary duty is to encourage parental involvement in the learning environment (Type 3). (For instance, occasions, workshops, or courses for their own educational advancement). Parent assistance needs to be gathered and arranged at the school, at home, or in other locations. The fundamental duty of schools (Type 4) is to communicate with parents who organise, monitor, and encourage their kids' academic or homework-related activities. It involves instructing parents on how to help kids with their homework and other resources linked to the course. The fundamental responsibility of schools (Type 5) is defined as parent participation in decision-making committees that monitor educational reform (e.g., advisory councils, Parent-Teacher Association [PTA] etc.).

Parental involvement is the primary duty of schools (Type 3). As a result, parents from various socioeconomic levels serve as representatives and leaders on school committees. Working in collaboration with the community and finding and incorporating a variety of community groups and resources that support school programmes (e.g., Title 1, after-school activities, parent institute committee) are all part of the essential duty of schools (Type 6) (Epstein & Salinas, 2004).

According to Epstein (2001), when schools regularly involve parents, the results are better because the pupils gain from the constant message about the value of education sent by both their home and school. This framework provides numerous examples of best practises, challenges to success, definitions that can be updated for future advancements, and results that can be achieved when families and schools implement the framework (Epstein, 2001; Epstein et al., 2002). As a result, this provides a starting point for the current study from the perspective of parents and students.

Parental Involvement in Students' Academic Achievement

Research has shown that collaborations between schools and families can improve educational initiatives and environments, provide families with the support they require, aid in the development of parents' parenting skills, and connect families with community resources (Epstein, 2001). The ability of these partnerships to create a network of support for kids that will enable them to succeed in school and in the future is perhaps most significant (Epstein et al., 2009). A growing amount of evidence shows that parental involvement at home and collaboration with school personnel enhances children's behaviour and academic success (Haenga, 2015). The two categories of "school-based involvement" and "home-based involvement," which focus on the site of parenting strategies, are the normative divisions of parental participation.

Parental behaviours that involve involvement and contact with schools are referred to as "school-based involvement" (Pomerantz et al., 2007). These behaviours include things like participating in school activities, chatting with teachers, attending meetings at the school, and volunteering there (Pomerantz et al., 2007). Two of the most common ways for parents to get involved in their children's education are parent-teacher conferences, which, according to national polls, are attended by two-thirds of parents in the United States (Pomerantz et al., 2007). By serving on the school board and attending board meetings, parents can engage in more school-related activities with their kids. Because parents have governance positions that offer them greater influence over decisions made at the school, this

level of participation is thought to be higher. However, because so few parents exhibit this higher level of dedication, most studies rarely draws attention to this engagement.

The goal of Haenga's (2015) study, which is anchored in a socio-cultural framework, is to better understand how home-school collaborations in the subject of mathematics may be created in a way that respects the needs and contributions of all participants – students, parents, and instructors. The regular family activities and how better parent knowledge of the mathematical opportunities given in these activities might promote parent confidence to participate in mathematical conversations with their children at home and in their community setting are of particular relevance. The study found that parent understanding of current approaches to teaching and learning in mathematics, better understanding of the language associated with the numeracy development project, and the facilitation of positive relationships between teachers and parents can all be supported by shared learning opportunities that involve parents, students, and teachers. Additionally, adopting activities that incorporate mathematics into regular activities, such as those in which families participate, can serve as a useful scaffold for parents to engage in mathematical conversations with their children more effectively in their own homes and in everyday situations. Opportunities for parents to see instructors' interactions with pupils have also been found to be an effective tool for helping them create more effective communication methods that will help them better support their children's education.

Adam (2018) in a study investigated the role of parents in the education of children with disabilities (CWD) in then Brong-Ahafo Region, Ghana. The study specifically looked at parents' expectations for CWD in schools, parents' participation in CWD decision-making in schools, parents' contributions, and partnerships between parents and teachers to improve CWD learning outcomes in schools. Despite the fact that parents, particularly mothers, frequently attended PTA meetings, the study concluded that parents are not involved in making decisions about matters pertaining to their children's education. The survey also found that parents are under-empowered and do not assist their children with their schoolwork, which has a negative impact on their children' learning outcomes. These findings corroborate what Kwarteng et al. (2022) found in their study that assessed the socioeconomic status and levels of parental participation on the academic performance of junior high school students in Ghana. The descriptive survey design was utilized expressly as part of the study's quantitative methodology. The study came to the conclusion that a significant element influencing students' academic performance is their socioeconomic status, specifically their education, employment, and income levels.

Little study has been done on informal home mathematics education. Parents' contributions to their children' mathematics education are a mostly underutilized resource for helping children perform better in math (Hyde et al., 2006). Due to the erratic relationship between this form of involvement and academic accomplishment, it is unclear exactly how parental homework involvement can be useful. According to studies, helping children with their schoolwork has no discernible effect on their academic performance (e.g., Hyde et al., 2006; Sharp et al., 2020).

Contrarily, Tam and Chan (2009) discovered a favourable correlation between parental involvement in children's schoolwork and their academic growth. Additionally, homework assistance is highly correlated with favourable attitudes about mathematics homework and academic accomplishment when parents are instructed to assist their children with their homework. For instance, Hyde et al. (2006) examined interactions between moms and their fifth-grade children as they worked on difficult arithmetic problems to assess homework habits in the home (pre-algebra equivalence problems). The findings showed that children worked on their math homework for an average of 23 minutes every day, with an additional 8 minutes on average from their parents. The quality of the mathematics content that mothers taught when instructing and the quality of the scaffolding they provided for the child were found to vary greatly among moms, according to videotapes of mother-child interactions. As anticipated, mothers who themselves had more training in mathematics did better when it came to structuring and delivering mathematical material. Mothers who were more confident in their mathematical abilities also did better.

The findings imply that children have unequal access to parental resources for learning math; these imbalances may be addressed through school-family cooperation programs. Gonida and Cortina (2014) investigated the potential predictive power of various types of homework involvement (including autonomous support, control, interference, and cognitive engagement). They discovered that the single factor predicting achievement is autonomy support. Additionally, parental intervention with homework was a poor predictor of success. According to research by Moroni et al. (2015), parental involvement in children' homework was positively correlated with their achievement when it was viewed as encouraging, but negatively correlated when it was viewed as invasive and controlling. Furthermore, compared to students with better reading achievement, students with lower achievement reported increased parental control.

Gyamfi and Pobbi (2018) used the context of Ghana to conduct their study with the goals of identifying significant parental actions that constitute parental discussion at home regarding a child's education and looking into how such discussion affects a child's school performance. For the study, a hybrid design technique was modified. Parents' conversations were proven to have a good and significant impact on their children's academic success. In their prior study, Gyamfi and Pobbi (2016) examined the practice of parental monitoring activities in Ghanaian homes, which are necessary to raise students' academic performance. The goal of the study was to identify the pertinent elements of parental monitoring that are required to enhance a child's academic performance. It specifically looked at the junior high school practise of parental supervision. Seven monitoring activities, including scheduling TV time for the child, limiting playtime, checking homework, selecting a TV show for the child, scheduling the child's return from school, scheduling the child's study time, and selecting subjects for the child, were used to assess parental supervision. The study indicated that parental involvement in all of the activities related to watching over their children's academic progress was minimal.

METHOD

Research design

In order to fulfil the study's objective, we employed case study design. This design helps in gathering data that describe parental involvement in so far as to catch the close-up reality of participants' experiences (Yin, 2014). The study was conducted in one junior high school in Duayaw-Nkwanta in the Tano North Municipality.

Sample size and sampling techniques

In the selected junior high school (JHS), a sample size of 10 comprising 5 students and 5 parents was used for the study. Parents who were included in the study were those who had their wards in the selected JHS. Yin (2014) recommends at least 6 sources of evidence in case study. In other words, six or more interviewees are recommended per case study. Therefore, employing sample size of 10 is considered appropriate.

In the study, we employed purposive and snowball sampling techniques in selecting the school and participants. The decision for the selection of the school was motivated by their high performance in Basic Education Certificate Examination (BECE). We needed to understand how parents contributed to the academic success of their children. The study included only JHS students who were in their final year who gave their consents through consultation with their teachers and confirmed by parents, and these students led us to recruit their respective parents to partake in the study.

Research instrument

We employed semi-structured interview in garnering qualitative data from the participants of the study. The use of semi-structured interview helped us to follow-up questions that came-up in the course of the interview and created room for easy responses to those questions. In ensuring the validity of the instrument, copies of the instrument were given to two colleagues one from Kwame Nkrumah University of Science & Technology and the other from St. Joseph's College of Education for their expert views on improving the quality of the instrument. There were two set of interview guides that were designed to solicit information from both parents and students about how parents perceive and

involve themselves in the mathematical practices of their children. Interview guide for parents consisted of three sections A, B, and C. Section A comprised demographic items such as level of education and work they do for a living. Sections B and C consisted of six questions that solicit information about how parents perceive and involve themselves in the mathematical practices of their children. In the case of students, the interview guide consisted of two sections: A and B. These sections consisted of seven questions that solicit information about how parents perceive and involve themselves in the mathematical practices of their children.

Data collection and analysis

We sought a permission to conduct the study from the Directorate of Ghana Education Service at the Tano North Municipality. Following that, a visit was made to the selected school to seek permission from headteacher to conduct the study in the school. The headteacher then led us to the class and then helped in explaining the purpose of this study to the students, and among those who showed interest, five were selected. We took their parents' phone contact and addresses, and urge the students to share rationale for the study with their parents before we even get to them through contacts. Calls were made to parents on phone where we shared with them the rationale for this study and what they stand to benefit from the findings. We also made arrangements with each of the parents where and when to meet for interview. Based on the agreement, subsequent visits were made to them at their respective homes.

An individual face-to-face interviews were done at the respective homes of participants at the agreed time and day. Twi and English languages were used for the interviews, because the participants were fluent in at least one of the languages. The interviews were recorded with the permission of the participants using mobile phone device**.** During the interviews, participants were requested to give a detailed description of their experiences. This included the participants' experiences at home, and in school. The interview for the study lasted for about an hour with each participant. In this study, we had a prolonged and concentrated engagement with the participants about the study which spanned for almost a month. In order to ensure the study's credibility, we made reflections on the interview by cross-checking with the participants' audios regarding what had been experienced during the interview. The data was then analyzed using content analysis. In order to code the information obtained from the interview, common patterns and themes were identified.

RESULTS

Demographic characteristics of parent participants

From the interviews, the parent participants were found to have had different educational backgrounds. One of the parents had tertiary education with one junior high school leaver. Three parents also had no formal education. Also, three of the parents interviewed were farmers with two engaged in private trade businesses to support their homes.

How Parents Perceive their Involvement in Students' Mathematical Practices

Parental involvement in children's academic success includes initiatives that guarantee students' academic success. In light of this, we questioned participants in an interview how they understood the concept of parental involvement in their children's education. Parental participation involves how parents support their children's learning activities, according to an interview with participating parents. This is evident in the following excerpts:

> "If you ask, I will say it [parental involvement] is about how we [parents] support our children in their learning process by way of encouraging them to study hard." (P3)

Another parent added that:

> "Talking about parental involvement, we mean how parents monitor their children learning progress." (P1)

Similarly, another parent respondent stated:

> "As for me, I will say parental involvement involves parents assisting their children in school so that they can learn and pass their exams." (P4)

Giving the aforementioned quotations from parent respondents, parental participation is defined as parental support for their children's learning, monitoring learning progress, and concerning assistance provided to improve children's academic work.

Parental involvement, according to the student responses, refers to how parents support their children's learning through motivating mechanisms like encouragement, meeting the children's educational needs, and providing all other necessary support. This is depicted in the comments made by some of the student respondents below:

> "Parental involvement is where our parents give us the support we need to learn." (S5)
> "I think parental involvement is when parents get involve in what we [children] learn in school at home" (S2).

It was also commented by one of the student participants that:

> "Parent's involvement is when parents attend to our [children] needs with regards to schooling." (S4)

Parental involvement, as evidenced by the aforementioned comments, is defined as parents actively supporting and providing for their children's educational requirements. This is a consensus among parent and student participants.

The study also investigated how parents felt about being required to participate in school events. The analysis of the interview data showed that parents need to get involved in their children's education by giving them financial and other educational supports. This is captured in the excerpts below:

> "Oh! I can be there to help with any financial or other concerns. We cannot put the education of our children only in the hands of the instructors." (P3)

Another parent respondent remarked:

> "Yes, parents must participate in school events. For instance, parents can provide helpful comments during PTA meetings on how we can best support students' academic performance and the success of the entire school." (P5)

According to the two aforementioned quotations from parent respondents, education of the child should be a shared duty rather than solely the domain of the instructor or school. However, one of the parent participants stated that parents ought not to involve themselves in school matters. She commented that:

> "As for me, I'm not in support. This is due to the fact that the child is for the instructor while at school. Therefore, parents do not need to get involved in school-related issues." (P1)

According to this quotation, parents' involvement in their child's education is seen as an interference because the youngster is mostly in the care of the teacher or school.

The students who participated in the interview all agreed that parents ought to get involved in their children's education since doing so can help them achieve better academically. Comments by some of the student participants is captured in the following excerpts:

> "Sure, even if I don't feel like going to school, my parents can still insist that I do so." (S5)
> "Some of the parents' initiatives might help us [children] in school to succeed academically." (S1)

The study further investigated parents' perspectives on how to engage with their offspring. It was found that parents can influence their children's learning behaviour by keeping an eye on their at-home homework and attendance at school. This is captured in the following excerpts:

> "I think we [parents] can keep an eye on our kids' schoolwork at home and make sure we meet their needs." (P1)
> "Parents can become involved by keeping an eye on their children's attendance at school and meeting their needs while they are there." (P3)

From these two quotations, parents can infer that they should support and monitor their children' academic progress at home, encourage good attendance, and meet their needs while they're at school.

Parents can support their children in setting up remedial lessons and helping them with their homework, according to a parent participant. One commented that:

> "In addition to helping their children with their schoolwork and tasks at home, parents can arrange for their children's extracurricular activities." (P2)

This remark expands on the ways that parents can support their children's education by setting up extra tuition and helping them with their homework. According to the student participants' accounts, parents can assist children with their academics by helping them in doing homework and solving some mathematical problems if possible and by reducing the amount of work they have to do at home. One of them stated that:

> "Some parents who are educated can give their children some support when it comes to doing homework or provide mathematics resource materials." (S4)

Another student also commented:

> "My parents can get involved by buying study materials on mathematics and reducing the amount of work their children have to do at home." (S1)

From the quotes above, students believe that parents can help their students learn by helping them enunciate certain words and by supporting them with textbooks or other reading resources.
Similar to this, one of the student participants said that parents can help their children in doing homework and solving some mathematical problems, and also giving them educational resource like textbooks, food. It was recounted that:

> "Parents who teach math can assist their children in solving some mathematics problems and even buy textbooks and others." (S2)

From the quotation above, parents' contributions to their children' academic success include meeting their educational needs such as helping in homework and solving some mathematical problems so they can succeed in school. Participants in this study agree that parents should be involved in their children's education by offering financial and other educational supports for students to help them perform better academically.

How Parents Involve Themselves in Students' Mathematical Practices

Parental involvement is not limited to a single set of activities and can take many various forms. Parental school involvement encompasses a wide range of activities that are all connected to academic achievement, including helping out in the classroom, interacting with the teacher, engaging in academic activities at home, promoting the importance of education, and participating in parent-teacher relationships. Families who are dedicated to actively promoting their children's mathematics learning and development unquestionably contribute to students' academic performance.

In light of this, we questioned the study's participants about the monitoring of children's mathematical activities to improve their performance in school. It was observed that some parents keep an eye on when their children get home from school and mathematics homework they bring home. This is illustrated in the excerpt below:

> "I can keep an eye on my child's return from school because I am aware of when he leaves for school. And he returns I usually ask whether he was given homework." (P3)

According to the aforementioned remark, parents should keep an eye on when their children get home from school and whether they came home with mathematics homework as that can impact positively on their academic performance. Contrarily, one of the parent participants mentioned that:

> "Hmm! since I finish work late due to the nature of my job, I am unable to truly keep track of when they get home from school. Also, I didn't go to school and so I can help when it comes to students' homework." (P2)

In contrast, this remark finds parents' claims that their ability to supervise their children's return from school and assist in homework is hampered by the nature of their jobs and illiteracy.

In the case of monitoring children's choice of programmes on television when at home, a parent stated:

> "Monitoring the child's television viewing preferences is not at all a concern to me. I don't have television at home, so children won't even have the chance to watch shows, let alone be left alone to choose." (P4)

The aforementioned quotation highlights how crucial it is for parents to be able to afford a television and how their choice of television programmes can have a significant impact on their children's education.

A student who commented on the monitoring of children's choice of programmes on television said:

> "My parents do not choose the shows I should watch on my behalf. But mom frequently drives me away to go learn if she catches me watching TV outside of my free time." (S2)

It was discovered through the accounts of the student participants that some parents keep track of the time their children get home from school. This is captured in the comments below:

> "The time I leave for school is known to my parents. So, if I arrive home late, she asks questions." (S3)
> "My mother can question why I arrive home late because she is aware of the time I am meant to leave for school." (S4)

The two quotations mentioned above back up students' claims that their time away from school is monitored and emphasize the necessity for them to be attentive and make sure the proper thing is done.

The study also looked at how frequently parents and their school-aged children interact about issues involving their academic work and also involve themselves in school activities. From the interview, parents and school-aged children frequently talk about things related to their academic work, though they seldom visit their schools to discuss their math progress. The following excerpts depict some of the parents' narrations:

> "Although I don't get time to attend PTA meetings at school, I usually talk to her at home about the progress she is making in studies especially in difficult subjects like math." (P1)
> "As for meeting my son's teachers at school, it is one thing that I don't do. But my child constantly lets me know what he needs for school and how I can help." (P3)

On the other hand, one parent claimed that he occasionally spoke with the children about issues related to their schoolwork. This is captured in the excerpt below:

> "Sometimes it is carried out. I can make arrangements for my child if he or she informs me of any needs at school." (P5)

The comments above reflect the idea that parents should talk to their children about their mathematics progress at home on a regular basis, and also visit the teachers of wards in school to discuss their

students' academic progress. It could be inferred from this quotation that parents did not frequently discuss their children's academic progress.

The student responses revealed that their parents frequently speak with them about issues pertaining to their academic work. One of them shared his/her experience in the following excerpt:

> "My mum usually requests my exam results, and pay particular attention to what I got in math and English." (S1)

Another student commented that:

> "They frequently check to see if I can understand the material I was taught in school." (S4)

The allegation made by children that their parents talk to them about their studies is also implied in this quotation. The quotations mentioned above back up students' claims that having parents who communicate with them has a good effect on their academic performance.

DISCUSSION and CONCLUSION

Discussions

The value of parental involvement in students' education has long been recognised, as evidenced by the literature. That is to say that, those interested in ensuring that school children have the best possible developmental and educational results have long been interested in the topic of parental participation in education. The two most crucial environments for a child's learning and growth are their home with their parents and their school with their teachers (Galindo & Sheldon, 2012). According to sociologist Epstein, a child's ability to learn can be significantly impacted by the way their family and school are connected. The growth of children and their academic success are impacted by these two fields of influence in "overlapping domains of influence" (Epstein, 2001; Epstein et al., 2009). According to Epstein's theory that cooperation between schools and families broadens the spheres of influence between these two groups, parental involvement can help both families and schools more effectively advance any common goals they may have regarding children's development and academic success.

From the study, it was found that majority of parents have had no form of formal education and majority of them were also farmers. These findings have implication for the extent to which they can involve themselves in the mathematical practices of their children. This is because, academic achievement of the students and the parents' educational background are closely correlated since raising children's mathematical abilities heavily relies on the parents' self-assurance in encouraging the growth of their children's arithmetic knowledge and skills. This is confirmed by Kwarteng et al. (2022) study's and Kafoussi et al. (2020) study's findings. Kwarteng et al. in their study came to the conclusion that a significant element influencing students' academic performance is their socioeconomic status, specifically their education, employment, and income levels. This calls for the Government initiate or if already started increase adult literacy to raise educational standards because doing so will greatly increase parental involvement in their children's education and thus boost students' performance in school subjects. In Papadopoulos' (2017) assertion, the interaction between parents and instructors is centred on empowering parents to assist their children with their homework and connecting kids' success with the amount of time parents spend on it. This is due to the fact that parents who attended school themselves understood the value of education. They have a better likelihood of helping their children succeed academically. This highlights the need to build research around the connections between parental involvement and their mathematical identity in order to improve mathematics education through carefully planned school-family interactions.

While there are several definitions of parental involvement, most educators concur that it is essential for students' academic growth. The interviewees defined parental participation as a method by which parents support their children's learning through encouraging mechanisms including providing for their educational needs. Parental participation, for instance, is described as "talking about how parents

support their children in the learning process" by one responder. This corroborates the definition of parental involvement given by Dumont et al. (2012), who described it as parents' participation in their children's education by giving them resources for their academic careers. Traditional definitions of parental involvement include involvement in both school and home activities, such as assisting with homework, volunteering at the school, engaging with teachers, and parent-teacher conferences. These were consistent with study findings which revealed among other findings that some of the ways by which parents can help in the development of children's mathematical development is provision of learning resources and activity at home, helping with mathematics homework, encourage good study habits, monitor their school attendance, organize remedial classes, parents' participation in school activities, and teaching appropriate behaviour for academic success.

From the study, it was revealed that some of the ways by which parents can help in the development of children's mathematical development is the monitoring of school attendance. Monitoring which is a primary responsibility of parenting according to Jeynes (2012), encompass the measures parents take to meet their children's fundamental physical and safety needs. For instance, arriving late to pick up a child from school might have serious safety repercussions, especially if the school closes and no adults are present. Depending on the child's chronological age, the distance between the child's house and the school, and other factors, different levels of safety protection are provided for school-age children. To ensure that the child does not struggle, parents must at the very least make sure that someone is present to handle the child's meal and transportation needs before and after the school day. Although some older kids can handle these duties on their own, someone should nevertheless keep an eye on their whereabouts before and after school, how they spend their weekends, and who they are spending them with. They should also be checked on about their dietary needs (Jeynes, 2007). In order to further improve their children's education, Pomerantz et al. (2007) suggested that parents watch how their children's teachers train them. By doing so, they may get more information and confidence about how to teach their children at home.

Another way that families can participate in their children's mathematics education is through homework. By creating math homework kits, teachers can come up with creative ways to get parents involved in homework (Davis & Kelly, 2017). All the materials needed to complete the activities were provided in the kits, along with clear, straightforward instructions. In this way, it broadens the range of engaging activities that kids can partake in while educating parents on the math concepts their children were studying in school. The study by Syahadhata et al. (2021) reveals a number of learning assistance strategies that parents can implement to support their children's mathematical development. These strategies include providing learning facilities, supervising children's learning activities at home, supervising how children use their study time at home, monitoring the learning challenges that children face, and assisting children in overcoming learning challenges.

Parents take advantage of the benefits inherent in communication to encourage good study habits as revealed by the study findings. This concurs with the findings from Kraft et al. (2011) study that, children's academic performance was greatly influenced by parent-child communication, which should be enhanced to support easy learning for the kids. They made the point that strong parent-child bonds result in children performing better academically. Cultivating the parents and children relationship is vital to the development of children in education. But for many parents, a key barrier to involvement is a lack of time. This is due to the fact that parents who are employed frequently cannot attend school events during the day. This confirms the study findings that parents do not regulate children's playing time after school due to the nature of their work. The ability to choose, carry out, and make decisions for oneself is a crucial skill for elementary school students to develop because at this age, kids frequently impose their will (Syahadhata et al., 2021). It is important that parents exercise some level of control over their children's daily engagement. In the view of parents granting their children both freedom and limits, parents must help their children develop positive personalities. In order for their children to learn, parents must also apply a lot of control and discipline. In this direction, parents' contributions to their children's success in their homeschooling become crucial. According to studies, parents' diligent attempts to instil discipline and strong study habits in their children are linked to their

performance in school across all family types through effective communication on matters related to academic work (Smith, 2011). This finding is consistent with what was found in the study that parents often communicate with school children on matters relating to their academic work.

Involving parents in their children's formal education makes sense because they serve as their children's first teachers from the moment of their birth (Liu & Liu, 2000). They serve as the children' first teachers and have a lasting impact on their aspirations and values in mathematics. Evidence suggests that parental involvement is important for children's academic performance in Ghana (Chowa et al., 2013; Gyamfi & Pobbi, 2018; Nyarko, 2011) But sadly, on our part of the world, parents still largely remain untapped resource for improving the mathematics performance of children (Hyde et al., 2006). It is therefore imperative that governments address the disparity in early mathematical proficiency and the ensuing achievement gap in high school mathematics (DeFlorio, 2011). From the findings, it was revealed that providing public education for parents could help improve parental involvement in the academic achievement of their children. Parents often do not have the education to engage their children in schoolwork or the resources to hire teachers. Therefore, giving parents the chance to work together through public education will give them the opportunity to exchange knowledge about school policies, practises, community resources, as well as approaches to parenting practises (LeBrun-Martin, 2013; Kafoussi et al., 2020). Schools must develop more effective methods of communication and outreach to parents who are unable, unwilling, or even reluctant to participate because of cultural and social capital hurdles if they are to boost student accomplishment through parental involvement. Engaging parents in conversation about the shift in teaching and learning in mathematics in particular might help to develop a feeling of urgency about the need for a focus on primary mathematics education. By illustrating the backdrop of proposals for reform, discussion of more universal reforms advocated in education today may help parents better comprehend developments in mathematics education

Conclusions

In general, the COVID-19 crisis has served to draw attention to other variables that are sometimes neglected in the context of education but that should be fostered as a necessary component of attending school and that will warrant more attention in the wake of the epidemic. Together, the lessons discovered highlight the necessity of implementing a plan to support children's and lessen educational disparities once the coronavirus-related school closures are gone. In order to raise children and lessen educational disparities, the agenda must also repair the system. To provide wraparound resources, such as parenting classes customized to the individual needs of students across the nation, school systems and the parents of their students must build a flexible set of strategies.

From the findings, it was revealed that some of the ways by which parents can help in the development of children's mathematical development is provision of learning resources and activity at home, helping with mathematics homework, encourage good study habits, monitor their school attendance, organize remedial classes, parents' participation in school activities, and teaching appropriate behaviour for academic success. The results of the study demonstrated that parental involvement in children's education is essential for student's learning, behaviour, and academic achievement. Therefore, there is the need for parents and schools to collaborate in order to promote children's well-being and educational success through advocacy. From the study, providing public education for parents could help improve parental involvement in the academic achievement of their children.

Suggestions for practitioners and academics

According to the study's findings, the following suggestions could be made: From the study, parents can influence their children's learning behaviour in mathematics by keeping an eye on their attendance at school, setting up remedial sessions, and helping them with their homework. Therefore, the study suggests that Tano North Municipal Directorate of Ghana Education Service should collaborate with headteachers at basic schools to develop family engagement programmes that place an emphasis on parent-school partnerships and the parents' role in the children's mathematics development and future success. Future studies could assess homework practices in the Ghanaian homes, and examine

interactions between parents and children as they work out mathematics problems.

Delimitation and limitations of the study

As we interpret the results, we must keep the study's limitations in mind. One of the study's limitations is choice of the research design: case study. The case study's sample size is too small to allow for generalizing the results to the entire population. As a result, the results are biased in favour of the study's contributing elements. Also, for the researcher to function as a translator and transcribe some of the responses in the local language (Asante Twi) may threaten the credibility of the data despite the fact that the researcher is a native speaker of that language. The exploration of parents' views about their parental involvement and how they get involved in the mathematical practices of their children, also placed constraints on this study.

Ethics and conflict of interest

Authors acted in accordance with the ethical rules in all matters such as data collection in the research, and that there is no conflict of interest on the part of the authors.

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THE EFFECT OF THE 5W1H TECHNOLOGY MODEL ON SOME VARIABLES RELATED TO READING SKILLS IN PRIMARY SCHOOL

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Abstract

The main purpose of this research is to examine the effect of the technology integration model-based application example on some reading variables of primary school freshmen. For this purpose, the research was designed in a single-group post-test weak experimental design and a single-group pre-test-post-test weak experimental design. The study group of the research consists of 30 freshmen studying in a branch of a primary school at the middle socioeconomic level determined by criterion sampling method. Dependent t-test and descriptive statistics analysis were used in the analysis of the research data. The application example based on the technology integration model has been effective in the development of phonological awareness skills of primary school freshmen, their transition time to reading, and their reading speed and levels on paper and screen. It was determined that primary school freshmen made fewer reading errors in reading on screen than reading on paper, and the students' reading levels from the screen were better. It was determined that students' attitudes towards reading were quite high.

Keywords: Integration model, literacy, phonological awareness, reading speed, reading level.

INTRODUCTION

Educators who conduct studies on students who are defined as children of the digital age need to carefully plan the use of technology that naturally attracts and motivates them. Güneş (2013) states that children start playing educational games, watching educational broadcasts and television, using the internet and computers at the ages of 2-3 and that they learn to receive various information and messages very easily using these tools. In studies carried out on children's use of technology, it has been found that children under the age of five are heavy users of a range of digital technologies at home, that more than 60% of children under the age of three interact with digital technologies, that 23% of these children use television, computer, and internet, that 20% can multitask while using technology (Palaiologou, 2016) and that children under the age of eight also spend an average of 43 minutes on the mobile phone daily (Johnson, Adams, & Cummins, 2012). Dewey (2013) states that the child should be at the centre of education and the education and instruction to be provided should be designed according to the child's interests, level, and needs. He argues that an education that does not interest the child will be meaningless for him/her and thus he/she may show resistance to learning. For this reason, integrating technology into the first literacy teaching process, which is the first step in the learning journey of children, will make the learning process more enjoyable and provide permanent and meaningful learning.

It is the teachers who will discover the interests of children and provide teaching suitable for their level. Dewey (2013) points out that if teachers fail in their discovery and the provision of the content

suitable for children's level, learning will not take place. During the initial literacy development process, teachers should be able to create the content suitable for children's level and systematically integrate technology into this process to offer interesting experiences for children so that the interest of children can be aroused. For teachers to be able to do these, they need to know the characteristics of primary school children, learning theories and methods and techniques to be used in the initial literacy teaching; moreover, they should understand how to integrate technology into education and instruction and how to perform this integration in practice.

Theoretical Framework

According to Vygotsky's social constructivist learning theory, technology can provide visual teaching support to help children understand complex concepts, and according to Dewey's educational philosophy, children will combine real-world applications and abstract concepts through visual presentations provided by technology (as cited in Roblyer & Doering, 2014). With this visual teaching support provided by technology, it is thought that children will be able to feel the sounds, which is the beginning of the initial literacy teaching, to learn the letters corresponding to these sounds and how to combine them to create syllables and words and to read and write sentences and texts constructed through the meaningful ordering of words rather than just sounding them because they will be able to see the concrete counterpart of everything they sound, read and write with the aid of visual support and presentations. This visual presentation and teaching support provided by technology integration will enable first-grade children who are in the concrete operational stage according to Piaget's theory of cognitive development to learn reading and writing in a shorter time and in a meaningful way in the initial literacy teaching process.

Systematic integration of technology into the initial literacy teaching process is thought to be possible with technology integration models. Technology integration models shed light on how to handle the integration of technology. Usluel, Özmen, and Çelen (2013) stated that the integration process is a multidimensional and dynamic process, and it includes many variables such as teacher competences, individual competences, curriculum, education policies, technological infrastructure, and parents. In the study conducted by Özmen, Koçak Usluel, and Çelen (2014), it was seen that the studies on information technology [IT] integration were mostly focused on the context of "factors affecting integration" because the elements in the integration process are like pieces of a puzzle, they complement each other and when they all come together, a beautiful image is formed. Selection of the suitable environment for the content to be taught, time and IT was as much important as bringing these elements together because the accomplishment of the integration process, which aims to improve the learning process, is possible by selecting the appropriate IT for learning situations and then ensuring the permanence and sustainability of the process (Usluel & Yıldız, 2012). The active use of IT in the learning and teaching process has a significant impact on the development of students' reading, writing, math, and science skills (Zheng, Warschauer, Lin, & Chang, 2016).

The integration of technology into learning and teaching processes is provided systematically with technology integration models. One of these models is the 5N1H technology integration model. The 5W1H (What, Why, Where, When, Who, How) Technology Integration Model is a model developed by Haşlaman, Mumcu, and Usluel (2008) to improve student's learning and evaluate the information technology [IT] integration process. In the model, which has a cyclical structure, the questions of who, why, and how to integrate are the basic questions, and the questions of what, when, and where are under the question of how to integrate (Figure 1). The question "Why to integrate" states the purpose of the integration process. The answer to this question focuses on student learning in terms of pedagogy, technology, and content consistency. Concerning the question "For whom to integrate?", it can be said that the subject of the integration of IT into the educational and instructional process is students. Therefore, it is important to define the characteristics of the students in the target group. The question "How to integrate?" seeks an answer to how to use the determined IT resources and applications with teaching methods and strategies to create and maintain learning environments suitable for the characteristics of the in the target group and the targeted objectives. The question "What to integrate?" is related to which IT resources teachers and students will use. The question

"Where to integrate?" concerns the place of integration such as laboratories, homes, libraries, science centres, and museums. The question "When to integrate" seeks an answer to when to use IT resources and applications for effective lesson planning and integration of IT into the teaching-learning process.

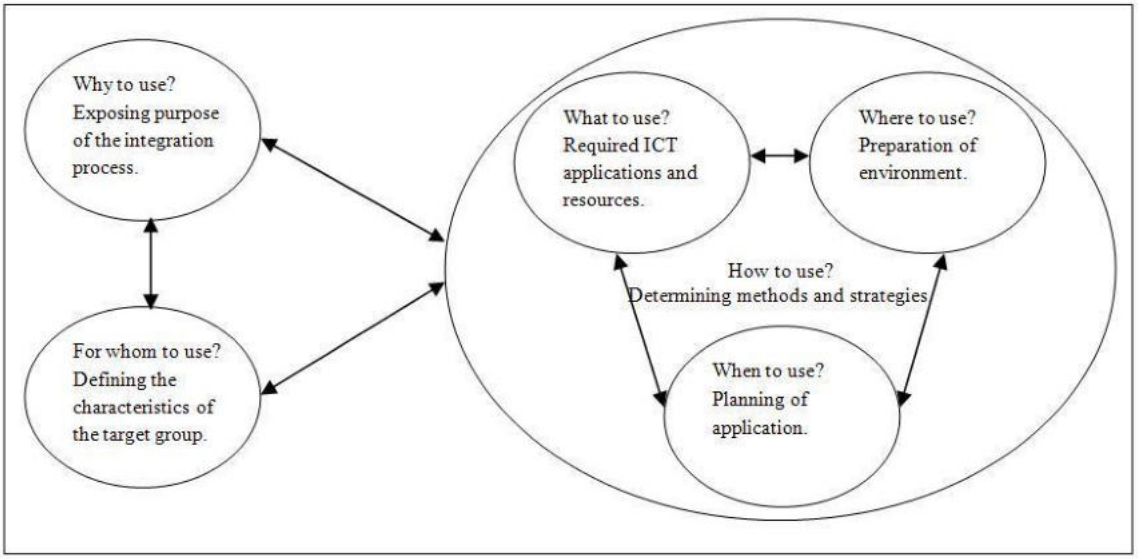

Figure 1. 5W1H technology integration model

It is an observed fact that technology is a part of our daily life and children are interested in technology in daily life. Due to the high interaction of children with technology, it is thought that it is necessary to systematically integrate technology into the initial literacy teaching process and environments, which may affect their academic life and future. Chauhan (2017) argues that if technology is extensively associated with pedagogy, it can be a powerful tool in the learning process of students.

Literature Review

When the literature on literacy teaching and technology integration is examined, it is seen that the visuals of sounds, syllables, and words in digital environments increase students' comprehension levels, improve their success in recognizing sounds, increase their reading speed, facilitate learning and support permanent learning (Açıkalın, 2018; Connor, Day, Zargar, Wood, Taylor, Jones, & Hwang, 2019; Ertem, 2014; Orhan Karsak, 2014a; Güneş, Uysal, & Taç, 2016; Gürol & Yıldız, 2015; Kesik & Baş, 2021; Özdemir, 2017; Taşkaya, 2010; Uğurlu, 2009; Zipke, 2017). It has also been concluded that electronic textbooks, educational software, and interactive boards support the recognition of sounds, letters, and reading texts with visuals and sounds, enable interactive education and that the computer can be a good tool for reading (Açıkalın, 2018; Ertem, 2014; Duran & Ertuğrul, 2012; Orhan Karsak, 2014a; Güneş, Uysal, & Taç, 2016; Kesik & Baş, 2021; Luo, Lea Lee, & Molina, 2017). It has also been determined that reading problems can be eliminated, teaching can be individualized and reading motivation can be improved by using technological tools and software (Açıkalın, 2018; Ertem, 2014; Taşkaya, 2010). Some other results reported in the literature are that primary teachers are willing and think that it is necessary to use digital technologies in Turkish and initial literacy teaching activities; yet, problems such as lack of hardware and software, not knowing how to integrate technology into the teaching process, difficulties in classroom management, teachers' professional experience and having seminars or training on the integration of technology affect technology integration and that the existing educational software should be arranged by the level and purpose of teaching (Duran & Ertuğrul, 2012; Ertem, 2016; Orhan Karsak, 2014a; Kartal, Baltacı Göktalay, & Sungurtekin, 2017; Özerbaş & Güneş, 2015).

It is thought that there is a need for an application-based study that will systematically integrate technology into the initial literacy teaching process and bridge the gap between theory and practice. In line with this need, within the scope of this research, answers were sought to the questions of why/who/how/what/where/when technology integration would be achieved in the first literacy

teaching process. Based on these questions, an application example based on the 5W1H technology integration model was designed and used because it allows for a structure where teaching activities are carried out systematically in the classroom and out-of-class environments. Besides, teacher-parent-student communication and interaction are ensured, and students' literacy skills can be followed easily. The use of the application sample prepared based on the technology integration model in the first literacy teaching process is believed to be a guide in the design and development of technology-supported environments in the context of the development of children's first literacy learning and skills, and contributes to the identification and elimination of the problems encountered in the implementation process. In addition, with this research, it is seen that not only the development of children's literacy learning skills, but also their digital skills can develop, that children can be prevented from learning to read and write incorrectly in out-of-class environments, that teachers can systematically integrate digital technologies into the first literacy teaching process, and that parents can help their children in the first literacy teaching process. The current study aimed to design a sample application based on the 5W1H technology integration model to apply in the initial literacy teaching process and to determine the effect of this model-based sample application on some reading variables. To this end, the study seeks answers to the following questions:

What are the effects of the sample application developed based on the 5W1H technology integration model to be conducted in the initial literacy teaching process in the primary school first-grade Turkish lessons;

1. on the development of phonetic awareness skills?
2. on the process of transition to reading?
3. on the speed and level of reading from paper and screen?
4. on the errors of reading from paper and screen?
5. on the attitudes towards reading?

METHOD

The purpose of the current study is to determine the effects of a 5W1H technology integration model-based sample application on some variables related to the reading skills of primary school first-grade students. In this connection, the weak experimental design, one of the quantitative research models, was preferred in the collection, analysis, and interpretation of the data. The weak experimental design is a design used when very few of the threats to internal validity can be controlled (Christensen, Johnson, & Turner, 2015). In the current study, the single group posttest weak experimental design and single group pretest-posttest weak experimental design were used together to determine the effect of the sample application based on the 5W1H technology integration model on some variables related to primary school first-grade students' reading skills. Within the purpose of the current study, the weak experimental design is deemed to be more appropriate as it is not possible to fully control all the variables that are not under investigation (McMillan & Schumacher, 1997). The reason why there is no control group in the study is that the study was carried out during the Covid-19 pandemic. In this process, it is very difficult to find a control group not subjected to technology-supported applications.

Focus Group

The study group of the current research is comprised of 30 first-grade primary school students attending one of the classes of a primary school in the central district of Haliliye in the city of Şanlıurfa, Turkey, in the winter term of the 2020-2021 school year. In the determination of the study group, criterion sampling was preferred. Criterion sampling is one of the purposive sampling methods. Patton (1987) states that probability-based sampling provides significant benefits in making valid generalizations about the population through representation, while purposive sampling allows for an in-depth study of situations that are thought to have rich information. The criteria used in the selection of the participants of the current study were their attending a school of a medium socio-economic level, their having devices to connect to the internet (computer, tablet computer, or mobile phone) and their having an internet connection (home internet or mobile phone internet).

The ages of the students in the focus group, as of September 2020, range from 68 to 80 months. Considering the average monthly income of the parents of the students, 12 of them have an average monthly income of 2 thousand TL and below, 6 of them between 2 thousand and 3 thousand TL, 2 of them between 3 thousand and 4 thousand TL, and 10 of them have an average monthly income of 4 thousand TL or more. When the educational status of the mothers of the participant students is examined, 11 of the mothers are primary school graduates, 3 of them are secondary school graduates, 11 of them are high school graduates and 5 of them are university graduates. When the father's education level is examined, 6 of the fathers are primary school graduates, 2 are secondary school graduates, 12 are high school graduates and 10 are university graduates. While 13 of the students have a computer at home, 17 of them do not. While 29 mothers and 26 fathers have mobile phones, 1 mother and 4 fathers do not. In total, 27 of them have the internet on their parents' mobile phones, while 3 of them do not. While 14 of the students have an internet connection at home, 16 of them do not. While only 13 of the participants use the Internet for their course activities, the rest use the Internet for different purposes in various amounts, as well.

Experimental Application

As it is not possible to fully control all the variables in the research, it is thought that choosing a weak experimental design is a more accurate choice (McMillan & Schumacher, 1997). The reason for the lack of a control group in the study is that the research practices were carried out during the Covid-19 epidemic; therefore, in this process, it is very difficult to find a control group without technology-supported applications.

Before the application, the Early Literacy Skills Assessment Tool was applied as a pre-test. Later, lessons were organized based on the 5W1K technology integration model during the first literacy teaching process for 18 weeks, and in the independent literacy process for 3 weeks. During the application process, the researchers were in the classroom as an observer, and the applications were made by the teacher. At the end of the experimental process, the texts used with the Early Literacy Skills Assessment Tool in the pre-test were read to the students, and the Transition Time to Reading Form, Reading Speed Form, Error Analysis Inventory, and Attitude towards Reading Scale were applied as the post-tests.

In the experimental designs applied in the study, the dependent variables were determined as primary school freshmen students' phonological awareness skills, transition times to reading, reading speed from paper and screen, their levels and errors, and attitudes towards reading. The independent variable whose effect on these determined dependent variables is examined is an example of an application based on the applied 5W1H technology integration model.

Data Collection Tools and Analysis

The tool by which the data were collected within the scope of the current study is stated next to the relevant problem statement and explained in Table 1.

Table 1. Research problems, data collection tools, and analysis methods

Research Problems	Data Collection Tools	Analysis Methods
What is the effect of the sample application developed based on the 5W1H technology integration model to be conducted in the initial literacy teaching process in the primary school first-grade Turkish lessons;		
1. on the development of phonetic awareness?	Early Literacy Skills Evaluation Tool [ELSET]	Dependent Samples t-test
2. on the process of transition to reading?	Form of Transition to Reading	Descriptive Statistics
3. on the speed and level of reading from paper and screen?	Reading Speed Form Error Analysis Inventory	Descriptive Statistics
4. on the errors of reading from paper and screen?	Error Analysis Inventory	Descriptive Statistics
5. on the attitudes towards reading?	The Scale of Primary School Students' Attitudes towards Reading	Descriptive Statistics

In the current study, to collect data for the first research question, the Early Literacy Skills Evaluation Tool [ELSET] developed by Karaman (2013) was used; to collect data for the second research question, the Form of Transition to Reading developed by Kesik (2021) was used; to collect data for the third and fourth research questions, the Reading Speed Form developed by Kesik (2021) and the Error Analysis Inventory developed by Ekwall and Shanker and adapted to Turkish by Akyol (2020) were used; to collect data for the fifth research question, the Scale of Primary School Students' Attitudes towards Reading developed by McKenna and Kear (1990) and adapted to Turkish from English by Kocaaslan (2016) was used.

The data collected with the Reading Speed Form, the Form of Transition to Reading, the Early Literacy Skills Evaluation Tool, the Error Analysis Inventory, and the Scale of Primary School Students' Attitudes towards Reading were analysed by using the SPSS 22.0 program package. In the analysis of the collected data, dependent samples t-test and descriptive statistics were used. The obtained findings are explained with tables and graphs in the findings section.

A sample application based on the 5N1H technology integration model

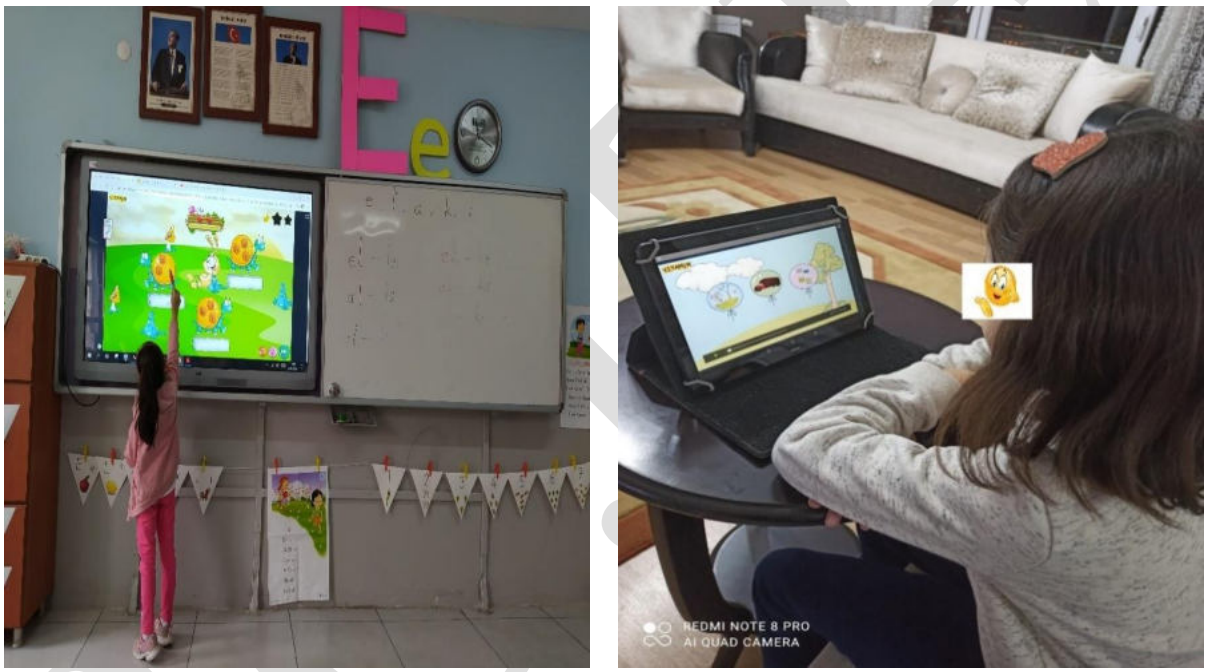

Figure 2. Visuals from the application

In the current study, a sample application based on the 5W1H technology integration model was designed to apply in the initial literacy teaching process. In the designed sample application, each sub-question of the 5W1H technology integration model was answered according to the variables of the initial literacy teaching. The answers to the questions of why to integrate, for whom to integrate, how to integrate, what to integrate, where to integrate, and when to integrate into the initial literacy teaching are respectively as follows: The reason for the integration in the initial literacy teaching is to perform the integration of technology into the teaching process in a systematic way and to determine its effect on children's reading skills. Moreover, it is to present a sample application based on a model of technology integration in the initial literacy teaching so that the gap between theory and practice can be closed. The integration in the initial literacy teaching process included children aged 69 months and over, and their primary teachers and parents. In the initial literacy teaching process, integration was carried out with different learning activities based on active and web-based learning, where interaction and communication were intense, including homework from printed materials and online assignments, and reading exercises from printed materials and on-screen.

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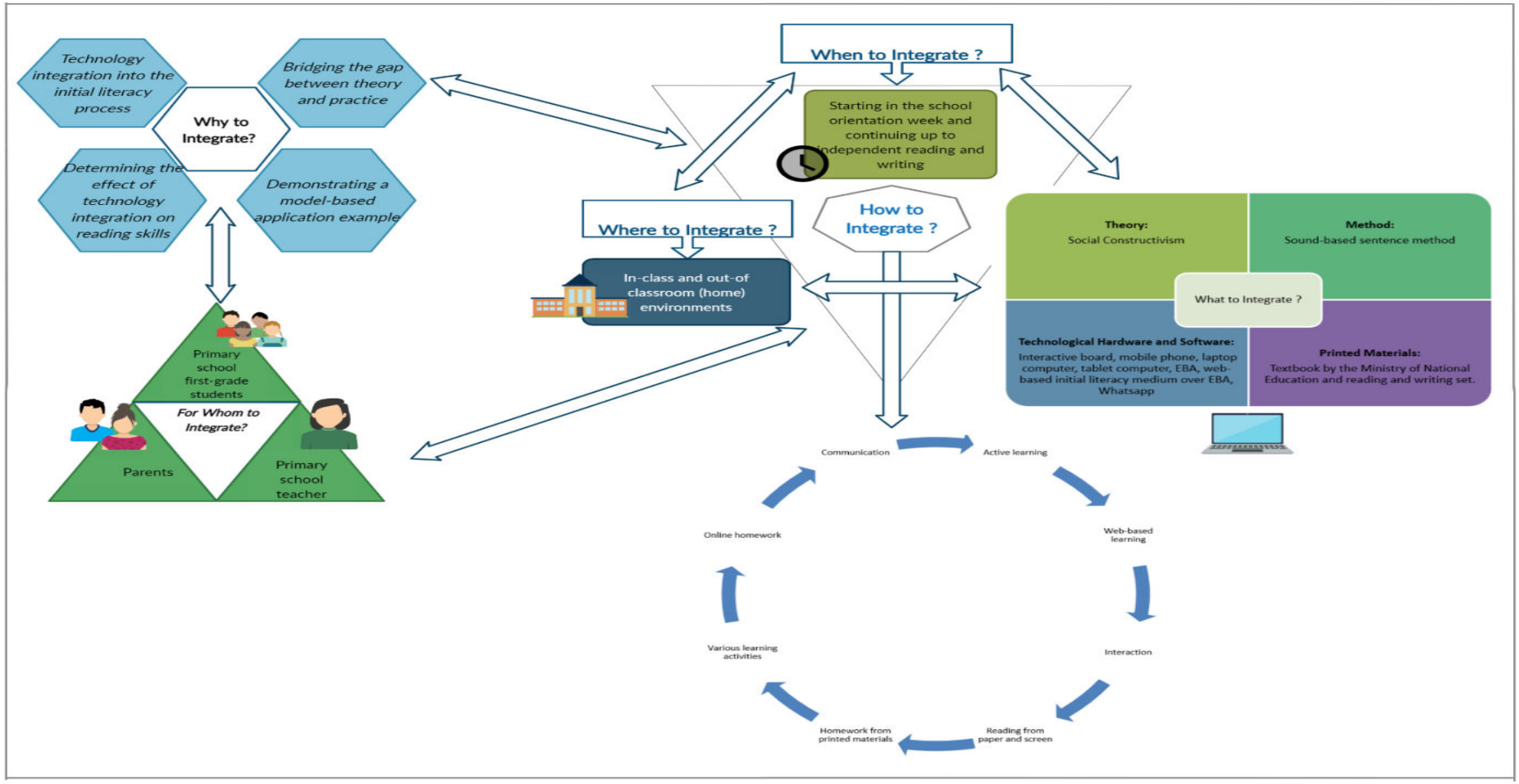

Figure 3. Sample application based on the 5W1H technology integration model

In the provision of the integration in the initial literacy teaching process, Vygotsky's social constructivist learning theory was used as the theory of integration, Sound Based Sentence Method recommended in the Turkish Curriculum of the Ministry of National Education, Education and Training Board was used as the method, interactive board (in the classroom), tablet computer (at home), mobile phone (at home) and laptop (at home) were used as the technological equipment and the Web-based initial literacy environment and Whatsapp messaging platform were used as the technological software. The sample application based on the 5W1H technology integration model was conducted in the classroom environment and in the out-of-class (home) environment through parental guidance. The application was started during the school orientation week and was completed when the children switched to independent reading. The visual summary of the model is given in Figure 3.

FINDINGS

In this section, the phonological awareness skills pre-test and post-test scores, transition times to reading, speed and levels of reading from paper and screen, errors in reading from paper and screen, and attitudes towards the reading of primary school freshmen in which a technology integration model-based application example was implemented in the first literacy teaching process findings and comments are included.

Findings related to Phonological Awareness Skills

In the current study, dependent samples t-test was conducted to determine whether there occurred a significant change in the phonological awareness skills (matching words starting with the same sound, noticing rhymed words, finding the initial sound of the given word, producing words starting with a stimulating sound, producing words starting with the same sound, omitting syllables or sounds, combining sounds) of primary school first-grade students who were subjected to a sample application based on the technology integration model in the initial literacy teaching process. In Table 3 below, the dependent samples t-test results showing the students' phonological awareness pretest and posttest scores are given.

Table 3. Results of the dependent samples t-test conducted to compare the pretest and posttest scores of the students subjected to the sample application based on the technology integration model

Matching Words Starting with the Same Sound	**N**	**Mean**	**Std.Dev.**	**df**	**t**	**p**
Pretest	30	3.23	1.52	29	-7.97	.00*
Posttest	30	5.53	.86			
Noticing Rhymed Words	**N**	**Mean**	**Std.Dev.**	**df**	**t**	**p**
Pretest	30	4.76	2.37	29	-7.75	.00*
Posttest	30	8.10	1.26			
Finding the Initial Sound of the Given Word	**N**	**Mean**	**Std.Dev.**	**df**	**t**	**p**
Pretest	30	7.00	3.50	29	-4.33	.00*
Posttest	30	9.36	1.35			
Producing Words Starting with a Stimulating Sound	**N**	**Mean**	**Std.Dev.**	**df**	**t**	**p**
Pretest	30	3.46	2.14	29	-5.36	.00*
Posttest	30	5.50	.93			
Producing Words Starting with the Same Sound	**N**	**Mean**	**Std.Dev.**	**df**	**t**	**p**
Pretest	30	1.90	1.49	29	-14.29	.00*
Posttest	30	5.50	.93			
Omitting Syllables or Sounds	**N**	**Mean**	**Std.Dev.**	**df**	**t**	**p**
Pretest	30	3.66	3.60	29	-7.07	.00*
Posttest	30	8.46	1.63			
Combining Sounds	**N**	**Mean**	**Std.Dev.**	**df**	**t**	**p**
Pretest	30	2.73	2.50	29	-8.42	.00*
Posttest	30	6.60	.72			
Phonological Awareness Skills Total	**N**	**Mean**	**Std.Dev.**	**df**	**t**	**p**
Pretest	30	26.76	12.25	29	-10.77	.00*
Posttest	30	48.06	5.40			

*p<.05

The results of the dependent samples t-test conducted to determine whether the primary school first-grade students' phonological awareness skills varied significantly as a result of their exposure to the sample application based on the technology integration model are given in Table 3. As a result of the analysis, it was found that there is a significant difference [$t_{(29)}$= -7.97, p<.05] between the pretest mean score ($Mean_{Pretest}$=3.23) and posttest mean score ($Mean_{Posttest}$=5.53) taken for the skill of matching words starting with the same sound and the effect size of this difference was found to be large (d=-1,46); that there is a significant difference [$t_{(29)}$=-7.75, p<.05] between the pretest mean score ($Mean_{Pretest}$=4.76) and the posttest mean score ($Mean_{Posttest}$=8.10) taken for the skill of noticing rhymed words and the effect size of this difference was found to be large (d=-1.41); that there is a significant difference [$t_{(29)}$=-4.33, p<.05] between the pretest mean score ($Mean_{Pretest}$=7.00) and the posttest mean score ($Mean_{Posttest}$=9.36) taken for the skill of finding the initial sound of the given word and the effect size of this difference was found to be medium (d=-0.62); that there is a significant difference [$t_{(29)}$=-5.36, p<.05] between the pretest mean score ($Mean_{Pretest}$=3.46) and the posttest mean score ($Mean_{Posttest}$=5.50) taken for the skill of producing words starting with a stimulating sound and the effect size of this difference was found to be large (d=-0.97); that there is a significant difference [$t_{(29)}$=-14.29, p<.05] between the pretest mean score ($Mean_{Pretest}$=1.90) and posttest mean score ($Mean_{Posttest}$=5.50) taken for the skill of producing words starting with the same sound and the effect size of this difference was found to be large (d=2.62); that there is a significant difference [$t_{(29)}$=-7.07, p<.05] between the pretest mean score ($Mean_{Pretest}$=3.66) and the posttest mean score ($Mean_{Posttest}$=8.46) taken for the skill of omitting syllables and sounds and the effect size of this difference was found to be large (d=1.29); that there is a significant difference [$t_{(29)}$=-8.42, p<.05] between the pretest mean score ($Mean_{Pretest}$=2.73) and posttest mean score ($Mean_{Posttest}$=6.60) taken for the skill of combining sounds and the effect size of this difference was found to be large (d=1.53). As a result of the dependent samples t-test, it was also found that there is a significant difference [$t_{(29)}$=-10.77, p<.05] between the total pretest mean score ($Mean_{Pretest}$=26.76) and the total posttest mean score ($Mean_{Posttest}$=48.06) and the effect size of this difference was found to be large (d=1.96). The contribution of the students' engagement in various activities such as listening to songs for each specific sound, watching animations, and constructing syllables and words through interactive activities during the sample application to this general large effect size is thought to be important. These findings show that the sample application conducted based on the technology integration model had a significant effect on the development of the primary school first-grade students' phonological awareness skills.

Findings related to Transition to Reading

In the current study, in order to determine the time of transition to reading of the primary school first-grade students subjected to the sample application based on the technology integration model, from the date of the first start of the initial literacy teaching process onward, the dates when each student started reading syllables, words, sentences and texts related to sounds in the 1st, 2nd, 3rd, 4th and 5th sound/letter groups [the sounds/letters in the Turkish alphabet in Turkey are taught by being classified into 5 groups on the basis of the principle of from the easiest to the most difficult: e, l, a, k, i, n in the first group; o, m, u, t, ü, y in the second group; ö, r, ı, d, s, b in the third group; z, ç, g, ş, c, p in the fourth group and h, v, ğ, f, j in the fifth group] in the Turkish curriculum implemented in Turkey and the dates when the students started reading independently after the completion of study of the sound/letter groups were added to the form of time of transition to reading. The added dates were then written as days and the primary school first-grade students' times of reading the syllables, words, sentences, and texts in the relevant sound groups and their transition to independent reading were determined. The number of days in which the primary school first-grade students read the syllables, words, sentences, and texts in the relevant sound group and switched to independent reading is shown in Figure 4.

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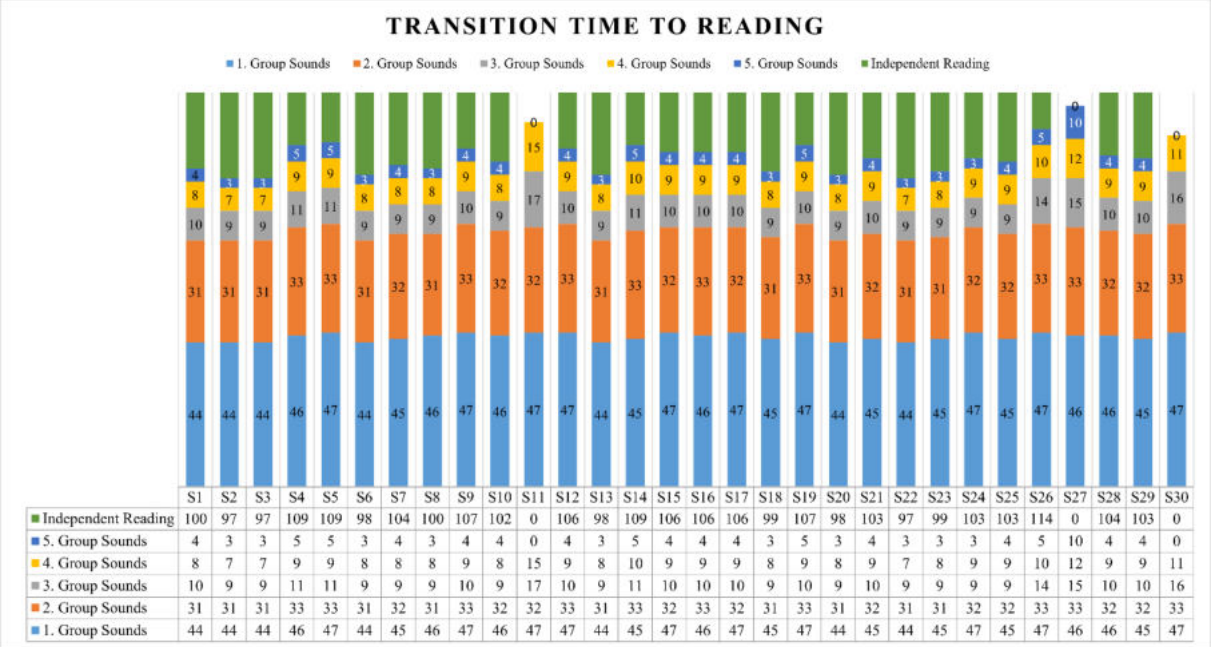

	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	S14	S15	S16	S17	S18	S19	S20	S21	S22	S23	S24	S25	S26	S27	S28	S29	S30
Independent Reading	100	97	97	109	109	98	104	100	107	102	0	106	98	109	106	106	106	99	107	98	103	97	99	103	103	114	0	104	103	0
5. Group Sounds	4	3	3	5	5	3	4	3	4	4	0	4	3	5	4	4	4	3	5	3	4	3	3	3	4	5	10	4	4	0
4. Group Sounds	8	7	7	9	9	8	8	8	9	8	15	9	8	10	9	9	9	8	9	8	9	7	8	9	9	10	12	9	9	11
3. Group Sounds	10	9	9	11	11	9	9	9	10	9	17	10	9	11	10	10	10	9	10	9	10	9	9	9	9	14	15	10	10	16
2. Group Sounds	31	31	31	33	33	31	32	31	33	32	32	33	31	33	32	33	32	31	33	31	32	31	31	32	32	33	33	32	32	33
1. Group Sounds	44	44	44	46	47	44	45	46	47	46	47	47	44	45	47	46	47	45	47	44	45	44	45	47	45	47	46	46	45	47

Figure 4. Times in which the primary school first-grade students read the syllables, words, sentences, and texts in the relevant sound group and switched to independent reading.

As can be seen in Figure 4, the primary school first-grade students started reading the syllables, words, sentences and texts related to the sounds in the 1st group within a time period ranging from 44 to 47 days; the syllables, words, sentences and texts related to the sounds in the 2nd group within a time period ranging from 31 to 33 days; the syllables, words, sentences, and texts related to the sounds in the 3rd group within a time period ranging from 9 to 17 days; the syllables, words, sentences and texts related to the sounds in the 4th group within a time period ranging from 7 to 15 days and the syllables, words, sentences and texts related to the sounds in the 5th group within a time period ranging from 3 to 5 days. Of the participating students, 27 started independent reading within a time period ranging from 97 to 114 days while the remaining three students (S11, S27, and S30) could not start independent reading. When these data are examined, it is seen that there is a decrease in the time period in which the students completed reading the syllables, words, sentences, and texts related to the other sound groups after completing reading the syllables, words, sentences, and texts related to the first sound group. This shows that the students became more and more practical in the context of combining the learned sounds and decoding the reading. It is thought that the shortening of the reading time, especially after the 1st and 2nd sound groups is due to the sample application based on the technology integration model. Thus, it can be argued that the necessary infrastructure for learning to read was formed in the students, and accordingly, the students could read the syllables, words, sentences and texts related to the other three sound groups in a shorter period. Through the sample application based on the technology integration model, the primary school first-grade students acquired the necessary skills in the 1st and 2nd sound/letter groups in terms of combining sounds and reading and practiced these skills in the other sound/letter groups and switched to independent reading.

Findings Related to Speed and Level of Reading from Paper and Screen

In the current study, to determine the reading speed and level of the primary school first-grade students subjected to the sample application based on the technology integration model in their initial literacy teaching process, the researcher had the students read the same text from paper and screen after they switched to independent reading (February 2021 / Winter term). While the students were reading the text, they were video-recorded by the researcher. Then, the video recordings were watched by the researcher and the students' reading speed was determined according to how long it took them to read the text and the number of words they read correctly in one minute, and their percentages of word

recognition and reading levels were determined according to the Error Analysis Inventory. The students' time to complete the reading of the text, reading speed, word recognition percentages, and levels are explained in Table 4.

Table 4. The primary school first-grade students' speed and level of reading from paper and screen

	Reading from Paper				Reading from Screen			
Student	**Time to Read the Text**	**Reading Speed**	**Word Recognition Percentage**	**Reading Level**	**Time to Read the Text**	**Reading Speed**	**Word Recognition Percentage**	**Reading Level**
S1	4.3	15	84	Worry	5.3	17	99	Free
S2	2.03	37	92	Teaching	2.12	43	99	Free
S3	1.15	63	96	Teaching	1.05	69	91	Teaching
S4	3.1	21	94	Teaching	3.24	24	96	Teaching
S5	4.54	14	92	Teaching	4	21	92	Teaching
S6	4.34	16	92	Teaching	4.22	21	97	Teaching
S7	2.43	22	71	Worry	4.06	20	92	Teaching
S8	5	6	83	Worry	4.12	16	85	Worry
S9	4.55	20	92	Teaching	2.76	22	95	Teaching
S10	2.1	35	94	Teaching	2.13	40	99	Free
S11	*Recognizes sounds and letters but cannot read independently.*							
S12	5.45	13	92	Teaching	4.42	20	95	Teaching
S13	2.15	30	82	Worry	2.14	33	88	Worry
S14	5.31	17	92	Teaching	4.23	19	89	Worry
S15	1.23	44	74	Worry	1.49	48	99	Free
S16	5.93	6	81	Worry	5.55	11	88	Worry
S17	1.47	48	100	Free	1.4	49	99	Free
S18	4.57	12	72	Worry	5.83	16	95	Teaching
S19	5.77	3	68	Worry	8.49	7	86	Worry
S20	1.41	38	85	Worry	2.06	42	99	Free
S21	6.44	12	83	Worry	5.24	13	91	Teaching
S22	2.4	31	77	Worry	2.03	32	82	Worry
S23	3.15	22	94	Teaching	3.2	30	97	Teaching
S24	1.43	39	92	Teaching	2.01	46	100	Free
S25	6.33	7	70	Worry	5.53	7	74	Worry
S26	5.88	6	76	Worry	9	7	90	Teaching
S27	*Recognizes sounds and letters but cannot read independently.*							
S28	9	9	92	Teaching	8.05	13	89	Worry
S29	4.76	17	95	Teaching	4.52	17	100	Free
S30	*Recognizes sounds and letters but cannot read independently.*							

When Table 4 is examined, it is seen that the primary school first-grade students' time of reading from paper ranges from 1.15 to 9 minutes while their time of reading from screen ranges from 1.05 to 9 minutes. Of the participating 30 students, S11, S27, and S30 were able to recognize the sounds and letters but could not combine and read them. The remaining 27 students' times of reading from paper and screen are as follows; 5 students read the whole text from the paper within a time period ranging from 1 to 2 minutes; 5 students in a time period ranging from 2.01 to 3 minutes; 2 students in a time

period ranging from 3.01 to 4 minutes; 7 students in a time period ranging from 4.01 to 5 minutes; 5 students in a time period ranging from 5.01 to 6 minutes; 2 students in a time period ranging from 6.01 to 7 minutes and 1 student in 9 minutes. On the other hand, 3 students read the whole text from the screen within a time period ranging from 1 to 2 minutes; 7 students within a time period ranging from 2.01 to 3 minutes; 3 students within a time period ranging from 3.01 to 4 minutes; 6 students within a time period ranging from 4.01 to 5 minutes; 5 students within a time period ranging from 5.01 to 6 minutes and 3 students within a time period ranging from 8.01 to 9 minutes. Accordingly, the means of the students' times of reading from paper and screen were calculated. The students' mean time of reading from paper was found to be Mean = 3.93 while that of reading from screen was found to be Mean = 4. When the means are examined, it is seen that the students completed reading from paper in less time than screen, with a difference of 7 seconds. Since the difference is very small, it can be said that the reading times from paper and screen are almost the same.

Reading speed was determined according to the correct number of words that the students read from paper and screen in 1 minute. As can be seen in Table 4, one student's reading speed from paper was found to be 63, 8 students' reading speeds from paper were found to be varying between 30 and 48, 12 students' reading speeds from paper were found to be varying between 12 and 22, 6 students' reading speeds from paper were found to be varying between 3 and 9. When the students' reading speeds from screen were examined, 1 student's reading speed from screen was found to be 69, 9 students' reading speeds from screen were found to be varying between 30 and 49, 14 students' reading speeds from screen were found to be varying between 11 and 24, 3 students' reading speeds from screen were found to be 7. Three students could not switch to independent reading. In Turkey, there are no standardized norms regarding the reading speed of students on a class and term basis. The existing research indicates that primary school first-grade students are expected to read between 0-10 words in the fall term, between 10-50 words in the winter term, and between 30-90 words in the spring term (Akyol, Yıldırım, Ateş, Çetinkaya & Rasinski, 2014). Thus, it can be argued that 21 of the participating primary school first-grade students' reading speeds from paper and 24 of the participating primary school first-grade students' reading speeds from screen comply with their grade level for the winter term.

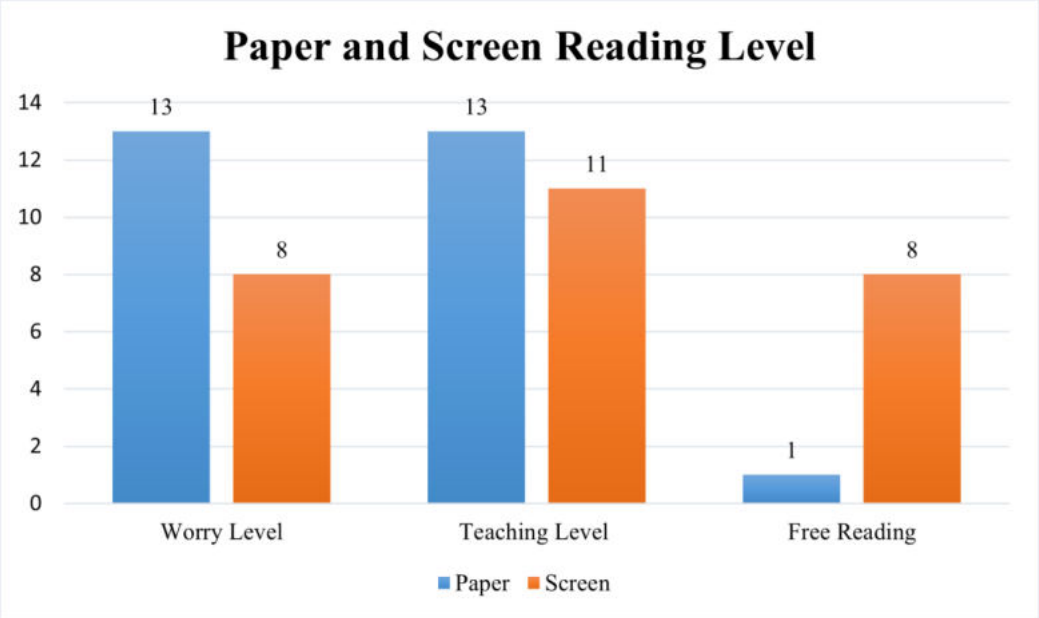

Figure 5. Levels of reading from paper and screen

In the current study, the percentages of word recognition from paper and screen and, accordingly, reading level of the primary school first-grade students were determined. Although there is no expectation in terms of reading level for the winter term for primary school first-grade students

(Akyol, Yıldırım, Ateş, Çetinkaya, & Rasinski, 2014), word recognition percentages and reading levels of the primary school first-grade students were determined as a result of the application in the current study. As can be seen in Table 4, 14 students' word recognition percentages from paper are 92 and higher, and 13 students' word recognition percentages are 85 and lower. Thus, one student's reading level from paper is at the free reading level, 13 students' reading levels from paper are at the teaching level and 13 students' reading levels from paper are at the worry level. When the word recognition percentages from screen in Table 4 are examined, it is seen that 19 students' word recognition percentages from screen are 90 and higher, and 8 students' word recognition percentages from screen are 89 and lower. Thus, it can be said that 8 students' reading levels from screen are at the free reading level, 11 students' reading levels from screen are at the teaching level and 8 students' reading levels from screen are at the worry level. The participating students' levels of reading from paper and screen are shown in Figure 5.

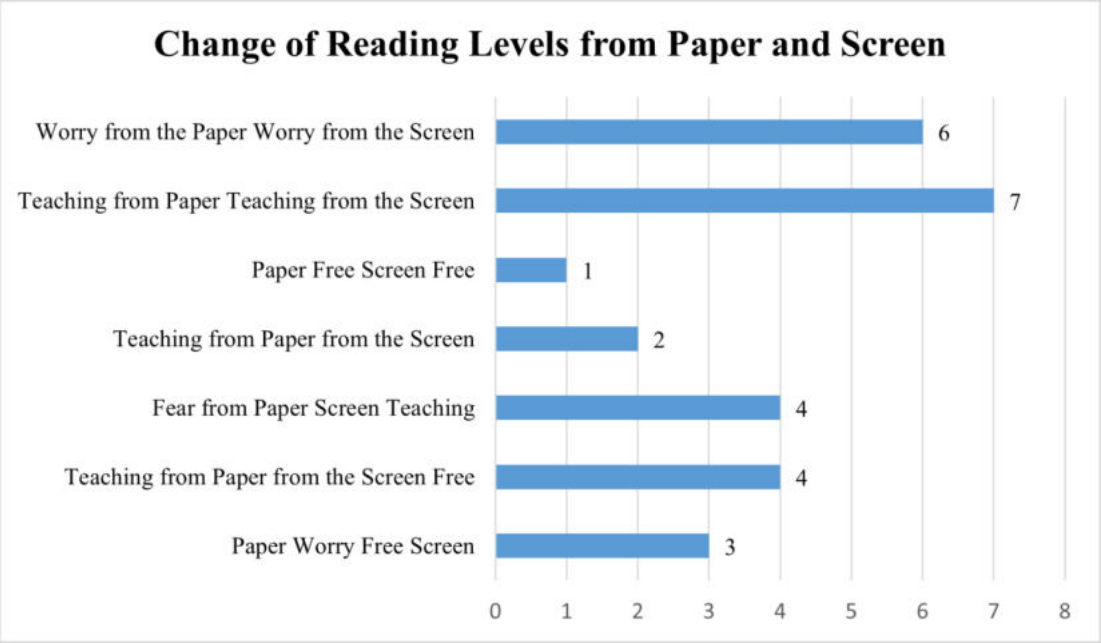

Figure 6. Change of reading levels from paper and screen

As can be seen in Figure 6, the participating primary school first-grade students' levels of reading from paper and screen varied. While 3 students are at the worry level in reading from paper, they are at the free level in reading from screen; while 4 students are at the teaching level in reading from paper, they are at the teaching level in reading from screen; while 4 students are at the worry level in reading from paper, they are at the teaching level in reading from screen; while 2 students are the teaching level in reading from paper, they are at the worry level in reading from screen; 1 student is at the free level in reading from both paper and screen; 7 students are at the teaching level in reading from both paper and screen and 6 students are at the worry level in reading from both paper and screen. These results show that while 13 students' levels of reading from paper and screen vary, 14 students' levels of reading from paper and screen are the same. When the reading levels of the students whose levels of reading from paper and screen vary are examined, it is seen that 11 students' levels of reading from screen improved more than their levels of reading from paper. On the other hand, 2 students' levels of reading from paper improved more than their levels of reading from screen. These results show that the levels of reading from screen of the primary school first-grade students subjected to the sample application based on the technology integration model are better than their levels of reading from paper in general. However, 2 students' levels of reading from paper were found to be improved more than their levels of reading from screen, which might be related to individual differences or different variables affecting their levels of reading from paper and screen.

Findings related to Errors in Reading from Paper and Screen

In the current study, to determine the primary school first-grade students' errors in reading from paper and screen, the students read the texts determined by the researcher in advance after the students started to read independently (February, 2021/Winter term). The obtained results are shown in Figure 7.

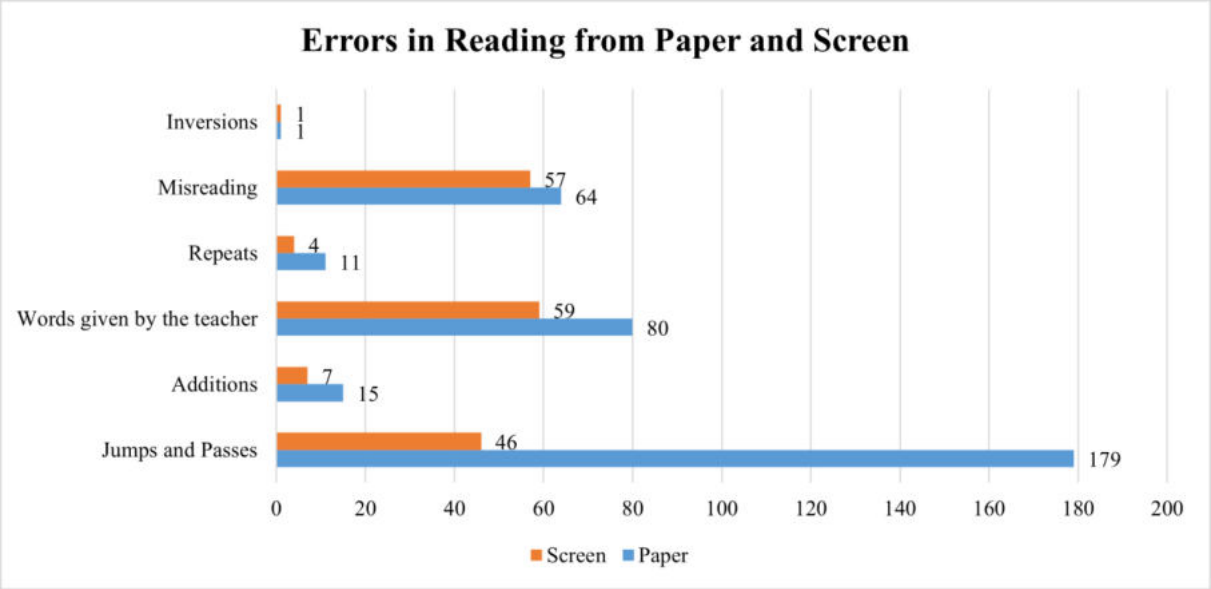

Figure 7. Errors in reading from paper and screen

As can be seen in Figure 7, the primary school first-grade students subjected to the sample application based on the technology integration model committed 2 errors of inversion, one in reading from paper and one in reading from screen, 64 errors of misreading in reading from paper and 57 errors of misreading in reading from screen, 11 errors of repeats in reading from paper and 4 errors of misreading in reading from screen, 80 errors of words given by the teacher in reading from paper and 59 errors of words given by the teacher in reading from screen, 15 errors of additions in reading from paper and 7 errors of additions in reading from screen and 179 errors of jumps and passes in reading from paper and 46 errors of jumps and passes in reading from screen. Except for the error of inversion, the primary school first-grade students made more errors in reading from paper than in reading from screen. Moreover, according to the types of errors, the most frequently committed error by the students is jumps and passes, followed by words given by the teacher and misreading. These findings show that the primary school first-grade students subjected to the sample application based on the technology integration model read more correctly from screen than from paper. Although the texts read throughout the study from paper and screen were the same, the reason why the students committed more errors in reading from paper than from screen might be because they interact more with technological tools in their daily lives, and thus, reading activities from screen can be more interesting for students and they can feel more motivated to read from screen.

Findings related to Attitudes towards Reading

In the current study, to determine the attitudes of the primary school first-grade students subjected to the sample application based on the technology integration model towards reading, the researcher administered a reading attitude scale to the students after they started to read independently (February, 2021/Winter term). The results of the reading attitude scale administered to the primary school first-grade students are shown in Table 5.

Table 5. Descriptive statistics for the attitudes of the primary school first-grade students toward reading

Dimension	N	The Lowest Score	The Highest Score	Mean	Std.Dev.
Attitude towards Reading for Enjoyment	30	.00	40.00	32.83	11.41
Attitude towards Reading for Academic Purposes	30	.00	39.00	32.93	11.34
Total Reading Attitude	30	.00	79.00	65.76	22.66

Table 5 shows the results of the descriptive statistics found for the reading attitude sub-dimensions and total reading attitude of the primary school first-grade students subjected to sample application based on the technology integration model. Thus, the mean score taken for the sub-dimension of attitude towards reading for enjoyment was calculated to be 32.83, the mean score for the sub-dimension of attitude towards reading for academic purposes was calculated to be 32.93 and the mean total attitude score was calculated to be 65.76. The mean attitude scores taken for the sub-dimensions and for the whole scale were found to be closer to the highest score. In light of these results, it can be said the applications supported with digital activities motivated the primary school first-grade students as such activities are a natural part of their daily lives and thus, their attitudes towards reading were found to be quite high.

DISCUSSION and CONCLUSION

In this section, the results derived from the findings and their discussion are presented. As a result of the administration of the sample application based on the technology integration model to the primary school first-grade students, the scores taken by the students for the phonological awareness skills of matching words starting with the same sound, noticing rhymed words, finding the initial sound of the given word, producing words starting with a stimulating sound, producing words starting with the same sound, omitting syllables or sounds, combining sounds and their total phonological awareness score were found to have significantly increased in the posttest compared to their pretest scores. Some studies in the relevant literature emphasize that computer-assisted education, educational software and multimedia-supported content improve students' phonological awareness and reading skills (Bishop & Santoro, 2006; Demirmenci & Ertem, 2014; Fasting & Lyster, 2005; Littleton, Wood & Chera, 2006; Macaruso, Hook & McCabe, 2006; Macaruso & Walker, 2008). In addition, it is argued that electronic texts and supporting technologies embedded in these electronic texts improve phonological awareness skills (Cheung & Slavin, 2012; Larson, 2009; McKenna, Reinking, Labbo, & Kieffer, 1999). The results of the research reported in the relevant literature concur with the results obtained in the current study concerning phonological awareness skills. It can be said that the development of phonological awareness skills of the primary school first-grade students, who were subjected to the sample application based on the technology integration model, positively affected their time of transition to independent reading and reading speed and level specified in the second and third problems of the current study. Rubba (2004) suggests phonological awareness as a prerequisite for initial literacy teaching. There are studies emphasizing the importance of phonological awareness for learning to read and being a successful reader (Nunes, Bryant, & Barros, 2012; Pennington & Lefly, 2001; Pullen & Justıce, 2003; Scarborough, 1990). Mann (1987) and Stanovich, Cunningham, & Cramer (1984) confirmed phonological awareness as an important predictor of reading success.

It was determined that primary school 1st-grade students, who were involved in a technology integration model-based application in the first literacy teaching process, had a decrease in the time they started to read from the first group sounds/letters to the last group sounds/letters. This shows that the students understood the logic of reading and became automatic. This is thought to be due to the

repetitions made based on digital technologies because, employing digital technologies, the students were able to see more visual and auditory elements and to do more repetitions and exercises. In this way, in the context of combining sounds and reading, the necessary infrastructure was formed in the students and they became more practical, especially after the completion of 1st and 2nd group sounds/letters. When the relevant literature is reviewed, it is seen the use of digital technologies in the teaching process provides students with the opportunity to repeat more than once, gives instant feedback (Lovell & Phillips, 2009; Musti-Rao, Lo & Plati, 2015), reduces their cognitive load (Mayer & Moreno, 2010), individualizes their learning (Englert, Manalo, & Zhao, 2004), and allows them to learn at their own pace (Littleton, Wood & Chera, 2006; Lovell & Phillips, 2009; Sorrell, Bell, & McCallum, 2007). The advantages of digital technologies such as providing students with the opportunity to repeat, allowing them to learn at their own pace, giving feedback and fostering learning and reading in a shorter time and providing the opportunity to practice will enable them to recognize words in a shorter time, thus increasing their speed of reading. The advantages of digital technologies and the inferences made based on the research results in the relevant literature can explain the finding of the current study showing a decrease in the time spent by primary school first-grade students on correctly learning the sounds/letters in the last sound groups compared to the first sound groups. It has been revealed by the results obtained in the current study that digital technologies have an effect on the transition time of primary school freshmen students to reading. However, digital technologies are not the only variable that is effective in the time of transition to reading. It should not be forgotten that different variables can also be effective. Yılmaz & Dikici Sığırtmaç (2008) stated that whether children have pre-school education, their parents' education status, and their families' monthly income affect their time of transition to reading. It was determined that the children who received pre-school education, whose parents have a high education level, and whose families have a high monthly income start to read in a shorter time.

The primary school first-grade students subjected to the sample application based on the technology integration model read the text from paper within a time period ranging from 1.15 to 9 minutes while they read the text from screen within a time period ranging from 1.05 to 9 minutes. The students' mean time of reading from paper was found to be 3.93 minutes while that of reading from screen was found to be 4 minutes. When the students' reading speeds from paper and screen were examined, their speeds of reading from paper were found to be varying between 3 and 63 while their speeds of reading from screen were found to be varying between 7 and 69. In Turkey, there are no standardized norms regarding the reading speed of students on a class and term basis. The existing research indicates that primary school first-grade students are expected to read between 0-10 words in the fall term, between 10-50 words in the winter term, and between 30-90 words in the spring term (Akyol, Yıldırım, Ateş, Çetinkaya, & Rasinski, 2014). Thus, it can be argued that 21 of the participating primary school first-grade students' reading speeds from paper and 24 of the participating primary school first-grade students' reading speeds from screen comply with their grade level for the winter term. The participating primary school first-grade students' mean speed of reading from paper in the winter term is 22.33 while their mean speed of reading from screen is 26. The mean reading speeds of the primary school first-grade students show that the students read from paper and screen at a speed expected in this grade level. While 13 students' levels of reading from paper and screen were found to be different, 14 students' levels of reading from paper and screen were found to be the same. When the reading levels of the students whose levels of reading from paper and screen varied were examined, it was seen that 11 students' levels of reading from screen improved more than their levels of reading from paper. On the other hand, 2 students' levels of reading from paper improved more than their levels of reading from screen. In light of these results, it can be said that technology-supported applications are effective on primary school freshmen students' reading speed and level from paper and screen. In general, the higher means obtained for reading from screen compared to reading from paper are thought to be since the applications are based on digital technologies and the students are active in the process. The only exception in these results is that the reading level of 2 students is more advanced in reading from paper than in reading from screen, which might be related to individual differences or different variables affecting their levels of reading from paper and screen.

When the relevant national and international literature is reviewed, it is seen that there are many studies on the effects of technology-supported applications on students' reading skills, speed, and success (Arens, Gove, & Abate, 2018; Cheung & Slavin, 2012; Değirmenci & Ertem, 2014; Gürol & Yıldız, 2015; Hilton-Prillhart, Hopkins, Skinner, & McCane-Bowling, 2011; Jamshidifarsani, Garbaya, Lim, Blazevic, & Ritchie, 2019; Kaya, 2018; Knezek & Christensen, 2007; Macaruso & Walker, 2008; Macaruso, Hook, & McCabe, 2006; Orhan Karsak, 2014b; Sorrell, Bell, & McCallum, 2007; Soydaş & Ertem, 2019; Şahin & Çakır, 2018; Şentürk Leylek, 2018; Yıldız, 2010). These results reported in the literature also support the positive effect of the sample application based on the technology integration model on the students' reading speed and level. This may indicate that technology-supported applications are effective on students' reading speed and level. However, in the related literature, there is a study reporting contrary findings. Çiftçi (2019) concluded that digital stories do not make a significant difference in students' reading comprehension, reading speed, and prosody. Thus, it can be said that variables such as characteristics of the application, environment, time, and practitioner may also predict the effect of technology-supported applications on reading skills. The sample application based on the technology integration model conducted in the current study improved the speed and level of reading from screen as well as from paper. The students' speed and level of reading from screen are better than their reading from paper and screen. This might mean that the education given based on digital technologies improved reading from screen from the first group of sounds/letters. In this connection, Ak (2019) stated that as a result of screen and paper reading practices and doing screen reading exercises continuously and regularly, the students' comprehension of what they read from paper improved and reading from screen had a positive effect on the reading speed of the students. For this reason, as in the sample application based on the technology integration model, students should be taught based on digital technologies from the first literacy teaching onwards and they should have screen reading exercises. The practices conducted in the current study had a positive effect on the primary school first-grade students' speed and level of reading from paper and screen. Cheung and Slavin (2012) state that one of the ways to increase students' reading success is through technology.

The primary school first-grade students subjected to the sample application based on the technology integration model made errors in reading from paper and screen. It was determined that the primary school first-grade students made more reading errors in reading from paper than from screen in all types of reading errors, except for one type of reading error. The most frequent type of error committed by the students in reading was found to be jumps and passes, followed by the words given by the teacher and misreading. In light of these results, it can be said that the sample application based on the technology integration model conducted in the initial literacy teaching process enabled students to make fewer reading errors in reading from screen than in reading from paper. Although the texts read throughout the study from paper and screen were the same, the reason why the students committed more errors in reading from paper than from screen might be because they interact more with technological tools in their daily lives, and thus, reading activities from screen can be more interesting for students and they can feel more motivated to read from screen. There are many studies in the related literature reporting that technology-supported applications reduce students' reading errors and increase their rates of correct reading (Değirmenci & Ertem, 2014; Kaman, 2018; Knezek & Christensen, 2007; Soydaş & Ertem, 2019; Yıldız, 2010). Some researchers argue that information technology and paper reading skills are necessary for online and screen reading (Leu, Kinzer, Coiro, & Cammack, 2004; Organisation for Economic Co-operation and Development, 2010). The finding obtained in the current study showing that the primary school first-grade students made fewer reading errors in reading from screen compared to reading from paper may indicate that the students have already acquired the required information technology and paper reading skills pointed out in the literature. In this regard, Larson (2010) conducted a study on primary school first-grade students and found that the students had more control over texts in e-books presented to them on screen than the texts they read on paper. This stronger control over the texts may result in fewer errors to be committed by students. The fact that the errors made by the primary school first-grade students subjected to the sample application based on the technology integration model while reading from

paper and screen are as expected from first-graders and that they made fewer errors in reading from screen may indicate that the necessary infrastructure for the development of fluent reading was formed in the students. The participating students' making fewer errors in reading from screen shows that their screen reading skills started to develop from the initial literacy teaching process onwards. This result shows the importance of the current study considering the fact that many reading activities are performed on screen in the digital age we live in.

The mean score taken by the primary school first-grade students subjected to the sample application based on the technology integration model for the sub-dimension of attitude towards reading for enjoyment was calculated to be 32.83, the mean score for the sub-dimension of attitude towards reading for academic purposes was calculated to be 32.93 and the mean total attitude score was calculated to be 65.76. The mean attitude scores taken for the sub-dimensions (the highest score for reading for enjoyment = 40 / the highest score for academic purposes = 39) and for whole the scale (the highest score = 79) were found to be closer to the highest score. Based on these results, it can be said that the use of digital technologies within the context of the current study, the active participation of the students in interactive activities in the classroom and online lessons and their completing these activities, the sending of online e-contents as homework together with printed materials outside the class and their involvement in reading activities from paper and screen might have made positive contributions to the students' attitudes towards reading. With these results, the effect of applications based on digital technologies on the attitude towards reading has been revealed. When the literature on the effect of technology-supported applications on the attitude towards reading is examined, it is seen that besides the studies reporting that technology-supported applications positively affect the attitude towards reading (Ak, 2019; Çetinkaya Özdemir, 2019; Hargrove, 2019; Kesik & Baş, 2021; Şahin & Çakır, 2018), there are also some studies showing that they have no effect (Kaman, 2018; Şentürk Leylek, 2018). While the majority of these results in the relevant literature support the results of the current study showing the positive effects of digital applications on primary school first-grade students' attitudes towards reading, very few studies show the opposite. Different variables may have led to the emergence of contradictory findings. However, in general, it is seen that technology-supported applications have positive effects on students' motivation and attitudes towards reading. Yunus, Nordin, Salehi, Sun, & Embi (2013) state that information technologies are beneficial in attracting students' attention, while Lee & Wu (2012) state that students' attitudes towards computers and literacy skills improve if they have information technology equipment at home. It is important for children to develop positive attitudes towards reading from the freshmen in terms of gaining reading habits and increasing their academic success. The fact that technology-supported applications mostly develop positive attitudes in the initial literacy teaching process reveals the importance of such studies.

Recommendations for Researchers

- Future research should be conducted to determine the effect of technology-supported teaching practices on the development of each sub-skill of phonological awareness skills.
- Experimental research can be designed to determine the effect of technology-supported applications on different grade levels and reading skills.
- The reasons why students' screen reading speed and level are better than their paper reading speed and level should be investigated.
- The effect of technology-supported applications on paper and screen reading speed and level at different grade levels should be investigated.
- The causes of reading errors that occur in primary school students' reading from screen and paper should be investigated.
- It should be investigated which elements of technology-assisted teaching applications are influential on primary school children's reading attitudes and motivation.

Recommendations for Practitioners

- Classroom teachers should benefit from the technology integration model-based application example in the first literacy teaching process.

- It is recommended to be patient in the process of technology-supported primary literacy teaching, to try to eliminate errors and deficiencies by observing, and to make motivating explanations.
- In the teaching of reading, reading from the screen should be done together with reading on paper.
- Students should be active in creating syllables, words, and sentences. Students should come to the interactive whiteboard and do the exercises themselves with the interactive e-contents.
- Which technological hardware and software will be used at which stage of the first literacy teaching should be planned in advance. Lesson designs should be created accordingly.
- Different platforms and messaging tools should be used actively in the first literacy teaching process.
- During the school adjustment week, students and parents should be informed about the use of educational software, platforms and tools to be used in the first literacy teaching process.
- In the first literacy teaching, online digital content should be sent along with homework from printed materials.

Limitations

- The research is limited to 30 freshmen primary school students studying in a state primary school in the Haliliye district of Şanlıurfa province in the 2020-2021 academic year.
- In terms of duration, the research is limited to 8 weeks in a face-to-face classroom environment in one-half term of the 2020-2021 academic year, and 13 weeks with online courses due to the Covid-19 outbreak.
- The research is limited to the teaching of 29 sounds/letters in the Turkish alphabet during the primary school freshmen Turkish lesson, the first reading and writing teaching process, and the 3-week reading activities when the children switch to independent literacy.
- The research is limited to one group post-test and one group pre-test-post-test weak experimental design.

Code availability

All analyses were performed with SPSS 22.0. No custom code was used.

Ethics and Conflicts of Interest Approval

This research is derived from the first author's doctoral thesis under the supervision of the second author. The study has undergone appropriate ethics protocol. The author(s) acted in accordance with the ethical rules in all matters such as data collection in the research, and that there is no conflict of interest between the authors. This research was ethically approved by the Hacettepe University Ethics Commission's letter dated 07 April 2020 and numbered 35853172-300. Informed consent was sought from the participants. No funding was received for the conduct of this study.

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WE ASKED TEACHERS: DO YOU KNOW WHAT DYSCALCULIA IS?

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Abstract

This study aims to determine the knowledge levels of primary school, mathematics, special education, and Psychological Counseling & Guidance (PCG) teachers on Dyscalculia. A descriptive survey model was used for the research. Four hundred eighty-nine teachers were selected for the study, including 254 primary school teachers, 130 high school math teachers, 53 psychologists, 28 special educators, and 24 secondary school math teachers. A survey form devised by Dias, Pereira, and Van Borsel (2013) during the research, including 18 questions, 2 of which were open-ended and 16 closed-ended, was used. The obtained data reveal that most participating teachers do not have adequate knowledge and experience on the meaning, effects, root causes of dyscalculia, and intervention strategies for dyscalculic children.

Keywords: Dyscalculia, math learning difficulties, dyscalculia awareness.

INTRODUCTION

Dyscalculia, having an incidence of approximately 3-6.5 % range (Butterworth, 2005), is defined as a specific learning disability characterized by the inability to learn basic arithmetic facts, process numerical quantities, and do accurate and fluent calculations. The difficulties faced should be below expected for the individual's chronological age and not result from inadequate education, daily activities, or mental disabilities (American Psychiatric Association, 2013). In the ICD-10, Classification of Mental and Behavioral Disorders, the World Health Organization (WHO) describes dyscalculia as involving a specific impairment in arithmetical skills that is not solely explicable based on general mental retardation inadequate schooling (ICD-10, Version: 2019, Article: F81.2). It is stated that deficiency present in dyscalculic individuals is inadequate in basic computational skills such as addition, subtraction, multiplication, and division, rather than the more abstract mathematical skills involved in algebra, trigonometry, and geometry or calculus (WHO, 2010).

Although there is no consensus reached on the cause of dyscalculia, the most common three views in the relevant literature can be listed as follows: The first view argues that dyscalculia occurs because of dysfunction in the mathematics-related neural areas of the brain (Agostini, Zoccolotti, & Casagrande, 2022), while the second asserts that dyscalculia is mainly an outcome of working memory deficiency (Keeler & Swanson, 2001). However, some researchers, such as Gifford (2005, 2006), denied the

existence of dyscalculia, interpreting it as a low mathematical performance displayed by some individuals due to behavioural, emotional, and/or experiential reasons.

Since dyscalculic students have different cognitive profiles, the incidence and level of behavioural characteristics may considerably vary (Gifford & Rockliffe, 2012). Reasons for this difference may include environmental factors, cultural factors (e.g., duration of education, characteristics of the counting system used, etc.), prenatal and postnatal illnesses, or socio-emotional difficulties (e.g., math anxiety) (Kaufmann et al., 2013). Yet, major common features and the relationship with mathematical performance can be given, and individual differences arise from the stated situations.

Dyscalculia can be expressed as a state of disability to sense numbers. Starting from this point, dyscalculic individuals can have difficulties understanding the meaning of numbers, counting, understanding numerical relations, and learning the four operations with numbers (Sharma, 2015). For example, they have difficulty determining how significant their answers are in an estimation, counting backward, and discerning the greater one of two numbers. They find the four operation signs (+, -, x, and /) confusing.

It is denoted that visuo-spatial memory deficiencies are widely present among students with dyscalculia (Alloway, 2011; Mammarella, Caviola, Giofrè, & Szűcs 2018). Visuo-spatial memory plays a relatively substantial role in mental operations, tracking mathematical operations, visualizing the appropriate mathematical model for a problem. Geometric thinking is based on spatial reasoning, and the improvement of spatial abilities is of great importance for learning geometry (Galitskaya & Drigas, 2021). Individuals suffering from visuo-spatial memory deficiencies can have difficulties in finding directions (left-right, east-west), reading maps, tables, analog clocks, and sequencing.

Dyscalculic individuals are relatively slow in comparison with their peers in doing mathematical operations. Dyscalculic individuals' brains need more time to do calculations (Butterworth, 2005). Dyscalculic individuals, in general, have a poor perception of elapsed time (Tobia, Rinaldive, & Marzocchi, 2018) and therefore may have difficulty in the effective use of time in exams. It is also stated that challenges encountered in the conception of time can be an essential indicator of learning disability.

Though taught different counting and calculation strategies, dyscalculic children insist on finger counting despite their advancing age (Mutlu & Soylu, 2018; Mutlu, Akgün, & Akkuşçi, 2020). One of the most important reasons for dyscalculic individuals to insist on finger counting strategies is ascribed to the fact that the fingers reduce the workload of working memory, and this has positive effects on their mathematical performance (Crollen et al., 2011). Indeed, dyscalculic children are denoted to stay one year behind their peers in terms of working memory capacity (Geary, Hoard, Byrd-Craven, and DeSoto, 2004).

Psychological problems can often accompany dyscalculia, and that can boost negative academic results. Dyscalculic children may develop low self-efficacy, lack of motivation, a feeling of guilt, math anxiety, and even school phobia (Ashcraft and Ridley, 2005; Ramirez et al., 2018). Dyscalculic individuals generally have high levels of math anxiety (Carey, Hill, Devine, & Szucs, 2015; Mutlu, 2019). Their high level of math anxiety can have an adverse and destructive effect on math achievement by triggering working memory deficiency (Ashcraft & Kirk, 2001; Mutlu, 2017).

In reviewing studies on dyscalculic children, it was found that children can learn mathematics, although not at the same pace as their peers, if the learning environment is appropriately adapted, considering their disability (Mutlu & Akgün 2016). Concrete-semi-concrete-abstract sequential strategy combined with direct teaching method, technology-assisted mathematics teaching, and game-based teaching methods can be preferred for teaching mathematics to children with dyscalculia (Swanson & Hoskyn, 1998; De Castro, Bissaco, Panccioni, Rodrigues, & Domingues, 2014; Mutlu & Akgün, 2019; Mutlu & Olkun, 2019; Benavides-Varel et al. 2020; Milton, Flores, Moore, Taylor, & Burton, 2019).

Although dyscalculia is not a consequence of inappropriate pedagogical methods, appropriate knowledge and educational practices for those students are essential for a successful intervention. Primary school teachers have a substantial part in the early detection of dyscalculia-related disabilities and in ensuring the right and adequate intervention. Therefore, teachers need to be aware of the characteristics of dyscalculia and dyscalculic students, primarily in terms of identifying these children at an early age, fulfilling and developing a successful educational intervention (Chideridou–Mandari, Padeliadu, Karamatsouki, Sandravelis, & Karagiannidis, 2016; Sousa, Dias, & Cadime, 2017). In this regard, when the relevant literature is reviewed, there appear to be many studies in the world and Turkey, through which the teachers' opinions on what characteristics dyscalculia and students with dyscalculia have been investigated.

A study in Brazil by Dias, Pereira, and Van Borsel (2013), determined 45% of 63 primary school teachers to deprive of knowledge of what dyscalculia was, and only 12.9% of teachers could describe the symptoms of dyscalculia. Several studies in India (Saravanabhavan & Saravanabhavan, 2010; Kamala and Ramganesh, 2013; Shukla and Agrawal, 2015) reported that teachers and pre-service teachers have limited knowledge of learning disabilities in general. In the study in Greece by Chideridou, Mandari et al., 114 high school maths teachers were revealed to know dyscalculia in general, but underperform, when it came to the characteristics of dyscalculic students, and some teachers confuse dyscalculia with intellectual disability. In a survey in Malaysia on the awareness of 80 primary school teachers on dyscalculia (Fu & Chin, 2017), approximately 58% of the teachers were unfamiliar with dyscalculia. In a study in Nepal (Adhikari, 2014), primary school teachers were reported to have limited knowledge about the characteristics of dyscalculia and felt unconfident to deal with dyscalculia. However, they had some experiences with dyscalculic children. Likewise, a study in Portugal by Sousa, Dias, and Cadime (2017) with 175 primary school teachers stated a large percentage of teachers (75.4%) have heard of dyscalculia before. Still, very few of them have worked with a dyscalculic student.

Many studies on the awareness and knowledge levels of teachers and pre-service teachers on dyscalculia were conducted in Turkey as well (Sezer & Akın, 2011; Karadeniz, 2013; Karasakal, 2019; Kuruyer, Çakıroğlu, & Özsoy, 2019; Nurkan & Yazıcı, 2020). In the studies conducted, math teachers were determined not to know the concept of dyscalculia enough (Sezer & Akın, 2011; Karadeniz, 2013; Nurkan & Yazıcı, 2020); similarly, most of the classroom teachers were identified to be unaware of the dyscalculia phenomenon and lack the knowledge required to cope effectively with dyscalculic children. Again, primary school pre-service teachers are reported to have an awareness of mathematical learning difficulties, but lack knowledge about math disabilities, have misconceptions about dyscalculia, not have foresight about how to discern mathematical learning difficulties and how to solve them (Kuruyer, Çakıroğlu, & Özsoy, 2019).

Studies in the world and Turkey to determine teachers' awareness and knowledge levels on dyscalculia and characteristics of dyscalculic students point out that teachers mostly do not know about dyscalculia and the attributes of dyscalculic students enough. However, it can be stated that the number of participating teachers in the studies is relatively low, and thus, the branch diversity is not sufficiently included. The present study examines the awareness of special education, primary school, secondary school, high school math, and psychological counselling and guidance teachers on dyscalculia and the dyscalculic student characteristics.

METHOD

Research Model

A descriptive survey model was used in the research. Descriptive surveys are the research approaches aiming to describe a previous or present situation as it currently is. The individual or object, which is the subject of the research, is tried to be described in its conditions and as it is. No effort is made to change or influence the variables in any way (Karasar, 2016). A survey technique was used in the research to reveal the knowledge and awareness of teachers on dyscalculia. A survey is a systematic question form prepared to collect information from primary sources. The purpose of using this

technique is to systematically collect and store the information, which will solve the problem of the research and test the hypotheses dealt with (İslamoğlu & Alnıaçık, 2019). There are also 2 open-ended questions about the definition of dyscalculia and intervention for the dyscalculic student in the questionnaire. For the analysis of these questions, the content analysis method used in qualitative research was used.

Population and Sample

The research population was composed of teachers working in primary, secondary, and high school level state schools and private education institutions in a city located in Turkey, affiliated with the Ministry of National Education in 2019. The research sample included 489 teachers who volunteered to participate in the research. They were distributed among 254 elementary school teachers, 130 high school mathematics teachers, 53 psychological counselling and guidance teachers, 28 special education teachers, and 24 secondary school mathematics teachers. The purposive sampling method, one of the non-random sampling methods, was used to determine the sample. This sampling method is intended to ensure the greatest possible diversity by including Primary, secondary, high school, special education, and PCG (psychological counselling and guidance) teachers who teach mathematics or are likely to encounter dyscalculic children in their professional lives. Table 1 outlines the demographic characteristics and distributions of the attendees.

Table 1. Frequency and percentage distributions on demographic characteristics of attendees

Variables		N	%
Gender	Male	205	41.9
	Female	284	58.1
Seniority (professional seniority)	Less than one year	46	9.4
	2-5 years	227	46.4
	5-10 years	153	31.3
	Ten years and above	63	12.9
Branch	Special Education	28	5.7
	Math (High School)	130	26.6
	Math (Secondary School)	24	4.9
	PCG	53	10.8
	Primary School Teacher	254	52
Educational Background	College	14	2.9
	Undergraduate	446	91.2
	Master's Degree	29	5.9
Age	0-30	303	62
	30-35	130	26.5
	35-40	44	9
	40-45	12	2.5

When looking at Table 1, it is seen that 58.1% of the participating teachers in the research are female, and 41.9% are male. Regarding the seniority variable, the rate of those who served less than a year is 9.4%; between 2-5 years, 46.4%; between 5-10 years, 31.3%; 10 years or more is 12.9%. When the educational status is examined, most of the attendees (91.2%) are seen to have an undergraduate degree.

Data Collection Tool

Data from the attendees were collected through a survey. The survey form used in the study was designed by Dias, Pereira, and Borsel (2013), based on the literature and experiences related to dyscalculia. It was adapted into Turkish by the researchers. During the adapting process of the survey, first, the survey form was translated into Turkish by the researcher following the Turkish culture and education system. Subsequently, two specialist lecturers in English teaching were asked to assess how well the translated items of the questionnaire corresponded to the original. Upon the experts' recommendations, relevant changes were made to the translated items. Eventually, the survey was made ready to be applied by having the language compliance and comprehensibility of the question items translated into Turkish, and checked by an expert working in the Turkish Language Education field. To evaluate the awareness and knowledge of the teachers on dyscalculia, the survey form includes 18 questions, apart from the ones aiming to determine demographic characteristics. Two of these questions are open-ended, and 16 are closed-ended. Knowledge areas desired to be measured in the survey and the ordinal numbers of the relevant items are presented in Table 2.

Table 2. Measured knowledge areas of the survey items

Knowledge Areas	Relevant Items
Meaning and concept of dyscalculia	1,2,3,4,8,13
Causes of dyscalculia	18
Characteristics of dyscalculia	5,7,9,10,11,12,15
Effects of dyscalculia	14,16
Intervention strategies for dyscalculia	6, 17

As shown in Table 2, the question items in the survey were handled under five categories. These categories are related to the concept and meaning, the causes, characteristics, effects of dyscalculia, and intervention strategies for dyscalculia.

Data Analysis

In analysing the closed-ended items of the survey form applied within the research, descriptive statistics were produced using the SPSS 23 software. Two open-ended questions were analysed using content analysis.

Limitations

The research is limited to the general survey model in terms of method. The data obtained in the current study are limited to the teachers' responses awareness and knowledge of the teachers on the dyscalculia survey. Therefore, the study is not extensive enough to explain why and how teachers gave these responses. Examination of such issues is worth considering in future research. The study's sample does not have the capacity to represent a larger national population. Moreover, the scope of the research was limited to teachers in public schools, private schools were not included in the research.

RESULTS

This study aimed to examine the dyscalculia awareness of teachers working in the central district of a city in Turkey. For this purpose, special education, primary, secondary, high school, and PCG

(psychological counselling and guidance) teachers have applied the survey and posed 18 questions. The findings obtained from the answers to those questions were depicted in tables.
First, the question "Do you know what dyscalculia is?" was addressed to the teachers. Findings relevant to this question are presented in Table 3.

Table 3. For the question, "Do you know what dyscalculia is?", Frequency and percentage distributions on the responses from the teachers

Branch	Yes		No		Total
	N	%	N	%	N
Special Education	22	78.6	6	21.4	28
Primary School Teacher	162	64.3	90	35.7	252
Math (Secondary School)	14	58.3	10	41.7	24
Math (High School)	84	65.6	44	34.4	128
PCG	51	96.2	2	3.8	53
Total	**333**	**68.7**	**152**	**31.3**	**485**

When Table 3 is examined, a total of 485 answers have been received from different branches for this question. While 333 (68.7%) of the teachers answered yes, 152 (31.3%) answered no. It has been the PCG teachers who answered “yes” the most (96.2%). It is noteworthy that secondary school math teachers have been the ones who answered “no” the most (41.7%). According to statements of whether knowing what dyscalculia is, the ranking from highest to lowest has turned out to be as follows: PCG (96.2%), special education (78.6%), high school math (65.6%), primary school (64.3%), and secondary school math (58.3%).

As the second question of the survey, teachers, having stated to know what dyscalculia is, were requested to describe dyscalculia. Content analysis of the answers given is complete and presented in Table 4.

Table 4. Description of dyscalculia by teachers

Themes	Codes	*f*	*Examples from Answers*
Specific learning disability	Mathematical learning disability	239	*"It is a kind of mathematical learning disability. It is a problem related to numbers."* (T, 44). *“Despite not having an intelligence problem, it is the difficulty that the student has in learning mathematics.”* (T, 48).
Incomprehension of mathematical language	Incomprehension of numbers and symbols	17	“*It is the disability of comprehending numbers and symbols in mathematics.”* (T, 273). *“The disability, limiting an individual's mathematical skills and causing difficulties with operations and numbers.”* (T, 145) *“It is the condition of inability to learn mathematical symbols and operations, despite not having a learning disability.”* (T, 449).
	Difficulty in associating mathematical operations	4	*“It is the condition of having difficulty in associating numbers, symbols, mathematical operations, though the individual does not have a mental problem.”* (T, 132). *“Inability to establish relationships between concepts, and comprehend them.”* (T, 149).

Table 4. (Continued). Description of dyscalculia by teachers

Themes	Codes	*f*	*Examples from Answers*
Association with dyslexia	Mirror writing of the words/sounds/digits	9	*"Mirror writing, by a student, of words and numbers"* (T, 224). *"Mirror writing of the sounds which make up the words"* (T, 4). *"Inability to read and write letters like b and d*" (T, 215). *"Mirror writing of digits"* (T, 435).
	Mathematical equivalent of dyslexia	3	*"Dyslexic state in mathematics. Learning disability in mathematics"* (T, 17). *"Dyscalculia is the inability to do mathematical calculations. It is a part of dyslexia."* (T, 151).
Academic failure	Failure in math	7	*"Failure of the student in math"* (T, 332).
Neurological disorder	Mental disability	2	*"It is a mental problem and math learning disability"* (T, 160). *"It is a mental deficiency"* (T, 85).

As seen in Table 4, a total of 281 teachers tried to define dyscalculia. On the other hand, 208 teachers did not answer this question. When the responses were scrutinized, it was seen that teachers mostly tried to describe dyscalculia as a mathematical learning disability, which is a specific learning disability (239). The number of teachers defining dyscalculia as the incomprehension of mathematical language was 21. Additionally, 12 teachers tried to describe dyscalculia by associating it with dyslexia, and seven attempted by associating it with academic failure in the math course. On the other hand, two teachers associated dyscalculia with a neurological disorder and mental retardation.

As the third question, the teachers were asked the question, "Have you ever discussed the concept of dyscalculia during your occupational training? (Within the undergraduate/postgraduate period)". The findings of the responses to this question are given in Table 5.

Table 5. For the question, "Have you ever discussed the dyscalculia concept during your occupational training?", Frequency and percentage distributions on the responses from the teachers

Branch	License (Undergraduate)				Postgraduate			
	Yes		No		Yes		No	
	N	%	N	%	N	%	N	%
Special Education	8	28.6	20	71.4	0	0	13	100
School Teaching	68	27.4	179	72.2	15	11.8	112	88.2
Math (Secondary School)	6	25	18	75	1	8.3	11	91.7
Math (High School)	35	28	89	72	4	6.9	53	91.4
PCG	41	77.4	12	22.6	4	40	6	60
Total	**158**	**33.1**	**318**	**66.5**	**24**	**10.9**	**195**	**88.6**

According to Table 5, the number of teachers confirming to have ever discussed "dyscalculia" during their undergraduate education is 158 (33.1%), while those saying "no" are 318 (66.5%). When the distribution of those saying "yes" is examined in terms of the branch, it is seen that the highest rate belongs to PCG teachers (n=41, 77.4%). The rate of "yes" answers, except for this branch, ranged from 25% to 28%. Accordingly, if PCG teachers are exempted, only one out of four teachers ever discussed the dyscalculia concept during the undergraduate education period. When looking at the

postgraduate period, those rates can be said to be much lower. The number of those who said "yes" was 24 (10.9%), while those who said "no" were 195 (88.6%). If Table 5 is analysed based on branches, PCG teachers are seen as the group, which discussed the dyscalculia concept the most during this period (n=4, 40%). However, when looking at other branches, it was revealed that only one out of every ten teachers had such a discussion during the graduate school period.

As the fourth question, a similar question was asked to the teachers about dyslexia (reading difficulty), which is one of the specific learning difficulties. The results of the teacher responses to the question "Have you ever discussed dyslexia during your vocational education? (undergraduate/graduate period)" are provided in Table 6.

Table 6. For the question, "Have you ever discussed the dyslexia concept during your occupational training?", Frequency and percentage distributions on the responses from the teachers

Branch	Undergraduate				Postgraduate			
	Yes		No		Yes		No	
	N	%	N	%	N	%	N	%
Special Education	24	88.9	3	11.1	6	75	2	25
School Teaching	190	75.7	61	24.3	29	34.5	54	64.3
Math (Secondary School)	7	35	13	65	4	36.4	7	63.6
Math (High School)	72	56.7	55	43.3	9	23.7	29	76.3
PCG	46	86.8	7	13,2	3	37.5	5	62.5
Total	**339**	**70.9**	**139**	**19.1**	**51**	**34.4**	**97**	**65.6**

According to Table 6, the teachers can be said to be more familiar with the dyslexia concept. When looking at the answers, 339 (70.9%) teachers answered "yes" to this question, while 139 (19.1%) answered no. When analysing on a branch basis, it is seen that special education teachers marked the "yes" option at the highest rate (N=24, 88%). Based on other branches, the ranking of the "yes" option from high to low occurred as; PCG 46 (86%), primary school 190 (75.7%), high school math 72 (56.7%), and secondary school math teachers 7 (35%). In the postgraduate period, this time, it was seen that this concept was less discussed. The number of those who said "yes" was 51 (%34), while those who said "no" were 97 (%65.6). A similar ranking to the undergraduate period was revealed, although the rates have decreased from a branch-based perspective. Eventually, compared to dyscalculia, it is possible to say that dyslexia is a learning disability with which the attendees are more familiar.

As the fifth question, "Have you ever happened to face situations in your professional career that caused you to doubt dyscalculia?" was addressed to the teachers. Findings relevant to this question are presented in Table 7.

Table 7. For the question, "Have you ever happened to face situations in your professional career that caused you to doubt dyscalculia?", Frequency and percentage distributions on the responses from the teachers

Branch	Yes		No		Total
	N	%	N	%	N
Special Education	5	17.9	23	82.1	28
School Teaching	69	27.9	178	72.1	247
Math (Secondary School)	9	37.5	15	62.5	24
Math (High School)	33	25.8	95	74.2	128
PCG	9	17.3	43	82.7	52
Total	**125**	**26**	**354**	**74**	**479**

When Table 7 is examined, the total number of responses to this question is seen to be 479. While 125 (26%) of these answers were yes, 354 (74%) were no. Of those who stated that their students might have dyscalculia in their professional life, the highest rate, 37.5%, is found among secondary school

mathematics teachers. This rate was 27.9% for primary school teachers, 25.8% for high school math teachers, 17.9% for special education teachers, and 17.3% for PCG teachers. Although secondary school mathematics teachers answered the first question of this study, which was "Do you know what dyscalculia is?", with the least number of "yes," the fact that, in the fifth question, those teachers were the ones who expressed the doubt of dyscalculia with the highest rate may be indicating that the symptoms of dyscalculia were not known enough.

The sixth question of the questionnaire was related to the fifth question, and the teachers, who stated to have ever had a student whom they suspected of being dyscalculic before, were asked how they intervened with these students. Only 89 teachers answered this question, and requested to answer as open-ended.

The answers given are summarized in Table 8.

Table 8. Interventions to Students, Assessed to Have Dyscalculia

Themes	Codes	*f*	Examples from Answers
Referral	Referral to the Guidance and Research Center (GRC)	28	*"I referred the student to the GRC"* (T, 205). *"Through communications with primary school teachers, I fulfilled coordinations to ensure the student be referred. I referred the student to the hospital and GRC."* (T, 168).
	Referring to the school's guidance service	20	*"I referred the student to the PCG (psychological counseling and guidance) teacher in our school"* (T, 256). *"I referred the student to the counseling service"* (T, 46).
Educational Intervention	Material-Assisted Concrete Teaching	13	*"I used concrete teaching materials"* (T, 299). *"I concretized the mathematical concepts"* (T, 474).
	Using different teaching methods in the class	11	*"I tried different methods such as games, visuals, etc."* (T, 173-T, 190). *"I tried different teaching methods and techniques, like teaching methods with games"* (T, 9).
	Conducting a private study with the individual	10	*"I taught one-on-one."* (T, 275). *For the person I suspected, I strived to ensure a different environment to study. I reduced the lessons to easier and simpler subjects"* (T, 151).
	Simplifying the lesson	5	*"I conducted practices in the educational environment. I simplified the teaching"* (T, 162). *"I simplified the lesson and supported it with materials"* (T, 13).
Gathering Information	Doing research	2	*"I probed into the situation and strived to find a solution"* (T, 226).

As shown in Table 8, the intervention ways for students suspected by teachers of being dyscalculic have been addressed under three categories: referring, educational intervention, and information

gathering. In response to the question, teachers' interventions mainly referred them to guidance and research centres (28). While a referral is a stage of the diagnostic process, it is not the first step. The best step for teachers is to first meet with the school's guidance service and evaluate the situation by including the student's family in the process as well. In this regard, the number of teachers who referred the students to the school's guidance service was 20. In addition, some teachers also applied various educational interventions by providing concrete learning through the utilization of materials (13), delivering the lesson using different methods and techniques (11), studying privately with the individual (10), and simplifying the lesson. On the other hand, two teachers stated that they probed into children and dyscalculia before the first intervention since they did not know the situation.

As the seventh one, the question, "Can you discern a dyscalculic student in your class, if any?" was addressed to the teachers. The findings of the responses to this question are given in Table 9.

Table 9. For the question, "Can you discern a dyscalculic student in your class, if any?", Frequency and percentage distributions on the responses from the teachers

Branch	Yes		No		Maybe		Total
	N	%	N	%	N	%	N
Special Education	13	48.1	7	25.9	7	25.9	27
School Teaching	68	27.3	68	27.3	113	45.4	249
Math (Secondary School)	3	12.5	8	33.3	13	54.2	24
Math (High School)	27	20.9	40	31	62	48.1	129
PCG	33	62.3	1	1.9	19	35.8	53
Total	**144**	**29.9**	**124**	**25.7**	**214**	**44.4**	**482**

As seen in Table 9, three different answering options were offered to the teachers for the 7th question, such as “yes,” “no,” and “maybe,” to enable them to mark the third option when they were not sure. Four hundred eighty-two responses were received. Of these answers, 144 (29.9%) were "yes," 124 (25.7%) were "no," and 214 (44.4%) were "maybe." If analysed based on a branch, the number of PCG teachers who declared the capability to understand whether a child has dyscalculia was 33 (62%). In comparison, the same number occurred as 13 (48.1%) for special education teachers, 68 (27.3%) for private school teachers, 27 (20.9%) for high school math teachers, and 3 (12.5%) for secondary school math teachers.

As the eighth, the question, "Is a dyscalculic student dyslexic at the same time?" was addressed to the teachers. Findings relevant to this question are given in Table 10.

Table 10. For the question, "Is a dyscalculic student dyslexic at the same time?", Frequency and percentage distributions on the responses from the teachers

Branch	Yes		No		Total
	N	%	N	%	N
Special Education	4	4.8	23	85.2	27
School Teaching	6	2.6	229	97.4	235
Math (Secondary School)	0	0	20	100	20
Math (High School)	9	7.8	107	92.2	116
PCG	1	2	50	98	51
Total	**20**	**4.5**	**429**	**95.5**	**449**

According to Table 10, 449 answers were received for this question, of which 20 (4.5%) were "yes," while 429 (95.5%) were "no." Therefore, the vast majority of teachers can be said to have reached a consensus that a dyscalculic student is not necessarily dyslexic.

As the ninth, the question, "A child has difficulty understanding the measures (weight, distance, time). Might that child have dyscalculia?" was addressed to the teachers. Findings obtained from the teachers' responses are presented in Table 11.

Table 11. For the question, "A child has difficulty reading the measures (weight, distance, time). Might that child have dyscalculia?" Frequency and percentage distributions on the responses from the teachers

Type of Teaching	Yes		No		Total
	N	%	N	%	N
Special Education	17	65.4	9	34.6	26
School Teaching	128	54.7	106	45.3	234
Math (Secondary School)	15	65.2	8	34.8	23
Math (High School)	77	63.6	44	36.4	121
PCG	40	80	10	20	50
Total	**277**	**61**	**177**	**39**	**454**

According to Table 11, 454 answers were received for this question. 277 (61%) of those answers were "yes," while 177 (39%) were "no." In this regard, difficulty in sensing the measure, one of the symptoms of dyscalculia, was not seen as a symptom of dyscalculia by a considerable rate, 39% of the teachers. When Table 11 is analysed according to the branch variable, PCG teachers can think more homogeneously while answering the question compared with the teachers of other branches. The least number of "yes" responses came from primary school teachers. The rates of other branches were close to each other. The branches, where "yes" answers were received, are sorted, from the highest rate to the lowest, as follows: PCG teachers 40 (80%), special education teachers 17 (65.4%), secondary school mathematics teachers 15 (65.2%), high school mathematics teachers 77 (63.6%), primary school teachers 128 (54.7%).

As the tenth question, "When a student, having no problems in his previous education life before, meets mathematics, then suddenly starts to underperform. Might this be a suggestive symptom of dyscalculia?" was addressed to the teachers. The findings of the responses to this question are included in Table 12.

Table 12. For the question, "When a student, having no problems in his previous education life, meets mathematics, he suddenly starts to perform very poorly. Might this be a suggestive symptom of dyscalculia?" Frequency and percentage distributions on the responses from the teachers

Branch	Yes		No		Total
	N	%	N	%	N
Special Education	18	69.2	8	30.8	26
School Teaching	149	62.8	88	27.2	237
Math (Secondary School)	15	65.2	8	34.8	23
Math (High School)	85	70.8	35	29.2	120
PCG	34	69.4	15	30.6	49
Total	**301**	**66.1**	**154**	**23.9**	**455**

Dyscalculic students can perform successfully in other courses. Although dyscalculic students often have dyslexia symptoms, it can also be considered a failure in mathematics. When Table 12 is examined, it is seen that 455 responses to this question were received. While 301 (66.1%) of these answers were yes, 154 (23.9%) were no. When examined based on branch, it can be said that the yes/no rates were close to each other. It is seen that the highest rate of "yes" answers among the branches belonged to high school math teachers at 70%, while the lowest rate belonged to primary school teachers (62.8%).

As the eleventh question, "A student can solve math problems, in the form of 5+3=8, given by his teacher. But when the student is asked the same problem as '*Ayşe has five candles, and Fatma has three. How many candles do they both have in total*?' in verbal form, the student cannot solve the problem this time. Might that child have dyscalculia?" was addressed to the teachers. The findings obtained from the responses are presented in Table 13.

Table 13. Frequency and percentage distributions of the answers for the given scenario

Branch	Yes		No		Total
	N	%	N	%	N
Special Education	15	57.7	11	23.3	26
School Teaching	90	38.5	144	61.5	234
Math (Secondary School)	11	52.4	10	47.6	21
Math (High School)	50	42.4	68	57.6	118
PCG	16	32.7	33	67.3	49
Total	**182**	**40.6**	**266**	**59.4**	**448**

Dyscalculic children have difficulty in solving verbal problems. When the problem is verbally expressed, it may indicate that the child does not understand the operation if the child cannot solve it. Therefore, teachers are expected to answer this question with "yes." However, when Table 13 is examined, it is seen that 448 responses were received, of which 182 (40.6%) were "yes" and 266 (59.4%) were "no." When analysed on a branch basis, it is seen that special education teachers gave the highest proportion of "yes" answers with 57.7%. Secondary school maths teachers answered with "yes" at a rate of 52.4%, high school math teachers 42.4%, primary school teachers 38.5%, and PCG teachers 32.7%.

As the twelfth question, "A child has difficulty in using concepts such as bigger/smaller or less/more when comparing objects per their size and quantity. Might that child have dyscalculia?" was addressed to the teachers. The findings obtained from the responses are presented in Table 14.

Table 14. For the question, "A child has difficulty using concepts such as bigger/smaller or less/more when comparing objects per their size and quantity. Might that child have dyscalculia?" Frequency and percentage distributions on the responses from the teachers

Branch	Yes		No		Total
	N	%	N	%	N
Special Education	18	69.2	8	30.8	26
School Teaching	143	60.9	91	39.1	234
Math (Secondary School)	18	81.8	4	18.2	22
Math (High School)	81	67.5	38	33.5	119
PCG	43	86	7	14	50
Total	**303**	**68.3**	**140**	**31.7**	**443**

Dyscalculic children have difficulty using bigger/smaller or less/more concepts when comparing objects in terms of their size and quantity. Therefore, teachers were expected to answer this question with "yes." When Table 14 is examined, it is seen that 443 answers were received, of which 303 (68.3%) were "yes" while 140 (31.7%) were "no." When the rate of "yes" answers, based on branches, are examined from the highest to the lowest, it is seen that 86% of PCG teachers, 81.8% of secondary school math teachers, 69.2% of special education teachers, 67.5% of high school math teachers, 60.9% of primary school teachers answered "yes." For the thirteenth question, the teachers were given options to determine which conditions were mainly confused with dyscalculia. As shown in Figure 1, the responses are presented as a bar graph.

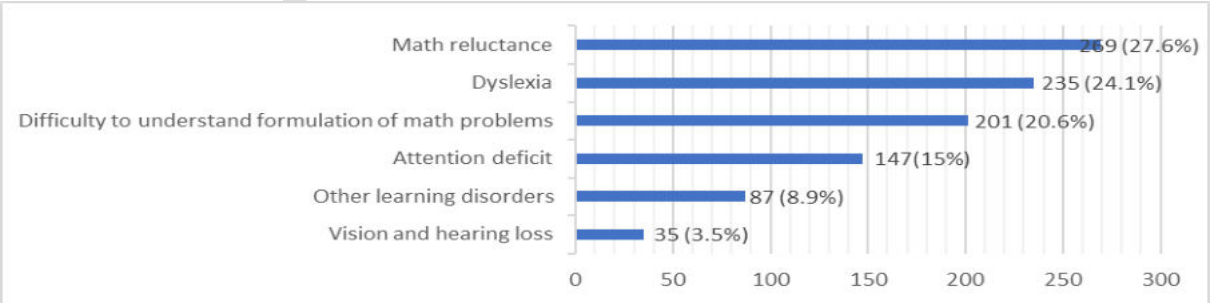

Figure 1. Conditions confused with dyscalculia

As shown in Figure 1, teachers stated reluctance towards mathematics to be the most confusing situation with dyscalculia (27%).

As the fourteenth question, “A child looks pretty anxious only in math lessons. Sometimes he feels disappointed and worried. He complains about the materials and clearly says/confirms that he doesn't like them. Might that child have dyscalculia?" was addressed to the teachers. The findings obtained from the responses are presented in Table 15.

Table 15. For the Question, “A child seems very anxious only in math lessons. Sometimes he feels disappointed and worried. He complains about the materials and clearly says/confirms that he doesn't like them. Might that child have dyscalculia?" Frequency and percentage distributions on the responses from the teachers

Branch	Yes		No		Total
	N	%	N	%	N
Special Education	14	51.9	13	48.1	27
School Teaching	104	44.4	130	55.6	234
Math (Secondary School)	11	50	11	50	22
Math (High School)	59	49.2	61	50.8	120
PCG	25	50	25	50	100
Total	**213**	**47**	**240**	**53**	**453**

When Table 15 is examined, it is seen that 453 responses to this question were received. 213 (47%) of those responses were "yes" while 240 (53%) were "no." Dyscalculic children feel anxious during math lessons and have negative feelings toward math materials. However, considering most of the answers received from teachers, the situation given in this question was not seen as a symptom of dyscalculia by the teachers. In this regard, it can be argued that the teachers are not familiar enough with the symptoms of dyscalculia. When the answers are examined on a branch basis, 51% of special education teachers, 50% of secondary school math teachers and PCG teachers, 49.2% of high school math teachers, and 44.4% of primary school teachers gave the “yes” answer to this question.

As the fifteenth question, "A child has difficulties in sorting (dates, counting numbers, ordinal numbers). Might that child have dyscalculia?" was addressed to the teachers. The findings obtained from the responses are presented in Table 16.

Table 16. For the question, "A child has difficulties in sorting (dates, counting numbers, ordinal numbers). Might that child have dyscalculia?" Frequency and percentage distributions on the responses from the teachers

Branch	Yes		No		Total
	N	%	N	%	N
Special Education	22	81.5	5	18.5	27
School Teaching	156	66.7	78	33.3	234
Math (Secondary School)	16	72.7	6	27.3	22
Math (High School)	95	78.5	26	21.5	121
PCG	43	91.5	4	8.5	47
Total	**332**	**73.6**	**119**	**26.4**	**451**

According to Table 16, 451 responses were received for this question, of which 332 (73.6%) were "yes," and 119 (26.4%) were "no." Dyscalculic students have problems in counting numbers and sorting dates. In this regard, most of the teachers consider the scenario given in the question as a symptom of dyscalculia showing that they have some basic knowledge of dyscalculia. 91% of PDR teachers, 81.5% of special education teachers, 78.5% of high school math teachers, 72.7% of secondary school mathematics teachers, and 66.7% of primary school teachers answered “yes.”

As the sixteenth question, “Do you think dyscalculia can engender restlessness, anxiety, or behavioural changes?” was addressed to the teachers. The findings obtained from the responses are presented in Table 17.

Table 17. For the Question, "Do you think dyscalculia can engender restlessness, anxiety, or behavioural changes?", Frequency and percentage distributions on the responses from the teachers

Branch	Yes		No		Total
	N	%	N	%	N
Special Education	23	88.5	3	11.5	26
School Teaching	196	83.8	38	16.2	234
Math (Secondary School)	20	90.9	2	9.1	22
Math (High School)	111	91.7	10	8.3	121
PCG	49	100	0	0	49
Total	**399**	**88.3**	**53**	**11.7**	**452**

According to Table 17, 452 answers were received from the teachers for this question. 399 (88.3%) of those responses were "yes," and 53 (11.7%) were "no." Dyscalculia can cause restlessness, anxiety, behavioural changes, educational and professional failure in children. The teachers regarded this situation, given as a hint within the question itself, as a symptom of dyscalculia at a high rate of 88.3%. When responses were analysed on a branch basis, all PCG teachers were seen to have answered "yes." Additionally, 91.7% of high school math teachers, 90.9% of secondary school math teachers, 88.5% of special education teachers, and 83.8% of primary school teachers gave the "yes" answer to this question.

As the seventeenth question, "Which specialist do you think should intervene with a dyscalculic individual?" was asked to the teachers, enabling them to give multiple answers. Figure 2 shows the bar graph of the responses received.

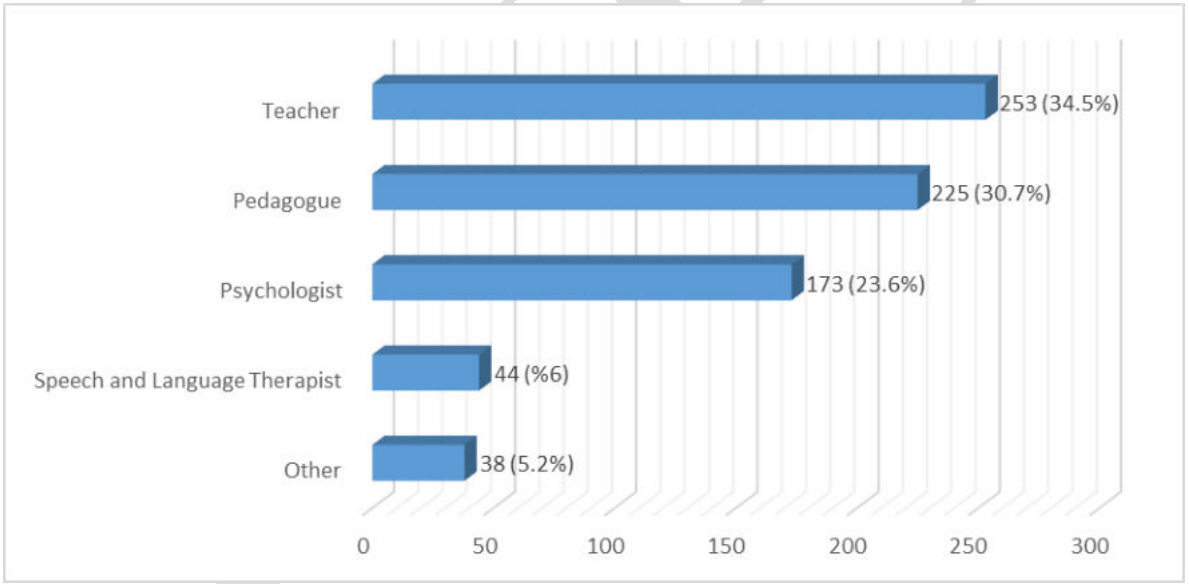

Figure 2. From teachers' perspective, the specialists that are supposed to intervene in a dyscalculic individual

When Figure 2 is examined, 34% of the attendees stated that they had thought teachers were the specialists, who should intervene with a dyscalculic individual. The rate of those stating that pedagogues should intervene was 30.7%, while 23.6% opted for psychologists, 6% for speech and language therapists, and 5.5% for the "other" option.

As the survey's final question, "What do you think the cause of dyscalculia is?" was asked to the teachers, again enabling them to give multiple answers. Figure 3 shows the bar graph of the responses received.

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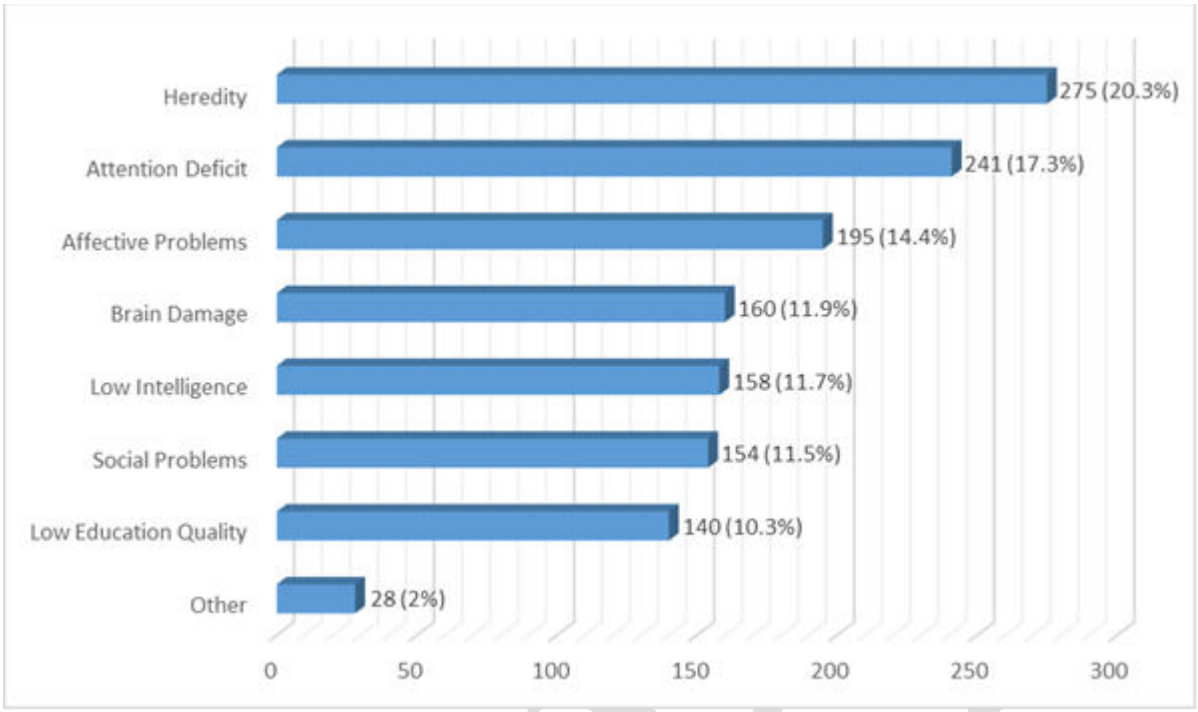

Figure 3. Causes of dyscalculia from teachers' perspective

20.3% of teachers ascribed the possible causes of dyscalculia to heredity, 17.9% to attention deficit, 14.4% to affective problems, 11.7% to low intelligence, 11.5% to social issues, and 10.3% to inadequate education quality.

DISCUSSION, CONCLUSION, and RECOMMENDATIONS

Dyscalculia similar to dyslexia, dysgraphia, and dyspraxia, is one of the learning difficulties students may encounter but is not known enough by teachers and parents (Henderson, 2013). Teachers need to be familiar with dyscalculia to develop strategies and methods to meet the needs of dyscalculic students, and inform society and parents on various aspects of dyscalculia accurately and adequately. This study aimed to determine teachers' knowledge level via an 18-item survey on five knowledge areas, consisting of the meaning, characteristics, effects, causes of dyscalculia, and intervention strategies for dyscalculia children. Within the scope of the study, 489 teachers consisting of special education, primary school, secondary and high school math, and psychological counselling and guidance (PCG) teachers were reached.

During the study concerning the dyscalculia knowledge area, the question "Do you know what dyscalculia is?" was asked to teachers, and approximately 69 of them answered "yes." According to statements of whether knowing what dyscalculia is, the ranking from highest to lowest has turned out to be as follows: PCG, special education, high school math, primary school, and secondary school math. As expected in the study, it was determined that the knowledge level of special education and PCG teachers about dyscalculia was higher than that of other teachers. Indeed, special education and PCG teachers may have seen the subjects related to learning difficulties and intervention to learning difficulties at the undergraduate level relatively more than other teachers. However, when it comes to the definition of dyscalculia, it is seen that the rate of teachers who managed to define dyscalculia correctly dropped to around 50%. When the definitions were scrutinized, most of the teachers were determined to have been deprived of adequate knowledge, made incomplete and inaccurate definitions, and confused dyslexia with dyscalculia. Many national and international studies confirm that teachers are not familiar enough with dyscalculia (Butterworth, Varma, & Laurillard, 2011; Tennant & Tennant, 2010; Sezer & Akın, 2011; Karadeniz, 2013; Karasakal, 2019; Kuruyer,

Çakıroğlu, & Özsoy, 2019; Nurkan & Yazıcı, 2020) For example, in a study conducted by Fu and Chin (2017) in Malaysia, it was determined that approximately 58% of 80 primary school teachers did not know about dyscalculia. Again, in a case study conducted by Nurkan and Yazıcı (2020) in Turkey, it is reported that math teachers do not have full knowledge of dyscalculia.

In general, two hypotheses on the causes of dyscalculia are more prominent. The first one can be worded as a dysfunction in the mathematics-related neural area of the brain, while the second can be briefly expressed as a working memory deficiency (Luculano, 2016). In this regard, within the second knowledge area of the research, it was tried to determine the knowledge levels of the teachers on the causes of dyscalculia. Conditions such as affective characteristics, low intelligence, social problems, and low education quality, which are not among the causes of dyscalculia (American Psychiatric Association, 2013, WHO, 2013), was regarded among the causes of dyscalculia by most of teachers. This implies that teachers do not have adequate knowledge about the causes of dyscalculia.

The data obtained in the knowledge areas of dyscalculic student characteristics and consequences of dyscalculia show that many teachers have limited knowledge. Indeed, this is expressed in a study by Chideridou–Mandari et al. (2016). Moreover, it is considered that most teachers interpret the characteristics of dyscalculic children over those of underachieving math students. Thus, it can be concluded that it is a foreseeable situation for teachers, which cannot define dyscalculia correctly and adequately, to lack sufficient knowledge about dyscalculic children's features.

The teachers were then asked how they intervened with their students suspected to be dyscalculic to determine their level of knowledge on the intervention for dyscalculic children. Only 18% of the participating teachers answered this question. That the teachers are not familiar enough with the subject can be argued as one of the reasons for this question to be answered by the least number. In a similar study conducted with 100 primary school teachers, it was determined that most of the teachers were not familiar enough with the strategies they should use to support their dyscalculic students (Tennant & Tennant, 2010). Again, in a study conducted in Turkey, it was reported that most primary school math teachers lacked the knowledge to effectively cope with the problems of dyscalculic children (Karasakal, 2019).

In conclusion, based on the data obtained in the study, most of the participating teachers do not have sufficient knowledge and experience regarding the meaning, characteristics, consequences, causes of dyscalculia, and intervention strategies for dyscalculic children. Although the incidence of dyscalculia is around 6.5%, consistent with that of dyslexia (Gross-Tsur, Manor, & Shalev, 1996), unfortunately, dyscalculia is not as widely known as dyslexia among teachers. Teachers, who are not familiar enough with dyscalculia and do not know how to intervene in children with dyscalculia, may end up with depriving children with dyscalculia as a qualified educational intervention needed much. Moreover, children's deprivation of the mathematical knowledge they need in daily life may adversely affect their quality of life. In this regard, the Ministry of National Education can organize in-service training, and relevant non-governmental organizations can hold seminars and conferences so that teachers will have sufficient knowledge and experience on dyscalculia.

Within the framework of these results, some suggestions were made to teachers and researchers. In this study, it was determined that most of the teachers did not have sufficient knowledge about what dyscalculia is, made incomplete and incorrect definitions, and confused dyslexia with dyscalculia. In addition, it has been revealed that teachers do not have sufficient knowledge about the causes of dyscalculia, the characteristics of dyscalculic children, intervention methods and effects for these children. In this context, courses for learning difficulties and dyscalculia can be given as compulsory or elective in universities. Articles, books, projects, activities, etc. can be made by researchers to increase awareness of dyscalculia. Thesis studies on dyscalculia can be done at both master's and doctorate levels. On the other hand, in-service training can be given to increase the knowledge level of teachers.

Ethics and Conflict of Interest

This article is based on the seminar held on 21 November 2019 hosted by the Muş Directorate of National Education. The authors declare that they acted in accordance with the ethical rules throughout the research process and that there is no conflict of interest between the authors.

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FLEXIBLE CLASSROOMS AND THEIR TEACHERS IN PRIMARY EDUCATION

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Abstract

The aim of this research was to get the opinions of primary school teacher candidates about flexible classrooms in which technology is integrated, the flexibility in the physical arrangement of the classrooms and the modern approach to classroom structuring, as opposed to the traditional classroom structure, and the role of teachers in these classrooms. The research study group consisted of 3rd-year pre-service teachers studying at a state university education faculty from 2021-2022. In the research, the data were obtained with a semi-structured interview form. For the analysis of the obtained data, the MAXQDA 2022 program and a content analysis technique were used. One of the main conclusions of the research was that the participants associated their definitions of the flexible classroom with the physical arrangement the most. According to their drawings, they preferred a u-shaped seating arrangement, and they defined the teachers of the flexible classrooms sociologically.

Keywords: Flexible classroom, classroom management, class teacher.

INTRODUCTION

Because of a change in the education paradigm, countries have been developing class structures suitable to their schools (Göçen, Eral, & Bücük, 2020). In addition to different responsibilities imposed on students in the 21st century (Walker, 2016), as the educational field has developed to better support students, constructivist pedagogies have gradually become more widespread. Today's students are demanding a change in the classroom because of the availability of different tools such as on demand videos, web 2.0 tool and computers. In the past, schools were shaped by the Industrial age; however, the classrooms of tomorrow will be shaped by the digital age (Arstop, 2018; Göçen, 2021). This new structure is called 'flexible sitting' in classrooms and has created a structure based on the view that students are in environments where they can express themselves more comfortably versus one in which they are using traditional tables and chairs (Swofford, 2021, Darling-Hammond et al., 2020). As Kennedy (2016, p. 20) considered: "Movability and maneuverability of seating are valued by 21st-century students because it facilitates the ability to work in groups or teams, which is becoming more common within the classroom, when seating configurations need to be altered within class, students may expect inherently that the classroom environment, especially seating, will be moldable to the task or purpose at hand".

The Theoretical Background of the Research

Designing flexible classrooms that are more conducive to student participation than traditional spaces has supported classroom management and students' meaningful learning. (Ellis & Goodyear, 2016; Rands & Gansemer-Topf, 2017). Zimmerman (2019) said that a flexible seating arrangement is a key part of this new, modern learning environment. The arrangement of personal living space is different from one individual to another. Seeing things that belong to a person in an environment gives the

individual a sense of owning the place and a feeling of belonging there (Büyükşahin, 2019). Classes constitute the most important and supportive factor at schools during the education and training process. Traditionally, classrooms are spaces designed by architects that contain different items such as tables, chairs, desks, cabinets, blackboards, audio, and visual elements. Monahan (2002) used the term "established pedagogy" to describe the impact of a space design on the activities that can occur within it. While formation of a physical learning space limits certain approaches, these approaches by their very nature become possible and can reflect methods used by the teacher, technical and even school management. In established pedagogy it is possible to see different examples of this. For example, traditional classrooms with rows of students facing the 'front' of the room position the instructor as the authority and primary source of information (Chandler, 2009). The physical environment of the class is one of the areas having an important impact on the success of students. This structure can play a role in determining whether the classroom is suitable for learning, as well as determine various details such as available resources, color, seating arrangement, lighting, and air conditioning. Even though relevant changes specified here do not have a significant impact on the success of students (Nguyen et al, as cited by Ghazali, 2017), they can have an impact on strengthening learning skills of a student.

Students in Turkey continue using physical educational spaces created by the Ministry of Education. Schools are constructed without regard for classroom set-up where it is assumed that wooden desks and tables in a space surrounded with four walls are sufficient. With technological advancements, the aim is to equip classes with top level cognitive materials. However, a person integrates the concept of space by correlating it with his or her own perceptions. For this reason, a space does not constitute a dimension having definite limits based on standards (Gezer, 2012). In this context, it is necessary to switch to classroom ergonomics tailored to the needs of students in the classroom instead of standardized classrooms (Büyükşahin, 2019). It is required for class arrangement to be more flexible and to conform to methods and techniques used in a school management approach. As the number of schools starting to redesign their learning environments increase, it is important to focus on the impact of the physical layout flexibility of classrooms and on students in the learning environment. There have been a limited number of studies that have evaluated benefits related with changes in the physical learning environment (Bagateli et al 2010; Pfeiffer et al 2008; Stapp, 2018). The fact that primary school students spend most of their time in one classroom has been very effective in understanding the impact of the learning environment on these students (Barrett et al, 2013). In today's classrooms, technological equipment such as computers with internet access and projectors are available as a requirement for modern classrooms. This technology facilitates remote access to information, carries the limits of the learning environment outside school, and changes the concept of the classroom environment (Şensoy & Sağsöz, 2015). Flexibility and openness constitute key qualities in promoting a community of relevant learners that can learn cognitively (Rands & Gansemer-Topf, 2017).

With the aim to increase participation in educational environments, educators have particularly evaluated subjects related to flexibility of physical variables of classroom space usage in schools. In the learning environment literature, there are also studies investigating how physical or established learning environments can develop pedagogy, and in return, how it can affect student outcomes (Blackmore et al, 2011; Cleveland, 2011; Clinton & Wilson, 2019; Fisher, 2005; Jamieson et al, 2005). With a pedagogic perspective, learning environments must provide teachers and students a space where they can discover information together. However, an effective learning environment must also be flexible enough to accommodate multiple learning approaches such as self-study and reflection, one-on-one teaching, peer discussion, small group work, teacher-led instruction and student presentations (Demir, Yıldız, & Tatik, 2019). Hence, some studies have concluded that when class arrangements are designed carefully, learning environments facilitate student centered teaching and this improves student participation (Cleveland, 2011; Stern & Etheridge, 2008). Gifford (2002) stated that open learning environments, classroom comfort and flexibility in furniture arrangement can have positive effects on learning outcomes.

Flexible, technology-enhanced classrooms have a variety of amenities designed to encourage student engagement, such as mobile and groupable furniture; writable surfaces; and ubiquitous access to power,

internet and content sharing capabilities. Studies conducted to understand the impact of flexible classes on teaching and learning have shown that these can positively affect academic success (Dori & Belcher, 2005) and student-teacher interaction (Walker et al, 2011). To move towards this type of student-centered learning, schools and educators are working towards a new style of learning in the 21st century. They set out to change the learning environment to meet the needs of their students and increase student engagement and academic success. As constituting part of this process, researchers have proposed changes in learning environments including improvement of teaching applications, increases in inclusion of technology, and changes in the physical class environment (Cleveland & Fisher, 2014; Kariippanon et al. 2018).

Effective usage of flexible class environments requires environmental competency to be at a high level. Environmental competence requires awareness of features related with the physical environment and skill to control or change the environment in connection with this. According to Lackney (2008), a lack of environmental competence can lead to teacher-led pedagogies in flexible learning environments. According to Robert, Ramsay & Bekiroglu (2021), lecturing is dominant in traditional classes because this is the approach where transmission is made the easiest. It revealed the effort to combine architectural design with teaching best practices to determine the impact of the physical learning environment on students (Rands & Gansemer-Topf, 2017). Successful pedagogy opens doors to success in academics, social and emotional growth, and lifelong skills (UNESCO, 2021). The educational environment is an environment where educational activities take place, where communication and interaction in teaching-learning processes take place, and where elements such as personnel, tools, equipment, facilities, and organization are formed. For this reason, it is a known fact that a well-designed classroom environment has a positive effect on students. Research (Darling-Hammond et al., 2020, Burgoyne & Ketcham, 2015; Cleveland, 2011, Stapp, 2019, Grimm, 2020; Zalud, 2020) suggests that students' learning is positively affected in flexible learning environments. In these classrooms, school management becomes easier and the communication between students who feel comfortable and teachers who effectively provide school management is strengthened. Thus, education and training become effective by differentiating from the traditional structure. Research on flexible classrooms is based on their impact on academic achievement, student learning and teachers' perceptions of the 21st century classroom. However, it should be noted that flexible classrooms do not mean the same thing for every teacher (Walsh, 2019). Some teachers prefer traditional seating arrangements (Erz, 2018) because they allow students to be disciplined (Morris, 2017) more easily than traditional educational structures. Some teachers, on the other hand, state that flexible classrooms negatively affect classroom management as they cause chaotic and waste time. Unlike other studies, the current study focuses on the characteristics that flexible classroom teachers should have. There has been no research on this topic in the literature.

The purpose of study

Changes in the structuring of traditional class organization into flexible classes came to the agenda mainly in Turkey and other parts of the world as modern and postmodern alternatives came out, but relevant studies have been quite limited. Given these new modern advances, children have the right to be educated in more flexible classes, where they are approached as individuals with personalities, interests and skills, rather than in classes where grade anxiety, standardized examinations and classification methods are used. Flexible classrooms are an alternative, where the teacher is not perceived as an authoritative force in the classroom. Instead, the classrooms are completely student-oriented, suitable for both individualization and group work in a physical sense and designed to meet the needs of the child.

The aim of this research is to determine the opinions of primary school teacher candidates about a flexible classroom structure versus the more classical classroom set-up and understand their views on the teacher characteristics within this structure, considering their interests and abilities and the abilities of the students. Sub-purposes determined in line with this aim are as follows:

- ✓ What are the opinions of primary school teacher candidates on the concept of a flexible class?
- ✓ How does primary school teacher candidate define a flexible class visually?

- ✓ What are the opinions of primary school teacher candidates on the role of the teacher in the class they drew?

METHOD

Research Design

A case study, a qualitative research design, was used in this study to determine the views of prospective teachers on flexible classrooms as an alternative layout to traditional classrooms. According to Chmiliar (2010), the case study is a methodological approach that includes in-depth analysis of relevant systems by using multi-data collection to obtain systematic information regarding how a limited system operates and processes. The most apparent feature of a case study is that an individual is examined within its context due to the unique characteristics of a related community or situation (Saban & Ersoy, 2016).

Study Group

Analogous (Homogenous) Sampling was used in the study. In the affinity sampling method, a small and homogeneous sample is considered and studied in detail (Neuman, 2014). In the affinity sampling method, the sample may include a similar subgroup in the population, or a highly specialized situation related to the problem of the research. For this reason, instead of reaching all the students who took the classroom management course, only the students studying in the department of classroom education were reached. Thus, the study group of this research consisted of 65 pre-service teachers in a state university in the 2021-2022 academic year in the faculty of education, department of elementary education, and department of classroom education. The name of the university where the research was conducted was not disclosed within the framework of ethical rules. The ethics committee letters of the relevant university for the realization of the research were obtained with the decision of the Scientific Research Ethics Committee dated 20.01.2022 and numbered 02/38. Findings relating with genders of primary school teacher candidate participating in research are given in Table 1.

Table 1. Findings about genders of participants

Gender	f	%
Female	48	73.84
Male	17	26.16
Total	65	100

It is seen from Table 1 that among 65 participants taking part in the study 48 of them are female and 17 of them are male.

In the research, the data were obtained from the participants through open-ended questions in a semi-structured interview form. Open-ended questions were prepared in line with the purpose of research by enabling participants to give answers requiring explanations rather than short answers. Questions also contained key phrases in the literature such as “flexible class”, “physical arrangement of class”, and “flexibility in school management”. Scanning was then done, and a draft interview form was prepared accordingly. To ensure that the form was valid, the prepared draft was presented to three experts in the educational field and their opinions were obtained. In line with expert opinions, the form was adjusted, and a pilot application was made. Ten pre-service teachers were selected for the pilot application, and they were requested to answer the form. Based on the initial data obtained from the pilot application, the functionality of the interview form was tested, and the final version of the form was created. To ensure external validity of the research, when findings were presented, quotes and images were included.

Questions for the interview form were created to determine opinions of participants in relation to flexible classes. The following questions were asked to participants within the scope of the study:

1. According to your opinion, what is a flexible class?
2. Can you draw a structure below that comes to your mind when you think about a flexible class?
3. What is the role of the teacher in the class you have drawn?

Validity and reliability

In qualitative research, validity and reliability depend on the degree of overlap with the realities of the person or organization, as they are evaluated with the records obtained by the researcher, or the comments made by the researcher. Records and comments are considered valid to the extent that they are in accordance with reality. However, the concept of validity and reliability, which is more commonly used in quantitative research, has been replaced by the term 'accuracy' in qualitative research. In this research, the terms 'transferability' for external validity, 'credibility' for internal validity, and 'durability' for reliability were used (Lincoln & Cuba, 1985, as cited in Şencan, 2005). 'Transferability' is the extent to which the researcher explains the scope of the study to the participants. 'Credibility' is the accuracy and reliability of the research results from the perspective of the people from whom information is collected. For this, the views of colleagues who are not in a subordinate or superior position but in a similar status are reflected (Şencan, 2005). To ensure the credibility dimension in the research, the answers given by the participants to each question were read by three experts in the field. The answers of the experts and the participants were compared and thus the consistency of the data was checked. 'Durability' is related to the consistency of the data. The researcher should keep good records and the research should be supported by evidence. In this study, robustness was maintained, because the researchers quoted the participants' responses exactly as they were given. In the discussion and conclusion section, the participants' views are presented in accordance with the structure in which they were found, which factors they were influenced by, and how they differ or have similarities with similar studies. The limitations of the study are also discussed at the end of the chapter. All these procedures show that this research can be accepted in terms of validity and reliability. In the analysis stage, answers obtained from primary school teacher candidates were transferred to a digital environment and a field expert was asked about the interview form with resolved data. According to the opinions received by the participants, themes and sub-themes were created and a coding key was created that indicated themes around consensus that were reached. Reliability was ensured when the same consensuses were reached among expert opinions as indicated by the newly created coding key. According to Büyüköztürk (2008), comparison of results with inclusion of a specialist other than a researcher in the analysis process, and having consensus with a ratio of 80%, ensures reliability of a study. At this stage, the Miles and Huberman's formula was used and is given as: Percentage of Agreement = Consensus / (Agreement + Disagreement) x 100 formula. The findings regarding the reliability analysis are as follows.

Table 2. Findings about reliability analysis of open-ended questions

Question no	Reliability percentage
1	91.2
2	87.6
3	80.4
Total	100

Analysis of Data

Data obtained from pre-service teachers with the semi-structured interview form consisting of 3 questions were analyzed with a content analysis technique. This technique was used to make the data meaningful by combining them within the context of scopes and themes. Content analysis is a technique that makes great contributions to the relevant literature by showing the gaps and deficiencies in the field and evaluating the features and usability of the studies (Kanlı et al, 2014). In order to make comparisons of particular concepts, themes and sub-themes, data were expressed numerically. MAXQDA 2022 was used for data analysis, particularly for systematic evaluation and interpretation of the data, because it is considered a powerful tool to develop theories and to test theoretical results. In the analysis of qualitative data, MAXQDA made it possible to develop a theory based on coding and to create a research report according to this theory, unlike other software that only codes (Çayır & Sarıtaş, 2017). Coding was made after findings with reliability analysis were obtained and then the analysis results were presented using a table and visual mapping.

IOJPE
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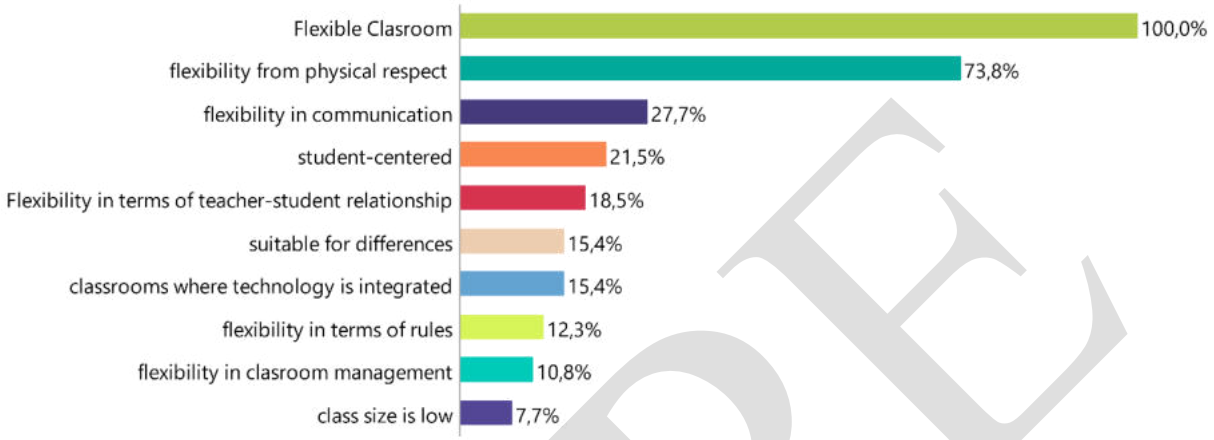
FINDINGS

Findings obtained from analysis of data collected in aiming for sub-purposes of study are submitted in this section.

With regards to the preliminary sub-purpose of study, opinions of pre-service teachers about what a flexible class is are obtained and these opinions are analyzed within context of codes created in relation to definition of "flexible class" and findings given in Graphic 1 are obtained.



Graphic 1. Flexible class

As it is seen in Graphic 1, majority of participants expressing opinion about what a flexible class is have correlated this flexibility with flexibility from physical respect (73.8%). It was determined that pre-service teachers correlated flexible classes with flexibility relating with school management at minimum (10.8%). It is seen that the teachers who expressed their opinions expressed flexible classrooms as classrooms suitable for differences (18.5%), classrooms in which technology was integrated (15.4), and classrooms with a small number of classrooms.

Analysis results about dimensions with which pre-service teachers correlated flexible classes physically are presented in Figure 1.

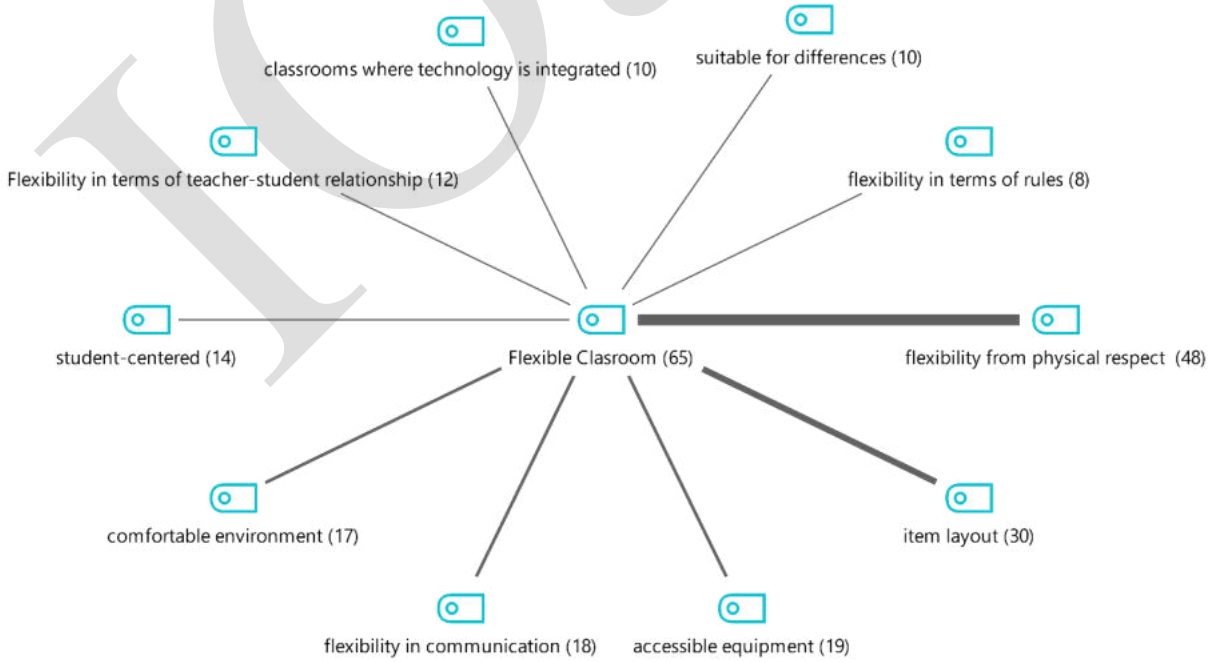


Figure 1. Flexible classes code sub-code sections model

As it is also seen in the figure, 48 of pre-service teachers expressing opinion have stated that flexible classes were physically flexible. Among participants who stated that flexible classrooms are physically flexible, 30 associated it with the arrangement of belongings, 19 with accessible tools and equipment, and 17 with a comfortable environment. Some of the opinions of pre-service teachers expressing opinion about physical flexibility code are as follows;

When defining flexible class, ÖA8 mentioned about the size of class and stated that physical order in this class must be as it is in local commodities week.

> ÖA8: It is the model in which teacher has access to every student and there are no back desks. While celebrating domestic good week in our classes in the past periods, arrangement in our class was in the same form and instead of giant and long classes, sweet classes that are a bit bigger than small and a little bit smaller than big would be an example for more flexible class structure. At the same time, as I have mentioned above, more rounded classes without back desks would be warmer and each student must be reachable and seen.

ÖA8 has stated opinion that when class is small it will be warmer and has made emphasis on size of flexible classes.ÖA14 has stated the opinion that different events can be specified with lights and has mentioned that flexible class must be outside scope of traditional structure. Furthermore, according to ÖA14 there must be technological devices such as computer and tablet for each student in flexible classes and besides, school management must be supported with variables such as lighting.

> ÖA14: I consider it as a class that operates as different from traditional class arrangement. Elements such as the fact that there are wheelchairs instead of normal chairs and that the tables can be adjusted according to the students' situation reflect the flexible classroom understanding. On one wall in the class there must be words, events, pictures enabling for students to get motivated which is related with the concept of flexible class. Providing electronic objects such as computer or tablet facilitates education of students. There can be lights on ceiling of class that can change according to event or the lesson. There can be light with a different color during book reading hours and there can be a different color of lighting while having lessons.

As being similar to OA14, ÖA16 stated that class arrangement must be in conformity with students and flexible classes must comply with individual differences. ÖA16 has said that in addition to physical order, school management must also be flexible, but that teacher should not compromise from his authority. Even though in the opinions of pre-service teachers it is mentioned about that there must be flexibility in physical and managerial dimensions, it is observed that the traditional structure is preserved.

> ÖA16: It can be defined as class arrangement related with variability and differences in the class, enabling harmonization to take place. A seating arrangement providing comfort for each child while no child will remain in back seats can be made. Desks that can be easily moved when desired constitute the main particular of seating arrangement according to my opinion. Desk arrangement should be made which can be harmonized with individual studies, group studies, experimental arrangement, and lesson arrangement in every condition. Class teacher must adapt to flexible conditions according to each situation. He should meet requests and needs of students but at the same time he should not compromise from his authority.

When opinions of participants stating opinions (ÖA8, ÖA14 and ÖA, 16) are reviewed, it is seen that they have defined flexible class as classes arranged in accordance with differences within varieties, having physical order for the student. According to participants order of each class should be supported with technological tools and classes must be developed in accordance with needs of students with technology.

When defining flexible class ÖA21 stated that in-class materials must be reachable by students and precautionary model should be used in school management.

> ÖA21: According to my opinion in the flexible class there must be an environment enabling for participation of all students in the class. Besides seating arrangement of students must enable them to be interactive in the class. Materials to be used in the class should be reachable. Measures should be taken in relation to factors affecting the class environment. A safe environment should be created.

When defining flexible class, ÖA26 and ÖA65 have stated their opinion that they considered these classes to be those not having rules, where rules have been made flexible. While defining flexible classes, ÖA26 has made emphasis on the particular that there could be space and time flexibility while lecturing as being different from traditional class environment, while there would be fun and guidance of teacher;

> ÖA26: Flexible class is a class where there aren't many harsh rules but that is not independent of rules. Meaning that in each morning lessons start at hour of 09:00 and lesson hours in following week can be changed as per student participation or conditions. For example, lecturing can be done in school garden and not always in the class. Students can come to lessons in civil clothing and not in school uniforms. In the lesson student and teacher can change roles. Student can sit at teacher's desk and lecture. There can be small cupboards in the class. Students can drink water from here during the lesson. In this way learning support is provided and both learning, and fun occur at the same time.

> ÖA65: Flexible class is a class where there are no rules and students can act comfortably, freely, where those who wish can sit on floor. In this class materials move; tables and desks are easily replaced. Students can move tables to where they wish.

> ÖA65: Flexible class is a class where there are no rules and students can act comfortably, freely, where those who wish can sit on the floor. In this class materials move; tables and desks are easily replaced. Students can move tables to where they wish.

> ÖA61: Flexible class is a class where student is at the center, has active participation, objects move easily, free physical arrangement and communication between student and teacher. Emphasis is made both on school management and physical dimension.… Flexible class is a class where there is student centered learning, where there is arrangement for active participation, planning accordingly, sitting order being different from traditional sitting order, applicable as per educational techniques, and methods. Teacher's desk must be close to each student. Teacher should be able to move freely. He should be able to move in the class. Desks mustn't be locked. In this way desks could be moved. In this way there will be a class order adjustable as per lesson and lesson plan.

In their flexible classroom definitions, pre-service teachers expressed flexible physical layout, environments with an arrangement different than the traditional seating arrangement (mostly u arrangement), where the desks can be moved and the items in the classroom can be changed easily. According to the pre-service teachers, the layout and functioning of these classes facilitate classroom management, support teaching and provide flexibility in terms of both time and space. Active participation is prominent in these student-centered classrooms, and teaching is kept alive by keeping strong student and teacher communication.

Within frame of determined themes and sub-codes overlapping code models established as per the ways participants mentioned about codes are as follows.

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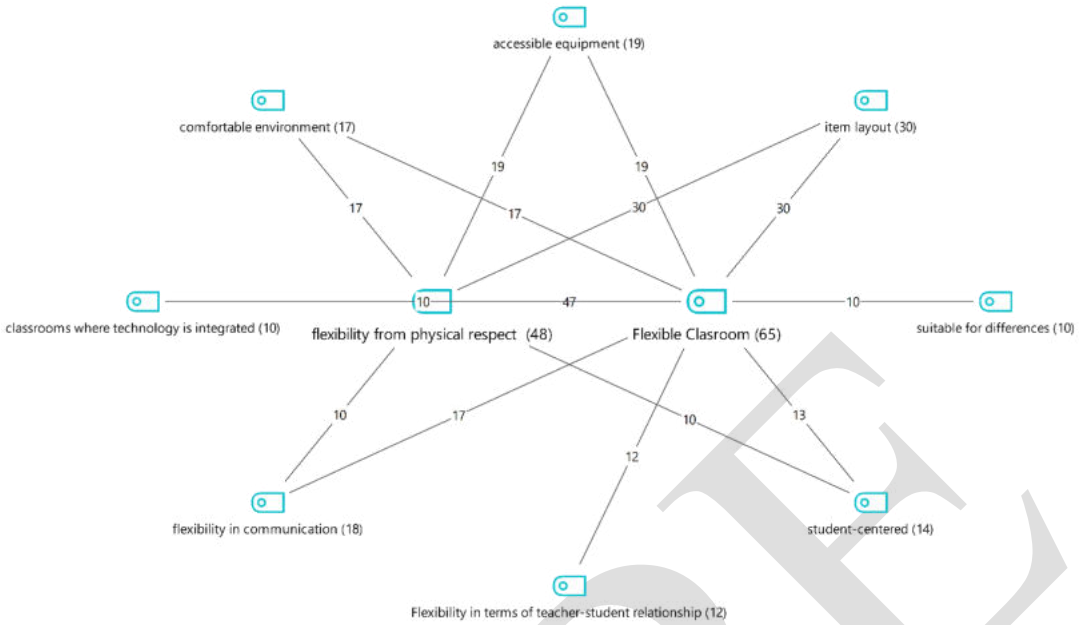
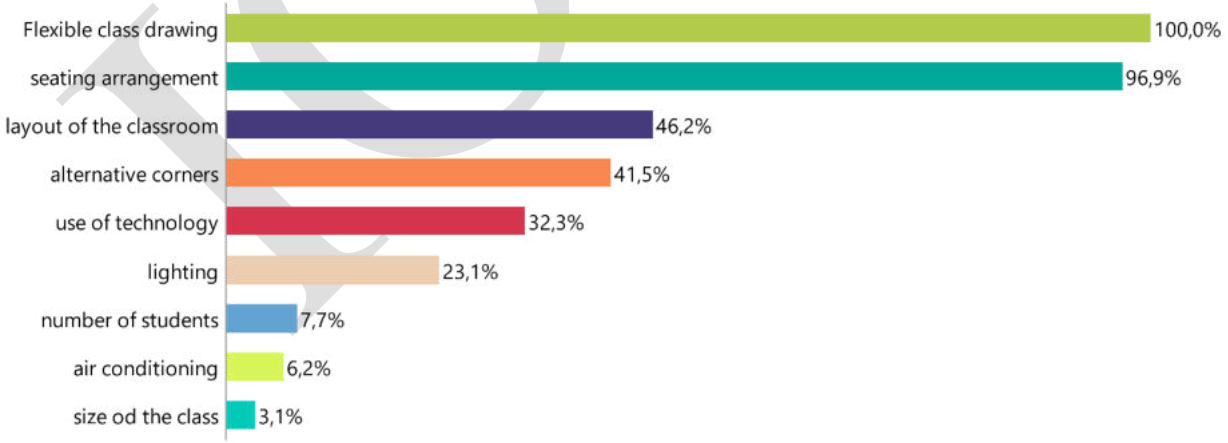


Figure 2. Physically code formation model

It is seen that teachers who express their opinions on what flexible classrooms are, correlate physical flexibility (n: 48) with the most accessible equipment (n: 19). However, it is seen that there is a connection with physical flexibility and communication in flexible classes (n: 18) and technology integrated classes (n: 10). It is seen that the participants define the flexible class as technology-integrated, flexible environments in terms of physical and management, where there is a comfortable communication environment. It is seen that pre-service teachers correlate flexibility in terms of physical environment with the availability of tools and equipment rather than the arrangement of goods.

Regarding the second sub-problem of the research, the drawings of the pre-service teachers for the flexible classroom were analyzed by coding according to the code key created within the framework of "variables related to the regulation of the physical environment" among the dimensions of school management, and the findings are presented below;



Graphic 2. Flexible class drawing

When the graph is examined, it is seen that most of the teachers (96.9%) who expressed their opinions made drawings for the seating arrangement, constituting one of the dimensions of the physical arrangement of the classroom. After the seating arrangement, the pre-service teachers mostly found the drawings related with the layout of the classrooms (46.2%) (Individual, sequential and multi-group). The drawings related to the size of the classroom (3.1%) and air conditioning (6.2) are at minimum. The

pre-service teachers who stated that there should be alternative corners make up 41.4% of the participants. Under the code of alternative corners, teachers have included many alternative corners such as plant corners, reading and resting corners, movie, and drama corners.

Drawings related with sub-codes of teachers making drawing about physical arrangement of flexible class are given in Figure 3.

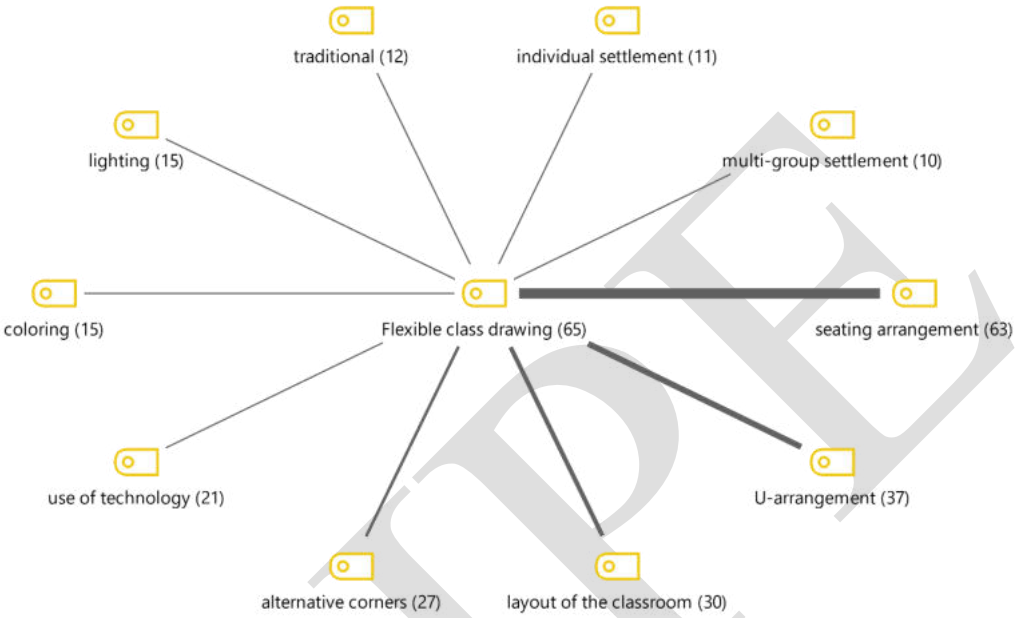


Figure 3. Flexible class drawing code sub-code sections model

It is seen that 37 out of the 63 pre-service teachers who mentioned about the seating arrangement while drawing the flexible classroom, depicted this arrangement in the form of a "u-arrangement". After the "U-arrangement" sitting style, the most traditional sitting style (n: 12) was drawn. It is seen in Figure 3 that the pre-service teachers who expressed their opinions preferred the individual layout (n: 11) in the classroom plan. Some drawings of participants making drawing of flexible class are as follows.

ÖA1:

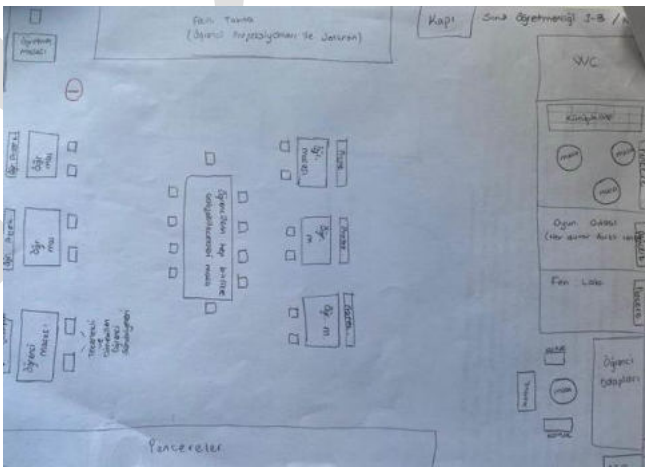


Figure 4. ÖA1's drawing

ÖA1 maintained the traditional seating arrangement constant while defining the flexible classroom visually. It is seen that this layout is supported by tables for different group activities. The participant, who visually defines the flexible classroom, has included spaces such as a toilet, game room and science

laboratory that are common to the use of the whole school, which are within the school but not specific to the classrooms, unlike traditional classrooms. Hence, he planned to make the class become more autonomous. He thought that lighting would be provided by adding windows to an entire wall of the classroom, and he created parts where students would be given individual spaces.

ÖA4:

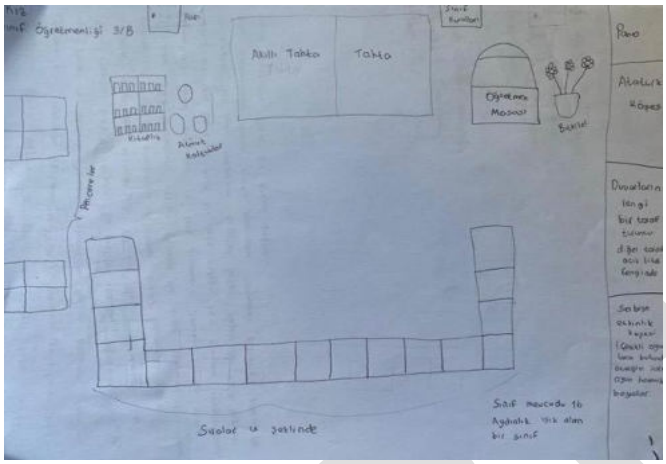


Figure 5. ÖA4's drawing

ÖA10:

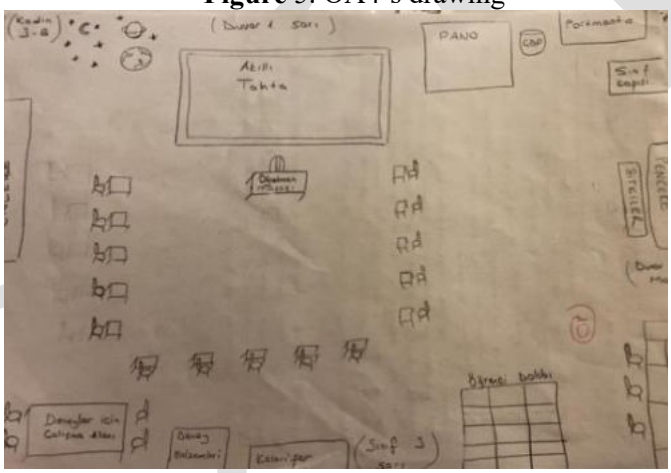


Figure 6. ÖA10's drawing

ÖA2:

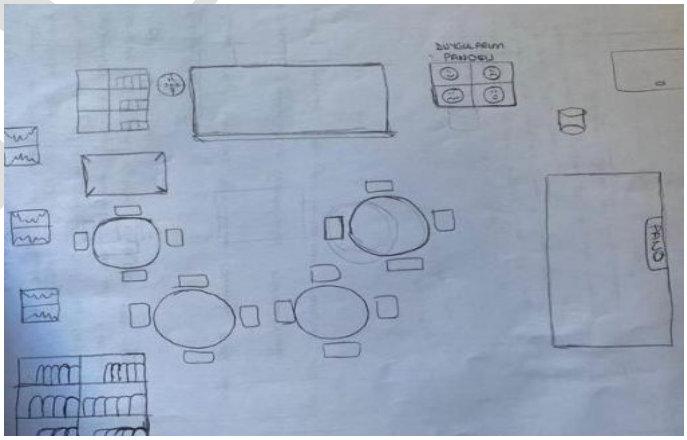


Figure 7. ÖA2's drawing

It is seen that participants ÖA2, ÖA4, ÖA10 mentioned about "u" form of sitting order in the sitting order of desks while establishing physical arrangement of class. Even though the layout differs

individually or in groups in the "U" shaped rows, the traditional classroom layout is generally reflected. PT4 added suggestions for the color and lighting of the classroom in addition to the u plan and did not find a drawing that differed from the traditional classroom. PT10 defined a class that includes alternative corners such as an experiment table with a “u” arrangement in the flexible classroom drawing. The pre-service teachers who designed the classrooms also included structures such as the board, Atatürk corner, library, student locker, which are in the classroom but do not separate the flexible classrooms from the traditional classrooms. PT2 drew the "u" layout while drawing the seating arrangement, while drawing the flexible class with the group layout. It has also added a mood board to the flexible classroom to contribute to school management.

ÖA3:

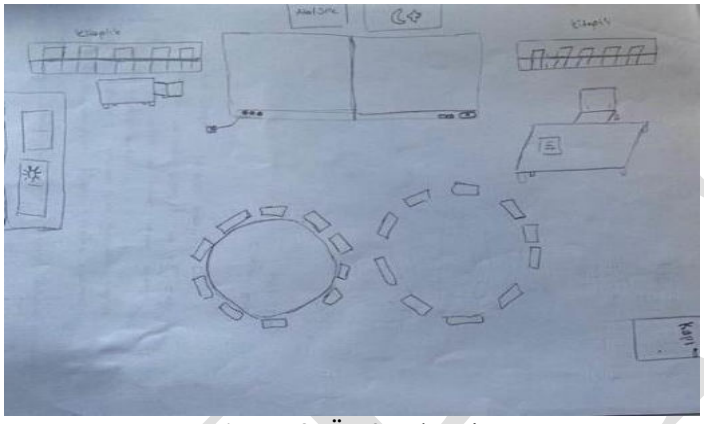


Figure 8. ÖA3’s drawing

ÖA63:

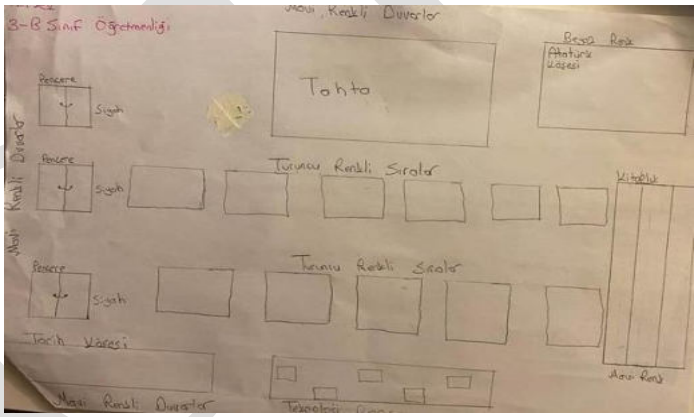


Figure 9. ÖA63’s drawing

ÖA11:

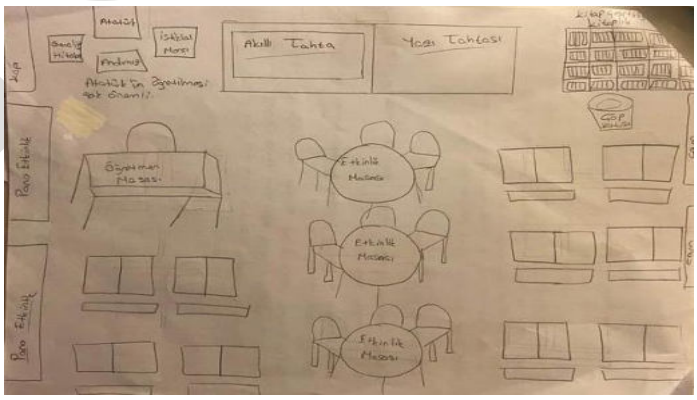


Figure 10. ÖA11’s drawing

When we look at the drawings of the participants who visually define the flexible classroom, it is seen that the boards are placed as in traditional classrooms, regardless of the desk order. Although PT11 included activity tables in the classroom, he conveyed the traditional order in the seating arrangement and could not go out of the traditional classrooms. Besides, unlike the traditional classroom, it expanded the Atatürk Corner. When it was looked at, it is seen that the general structure was preserved in the flexible class definition, except for the activity tables, which were added differently from the traditional class.

Examples of some of the drawings of the pre-service teachers who designed the seating arrangement in their drawings according to the grouped layout such as clusters and grouping of groups are given below.

ÖA2:

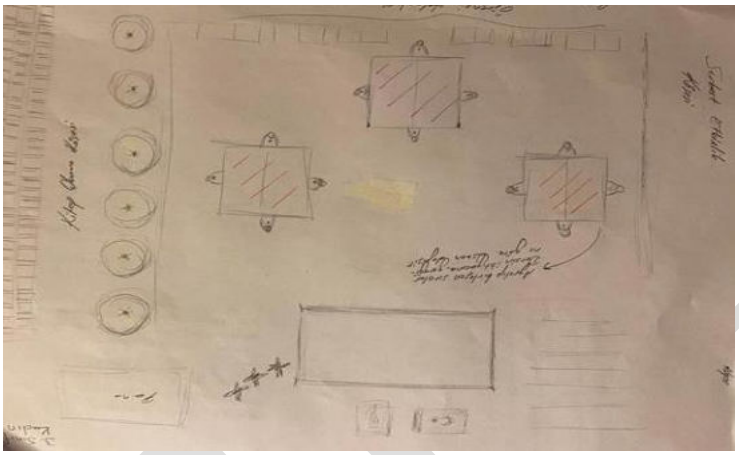


Figure 11. ÖA2's drawing

While drawing for the group layout in the classroom, ÖA2 also added a comfortable and individual book reading corner to the flexible classroom. Thus, it created areas for both individuality and group work in the flexible classroom.

ÖA9:

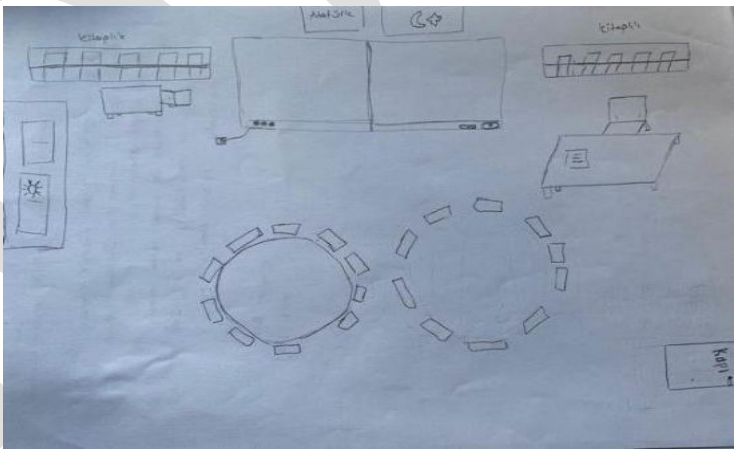


Figure 12. ÖA9's drawing

ÖA9 has defined group settlement order and flexible class visually but apart from this he could not create a drawing other than traditional class structure.

ÖA61 chose a grouped layout while describing the flexible classroom visually, and besides this, he painted a pedestal board rather than the traditional understanding of wood on the wall. This free-standing board can also be projected onto the wall and adjusted for activities. In addition, he included an alternative area to the visual definition of the flexible classroom by taking a rest and relaxation corner. Another variable that differs from the traditional structure is the presence of a food and beverage cabinet

in the classroom. It is understood from this drawing that the flexibility of eating, and drinking will be provided to the students in the classroom.

ÖA61:

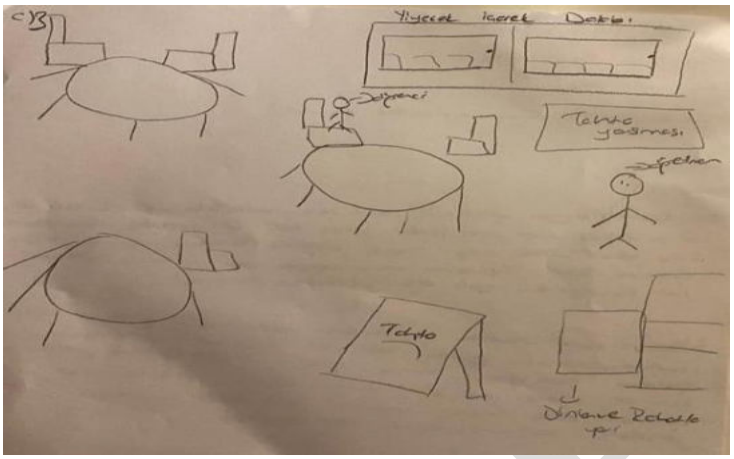
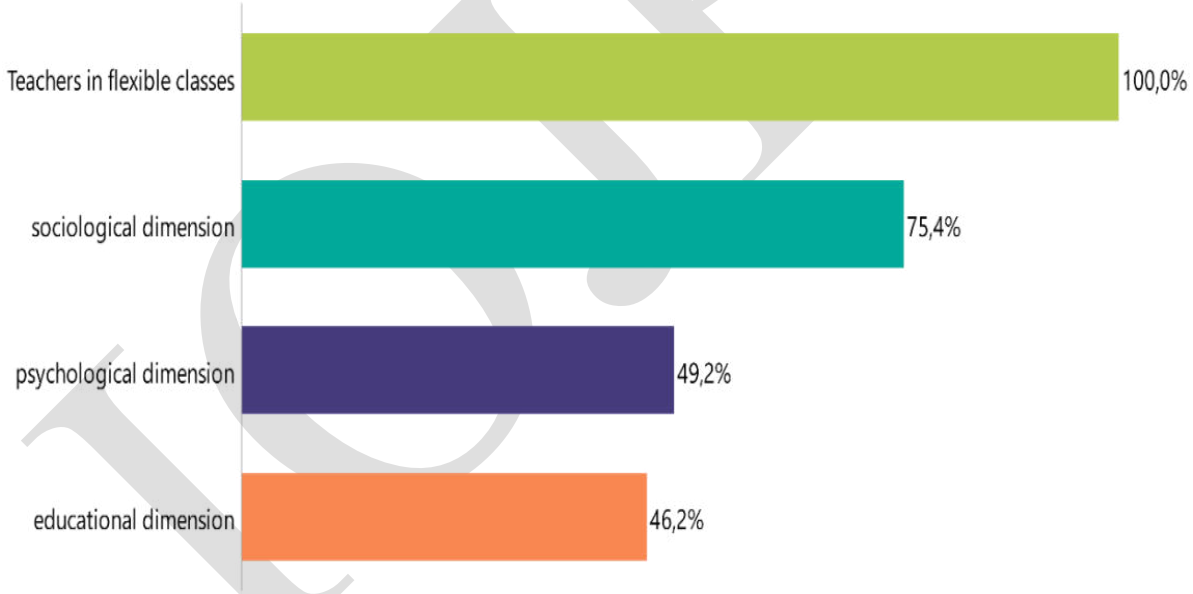


Figure 13. ÖA61's drawing

The data obtained for the third sub-purpose of the study were analyzed in terms of the characteristics that a teacher should have within the framework of the sociological, educational, and psychological dimensions of classroom management defined by Yücel et al. (2012), and the following findings were reached.



Graphic 3. Teachers in flexible classes

As can be seen in Graph 3, the majority of the participants (75.4%) expressed their opinions about the characteristics of teachers who have qualifications within the sociological dimension of classroom management. It is seen in the graph that the teachers who expressed their opinions mentioned the psychological dimension second (49.2%) and the least educational dimension (46.2%).

Some of the opinions expressed by the participants towards teachers in flexible classrooms are as follows.

When defining flexible class, ÖA14 stated as follows.

> ÖA14: Teachers are guides and advisors in classroom management. The teacher to whom the logical results model is applied motivates the student and is a teacher who shows

interest. Students are reminded of the rules until they internalize the classroom rules, and when they learn this, classroom management will be easier for the student. The psychoanalytic approach also cares about the structure of the family in the behavior of the student, recognizes the students, realizes the potential of each student, is a teacher with a model of love and logic, is a teacher who respects ideas, but acts as a guide for the student.

According to ÖA14, teachers in flexible classrooms are the ones who use the logical results model and provide internal and external control by motivating students. The teacher of the flexible classroom is a conscious teacher who knows the family and respects differences and applies the necessary model where necessary by mastering the models in classroom management.

ÖA15: Teacher leaves room for student, ensures discipline and order, and enables for training to take place most efficiently.

ÖA19: The teacher in his class is a teacher who loves students, values them, respect and tolerance for differences, besides, a person who can set the rules in the classroom with an effective discipline understanding and his students respect him, he does activities and group works as long as the lessons are appropriate, he tries to make the lessons fun instead of monotonous lectures. He does not give harsh answers to students' questions. on the contrary, in his class. He thinks that the student should be active in the lesson, even though there are no strict rules, the students know what he should do to his lesson.

ÖA14, ÖA15, and ÖA19 have defined teacher in flexible class as teacher providing discipline. According to ÖA19, teacher in flexible class is a person who is loving, knows about differences, understanding and who maintains authority. Besides they stated that teacher in this class must be pleasant and loving against students and that teacher should not be unpleasant.

ÖA26 defines teacher in flexible class.

ÖA26: Knowledgeable, having good communication with his students, sometimes being a teacher and sometimes being a friend of students, acting fairly against students, knowing students well, pleasant, determining class rules with students, making lessons become more pleasant, continuously investigating and learning.

He stated that a teacher must be entertaining and by mentioning about his look, he stated that he must be well groomed.

ÖA32: Teacher in this class is pleasant and nice, he attaches importance to lecturing by attracting attention of students and not just lecturing and living the class.

Participants who expressed their opinions emphasized that the flexible classroom teacher should be friendly, affectionate and open to communication under the sociological dimension of classroom management. In addition, they stated that under the psychological dimension of classroom management, flexible classroom teachers should provide discipline and benefit from management strategies appropriate to the situations in the classroom. They stated that teachers should be qualified and be able to apply the necessary models where necessary. The flexible classroom teacher, who is the person who organizes the teaching, should be fair in the classroom, guide the student and get to know the student.

Under sociological dimension pre-service teachers defined the teacher as consistent, fair, fun, sincere, knowing about student, being at center of class, and acting as guide and has defined teacher under relevant sub-codes and related detailed analysis is given in Figure 4.

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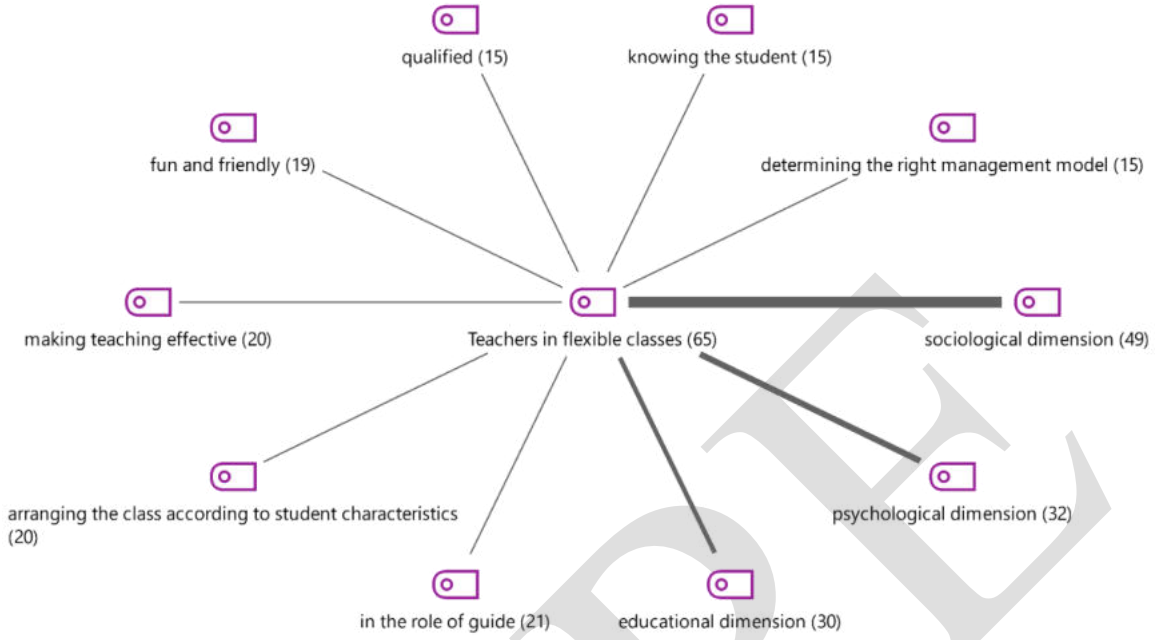

Figure 4. Flexible class teachers code sub-code sections model

The majority of the 49 participants (n: 21) who expressed their views on the characteristics of teachers in the sociological dimension defined the teacher in the flexible classroom as the "guidance" teacher. In the educational dimension, the majority of the 30 participants (n: 20) who expressed their opinions stated that flexible classroom teachers are the teachers who "make the teaching effective". Under the educational dimension, flexible classroom teachers were also defined as "qualified" (n: 15) and "determining the right management model" (n: 15).

Some of the opinions of participants about teachers in flexible class in sociological dimension are as follows.

> ÖA35: Teacher in class arrangement must be a guide. He must teach students how they can have access to information. Teacher must approach students as per their development periods. He must know his students well. He should know about situations outside the school. Teacher must act in a way to improve socialization among students. Having many activities in class is helpful to improve class climate. Skills of student must be determined well.

While defining the teacher in the flexible classroom, ÖA35 emphasized the importance of the teacher getting to know the students. The flexible classroom teacher should determine the student's interests and needs, organize the teaching and guide the student. According to PT35, the person who also organizes the communication between the students will be the teacher in this class.

> ÖA40: To attract attention of teacher and students to the lesson, to have better contact with them, he has used the class and desks in this form. Personally, he is a more elegant teacher at least against students.

> ÖA61: Teacher must guide the students. Teacher and students should learn together. Lessons should be given with plenty of activities and games. In school management, classroom climate must be full of joy, optimism, and love. Teacher should realize management with love.

> ÖA62: In the class teacher must approach students by considering cognitive approach and humanist approach of students at the fore in class environment. Teacher must be a guide leading the way for the students. He must be a teacher who respects opinions and thoughts of

students. The purpose of desk arrangement in class is to enable the teacher to see all the students. Classes should be arranged in u form not only to enable the teacher to see students but also to enable for students to see the teacher easily.

Considering the participant's views in terms of the sociological dimension of classroom management, teachers of flexible classrooms should know their students and be in favor of equality. The teacher who will guide the student is the person who increases the interaction and communication in the classroom.

DISCUSSION, CONCLUSION, and SUGGESTIONS

The results of this study, which aimed to get the opinions of pre-service teachers about flexible classrooms and the teachers of these classes, as opposed to more traditional classrooms, are as follows.

Pre-service teachers defined the flexible classroom as classrooms where flexibility in the physical sense and communication are provided, technology is integrated, and student-centered learning is encouraged, differences in learning?, are accommodated, and open communication is possible. Zimmerman (2019) determined, "In a modern learning environment, flexible classroom spaces organically integrate technology, helping teachers to better engage students and facilitate the mix of independent, small-group and whole-group class learning that is now viewed as essential to students' success. Kennedy (2019) stated, "The goal of flexible learning spaces is to provide students with environments where they can perform to their academic potential. Başdoğan & Morrone (2021) stated in their research with higher education students that the interaction of technology, physical environment and pedagogy increases active learning. YEGITEK (2018) stated that the current student profile in the developing and changing world is constantly developing and changing, therefore, in order to achieve the desired and targeted success, it is necessary to move away from the traditional understanding of education in order to provide students with 21st century skills. Flexibility offers the ability to bring two classes together for group teaching, to divide a single class into small groups and spread them over a larger area, or to combine different classes working on learning activities that do not complement each other (YEGITEK, 2018). Lisa (2019) believes that by changing traditional classrooms to flexible classrooms, students are more engaged in learning and perform better. Göçen, Eral, & Bücük, (2020) in their study, which describes flexible classrooms as the classrooms of the future, they stated that the "class of the future" can be classrooms integrated with technology that supports learning.

Flexible classrooms are classrooms with a small number of classrooms, are comfortable in terms of rules, and have flexible classroom management. Zalud's (2020) findings suggest that classrooms with flexible seating have a positive influence on student engagement. Physically, these classes show flexibility in terms of goods and accessible equipment. Flexible classrooms are relaxed environments and teacher-student communication is strong. Bekiroğlu, Ramsay, & Robert's, (2021) research results show that flexibility in the classroom can facilitate interaction and participation between students and instructors to create opportunities to encourage both cognitive and affective participation. These results are like the results in the current study where pre-service teachers define flexible classrooms as providing flexibility for communication, which will result in more flexibility in the physical, administrative and instructional dimensions of the classroom. Studies have also shown that flexible classes increase learning (Darling-Hammond et al., 2020, Burgoyne & Ketcham, 2015; Cleveland, 2011, Stapp, 2019, Grimm, 2020; Zalud, 2020). In Wahyudi's (2004) study, it was concluded that there is an important distinction between the perception of preferred and real learning environments and that students tend to prefer a more favorable classroom environment than they experience. In the current study, the pre-service teachers expressed their views on classrooms that were more suitable for teaching that were not like the traditional classroom structure but instead resembled the flexible classrooms they had described in their definitions. In this respect, student and teacher perceptions of preferred classroom environments are similar. Designing the walls of the classroom in such a way that the students' activities are exhibited enables the students to perceive the school as a living space. As a result, students feel more sense of belonging to the school (Ilgar, 2007). When the pre-service teachers' definitions of flexible classrooms are examined, the definitions are closely related to those adopted by the students with the goal of

teaching effectively. Participants defined a flexible class according to these visual definitions: a classroom supported by technology and created with a group layout in a physically "u-shaped" seating arrangement, with alternative corners for different activities and relaxation. This result is like that of Şahin (2019), that the semi-circular seating arrangement is preferred by the majority of the participating teachers, both because it increases student participation, communication and student success, and because it helps the teacher with classroom management. Pedro et al. (2017) found that school administration, teachers, and students all desire more flexible, reconfigurable, and modern classroom layouts, in which technology and active pedagogical practices can be easily incorporated. Lackney (2000) defined the principles of the educational design as being cost-efficient, learner-centered, progressive, age-appropriate, reliable, comfortable, accessible, flexible, and equity-based.

Teachers mentioned other desired items in the flexible classroom in their drawings from changing the color or the lighting of the classroom to even supplying air conditioning. Other than the seating arrangement, other teachers' drawings included specific use of technology and finding alternative corners in the classroom. Importantly, the drawings in flexible classrooms also included activity corners that would provide physical comfort to teachers while they carry out in-class activities that support education and training and reveal the relationship between the educational dimension and the physical dimension of classroom management. According to the research findings of Büyükşahin (2019) in which he investigated the effect of classroom ergonomics prepared with flexible seating arrangement on student and teacher motivation, flexible seating arrangement positively affects student and teacher motivation. In this context, it is notable that pre-service teachers emphasize the sitting arrangement the most, and its positive impact on classroom management and learning-teaching activities. Looking at the results of the current research, the teachers also mentioned many other physical dimensions that are important to consider for a classroom. These include physical elements in the classroom such as lighting, coloring, air conditioning, and alternative corners for activities. Şahin, Üstüner, & Korkmaz, (2018) agree that these physical dimensions are important, as they mention the factors that directly or indirectly affect classroom activities These factors include social and environment factors; the number of students in the classroom; the characteristics of the furniture, light, heat, and ventilation; and the seating arrangements of the students as influenced by classroom activities. According to YALE (2016), the "u-seating arrangement" gives the teacher freedom of movement and provides significant advantages in terms of using the whiteboard and reaching the desired student when necessary. In the U-shaped seating arrangement, the teacher can move freely in the classroom, encourages in-class discussions, and increases participation in discussions. The pre-service teachers' emphasis on the U-order in their drawings supports these findings in the literature. According to the pre-service teacher definitions, a teacher takes the role of a guide, knows the students, plans teaching by knowing student?, differences, ensures interaction in the classroom and is egalitarian. Hulac et al. (2020) and Wright (2020) indicated that there is limited research on the effects of flexible seating and questioned if the positive implications are due to teacher management or flexible seating.

In addition, in the educational dimension, pre-service teachers defined a qualified teacher as the person who makes teaching effective and determines the right model for classroom management by providing internal and external control. In an experimental study conducted by Demir-Yıldız & Tatik, (2019) on flexible classroom arrangement, they concluded that there was no effect of the flexible classroom environment on students' learning. On the other hand, in the pre-service teachers' definition of the flexible classroom teacher, it is assumed that teaching in a flexible classroom will be effective, and a positive change is expected on student learning. Höbek & Üredi (2017) conducted a study of primary and secondary school teachers on classroom management, and they found that teachers have a high tendency towards classroom management, behavior management, time management, organizing the educational environment, and relationship arrangements. Like the literature, the definitions of flexible classroom teachers by the pre-service teachers indicates that they are the individuals who make the environment suitable for the student and determine the appropriate method in classroom management. Based on the opinions of pre-service teachers and in agreement with similar results specified in the literature, it is possible to define a flexible class as a technology-integrated comfortable class aiming for

student success. Furthermore, this required student-centered training is established due to effective physical order, which is different from the traditional class structure in a physical and managerial sense and is within the frame of sociological and educational dimensions.

Suggestions

Based on the results of the study, suggestions for teachers who provide school management and are practitioners and for future research are listed below.

- ✓ Teachers can be given freedom regarding the physical layout of the classroom and teachers can design classrooms more comfortably according to the needs and characteristics of students. For this purpose, a budget can be allocated by the Ministry of National Education and teachers can be promoted.
- ✓ Subjects related to flexibility in classroom management and physical arrangement of the classroom can be presented to prospective teachers during their teacher education.
- ✓ A similar study can be repeated by obtaining the opinions of teachers and school administrators about flexible classes.

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. The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article. The ethical committee approval was obtained for this research from Çanakkale Onsekiz Mart University Scientific Research Ethics Committee with the decision numbered E-84026528-050.01.04-2200018231 dated January 20, 2022.

Limitations

In the study, data were collected only from primary school teacher candidates. This can be accepted as a limitation to approach it with a wider framework. Another limitation concerns the answers to the questions. The research is limited to the answers given by the teacher candidates to the questions.

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GENDER ROLES AMONG PUBLIC ELEMENTARY TEACHERS: BASIS FOR GENDER-RESPONSIVE INTERVENTION ACTIVITIES

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Abstract

Teachers are usually considered the backbone of schools, and understanding teachers' roles is vital to understanding the educational system. With this as a focus, differences in the perceived gender roles of public male and female elementary teachers were collected from 262 teachers from public central elementary schools in Cavite, Philippines. Results showed that elementary teaching is still a female-dominated profession and students have only limited encounters with male and/or father figures in elementary education. It was also observed that male and female teachers share equal roles in reproductive, community, and leisure activities. However, discrepancies are observed in their productive activities as female teachers spend more time in productive activities than male teachers. Strategies for gender-responsive policies and projects for teachers and other education personnel are recommended.

Keywords: Elementary teachers, gender roles, reproductive roles, productive roles, community roles.

INTRODUCTION

Teaching mirrors the common stereotypes of women and their supposed abilities and responsibilities for young children. For several years, there has existed a discrepancy between the number of female and male teachers at the elementary level. Historically, females have dominated the teaching profession at the elementary level. Teaching children in pre-elementary and elementary schools is traditionally seen as an extension of the mother's (nurturing) roles and, therefore, a natural job for women. In 2019, female elementary teachers in the Philippines were reported at 87.35% (World Bank Group, 2020). This deficit could result in an undesirable imbalance in elementary teacher gender demographics and perceptions about female and male teachers. The inferiority of male elementary educators has evoked an educational culture that perceives the near non-existence of male primary teachers as a common predicament among other basic education institutions. The notion of male primary school teachers is a possible injustice in elementary education.

Being a female-dominated profession yields negative impacts on the teaching profession. On the one hand, this results in a decline in educational quality and student discipline as boys in schools lack social role models and thus feel less engaged and underperforming (Dai, Li, Zhu, & Zhang, 2022; Sansone, 2017; Mulji, 2016; Antecol, Eren, & Ozbeklik, 2015). On the other hand, this condition may also result

in a reduced status of teaching as a profession [Organization of Economic Cooperation and Development (OECD), 2004]. Teaching is less prestigious than law, medicine, and engineering; but is more prestigious than most blue-collar work, such as truck driving, and pink-collar work, such as secretarial work (Ingersoll, 2018). However, in most cases in the Philippines, the teaching profession in the elementary does not yield a higher status quo than in secondary and tertiary levels.

Achieving a gender balance among teachers is vital for a gender-responsive education system [United Nations Children's Fund (UNICEF)/ United Nations Educational, Scientifi c and Cultural Organization (UNESCO), 2007). Yet, many barriers and challenges have hindered this. While most research focused on the impact of teacher gender on academics and behaviors of male and female elementary students (Hentschel, Heilman & Peus, 2019; Moses, Admiraal, & Berry, 2016; Wood, 2012; Florack, 2012), this study focused on the gender roles of male and female teachers to analyze possible reasons for the underrepresentation of male educators in the elementary level and to further suggest gender-responsive policies and projects to minimize, if not eliminate, this disproportionality. The conduct of gender analysis (UNESCO), 2009 should be aimed at identifying these barriers and eventually providing information for possible response strategies.

To address the disparity between male and female teachers at the elementary level, the researchers used gender analysis to analyze the productive, reproductive, and community roles of public elementary teachers. The main goal is to recommend policies, strategies, and interventions to address the gender problems, needs, and constraints arising from gender differentiation. To achieve this, the researchers used the Input-Process-Output-Outcome Approach (Figure 1).

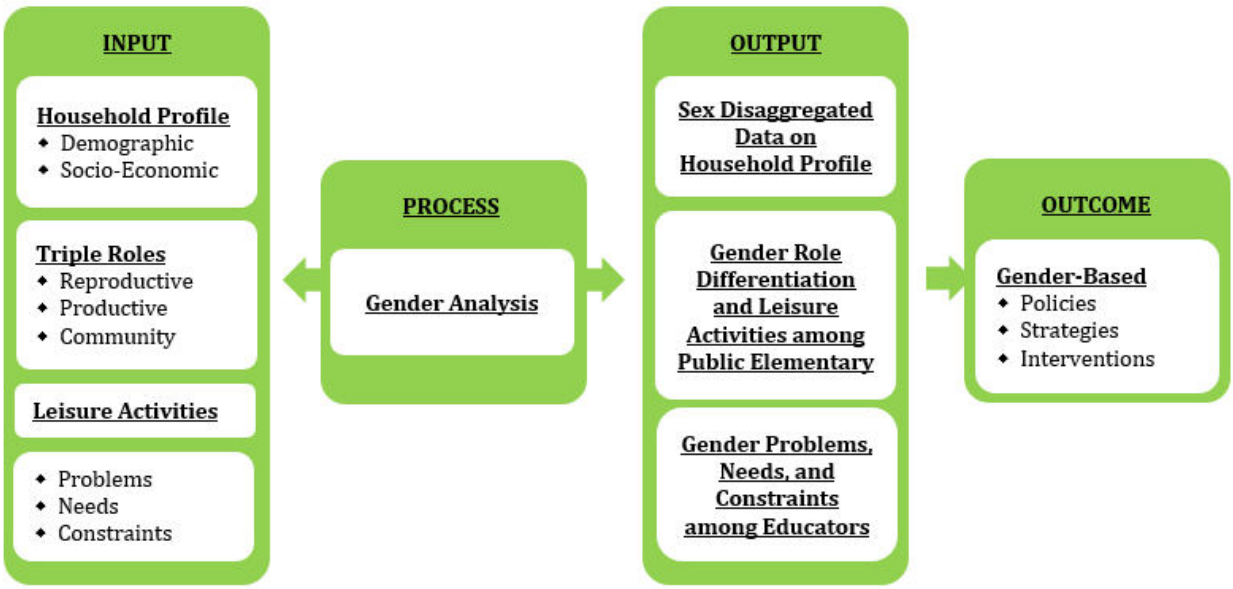

Figure 1. Conceptual framework of the study

The inputs considered were the institutional profiles, household profiles, triple roles, leisure activities, time devoted to triple roles and leisure activities, and the problems, needs, and constraints encountered in performing these roles and activities. Based on these primary data, gender analysis was conducted to create sex-disaggregated data on the household profiles and differentiate gender roles among elementary educators. Also, the identified problems, needs, and constraints among the participants served as bases for formulating policies, strategies, and interventions to develop a gender-responsive school community.

To better understand the disproportionality in the number of male and female elementary teachers, the researchers conducted a gender analysis of the participants' perceived differences in gender roles. Specifically, the study was aimed at determining answers to the following questions:

1. What are the socio-demographic characteristics of male and female elementary teachers and their households?
2. What are the perceived gender roles of male and female elementary teachers in reproductive, productive, community, and leisure activities?
3. What problems, needs, and constraints are identified based on their perceived differences in gender roles?
4. What gender-responsive and gender-equality strategies could be recommended to address the identified problems, needs, and constraints?

METHOD

Research Design

A descriptive research design has been selected for this research study. It describes gender-based differentiation among public elementary teachers in Cavite, Philippines. It was also used to determine the characterization of the participants and their households; gender roles in reproductive, productive, community, and leisure activities of the selected public elementary teachers in Cavite; and access and control over resources and benefits of males and females in the household, workplace, and the community.

Locale of the Study

The study was conducted in public central elementary schools in each town of Cavite. Central elementary schools were pre-selected to reduce time and effort in reaching the said schools as these were in the town proper.

Sampling Procedure

A total enumeration of male participants was employed, while systematic random sampling was used to select the female participants, which shall be equivalent to the number of male participants. A total of 262 elementary teachers from 23 central elementary schools in the municipalities and cities of Cavite participated in the study.

Data Collection Tool

The researchers developed the research tool used in collecting data for the study. The tool mainly contains demographic and socioeconomic characteristics (sex, age, civil status, educational attainment, academic rank, monthly income, and years in teaching) of the public elementary school teachers. Actual information was requested from them. As for the reproductive, productive, and community roles, a set of activities usually observed in the performance of various roles was listed. The participants were asked to check which are primarily done by a male or female family member, including themselves. There was a total of 36 identified activities that were validated. Three validators were asked to evaluate the activities and whether or not they agreed with the items used to measure the constructs. Fleiss' Kappa statistic was used to determine the interrater reliability. After the validation, only 32 items were used – 5 activities for the reproductive roles, 21 for the productive, and six for community roles. Items that have Fleiss' Kappa statistics of .40 and below were discarded.

Data Collection Procedure

Prior to the actual distribution of the instrument, the developed questionnaire was pre-tested on selected public elementary school teachers who were not part of the target participants. Permission from the Schools Division Superintendent of elementary schools was sought first to obtain the number and names of faculty members. Once permission was granted, the self-administered survey questionnaires were distributed to selected elementary school teachers. Also, interview with selected participants was conducted to validate their responses to the questionnaires.

Data Analysis

Data gathered were tabulated and analyzed accordingly. Descriptive statistics, frequency counts, ranks, means, and percentages, were used to describe the primary data collected among the educators. It gives information about the method and the process followed in the study.

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RESULTS

Sex-Disaggregated Data

Table 1 presents the sex-disaggregated data of public elementary schools regarding the number of stakeholders, namely staff, teachers, and students, for three school years. The number of stakeholders increased from SY 2017 – 2018 to the current school year. It can be noticed that there is almost an equal number of male and female staff and students in the three school years. However, the number of female teachers outscored the number of male teachers showing that teaching is still a female-dominated profession and students have only limited encounters with male and/or father figures in elementary education. Teachers opt to build their environments based on customary practices and gender identities, which may be biased towards a particular group or gender of students; in return, students may create bias in their own literacy experiences towards this created bias in the classroom (Florack, 2012).

Table 1. Sex disaggregated data of public elementary schools in terms of the average number of staff and teachers

STAKEHOLDERS	SY 2017 – 2018		SY 2018 – 2019		SY 2019 – 2020	
	Male	Female	Male	Female	Male	Female
Staff	2.00	4.33	2.33	4.33	2.33	4.33
Teachers	5.22	96.00	5.43	97.33	5.70	97.67

Gender Roles in Reproductive, Productive, Community, and Leisure Activities of Public Elementary Teachers

The gender roles in reproductive, productive, community, and leisure activities of public elementary teachers were collected through self-administered survey questionnaires. Results were presented as follows. Table 2 presents teacher participants' sex-disaggregated data regarding demographic characteristics. It can be seen that most of the female participants are 36-40 years old, single, college graduates, have an academic rank of Teacher I with a monthly income of PhP20.000 – 24.000, and have rendered 6-10 years in service. The male participants, mainly belong to 41-45 years old, single college graduates, have an academic rank of Teacher I with a monthly income of PhP20.000 – 24.000, and have rendered 6-10 years in service.

Table 2. Sex disaggregated data of teacher participants in terms of demographic characteristics

DEMOGRAPHIC CHARACTERISTICS	FEMALE (n = 131)		MALE (n = 131)	
	Frequency	Percentage	Frequency	Percentage
Age				
21 – 25	12	9.16	10	7.63
26 – 30	15	11.45	14	10.69
31 – 35	53	40.46	41	31.30
36 – 40	27	20.61	21	16.03
41 – 45	10	7.64	27	20.61
46 – 50	9	6.87	13	9.93
51 – 55	4	3.05	4	3.05
56 – 60	1	.76	1	.76
Civil Status				
Single	102	77.86	69	52.67
Married	29	22.14	57	43.51
Separated	0	.000	5	3.82
Educational Attainment				
College Graduate	107	81.68	77	58.78
with MA/MS units	14	10.69	39	29.77
MA/MS Graduate	10	7.63	15	11.45
Academic Rank				
Teacher I	86	65.65	57	43.51
Teacher II	27	20.61	36	27.48
Teacher III	6	4.58	17	12.98
Master Teacher I	10	7.63	17	12.98
Master Teacher II	2	1.53	4	3.05

IOJPE

Table 2. (Continued). Sex disaggregated data of teacher participants in terms of demographic characteristics

DEMOGRAPHIC CHARACTERISTICS	FEMALE (n = 131)		MALE (n = 131)	
	Frequency	Percentage	Frequency	Percentage
Monthly Income (Php)				
20,001 – 24,000	109	83.2	78	59.54
24,001 – 28,000	9	6.87	21	16.03
28,001 – 32,000	6	4.58	25	19.09
32,001 – 36,000	5	3.82	5	3.82
36,001 – 40,000	2	1.53	1	.76
40,001 – 44,000	0	0	1	.76
Years in Teaching				
1 – 5	45	34.35	27	20.61
6 – 10	48	36.64	50	38.17
11 – 15	19	14.51	19	14.50
16 – 20	4	3.05	22	16.79
21 – 25	7	5.34	5	3.82
26 – 30	8	6.11	8	6.11

Sex-Disaggregated Data

Table 3 presents the sex-disaggregated data of public elementary schools regarding the number of stakeholders, namely staff, teachers, and students, for three school years. The number of stakeholders increased from SY 2017 – 2018 to the current school year. It can be noticed that there is almost an equal number of male and female staff and students in the three school years. However, the number of female teachers outscored the number of male teachers showing that teaching is still a female-dominated profession and students have only limited encounters with male and/or father figures in elementary education. This disparity may opt teachers to build their environments based on customary practices and gender identities, which may be biased towards a particular group or gender of students; in return, they may create bias in their own literacy experiences towards this created bias in the classroom (Florack, 2012).

Table 3. Sex-disaggregated data of public elementary schools in terms of the average number of staff and teachers

STAKEHOLDERS	SY 2017 – 2018		SY 2018 – 2019		SY 2019 – 2020	
	Male	Female	Male	Female	Male	Female
Staff	2.00	4.33	2.33	4.33	2.33	4.33
Teachers	5.22	96.00	5.43	97.33	5.70	97.67

Gender Roles of the Participants

Reproductive activities. Table 4 shows the gender roles in reproductive activities that are primarily and sometimes done by members of the family. It can be observed that the father and male child primarily do water and fuel-related activities. In terms of health-related activities, it can be observed that both mother and father are primarily doing health-related activities. However, the burden is sometimes on the shoulders of the mothers. In terms of food-related activities, these are perceived to be a primary role of mothers and fathers; but sometimes done by mother and female Child. In terms of other household chores, most activities are distributed to each family member.

Table 4. Gender roles in and time allocation of reproductive activities that are done by members of the family

REPRODUCTIVE ACTIVITIES	Who Primarily Does	Who Sometimes Does	AVE. DURATION (HOURS)
Water Related			
1. Fetching Water	Father (1.15%)		.79
2. Buying distilled/ purified water	Father (79.39%)		.55
Fuel Related			
1. Buying gas	Father (71.76%)		.67

Table 4. (Continued). Gender roles in and time allocation of reproductive activities that are done by members of the family

REPRODUCTIVE ACTIVITIES	Who Primarily Does	Who Sometimes Does	AVE. DURATION (HOURS)
Health-related			
1. Bringing children to the doctor for a check-up	Father and Mother (70.23%)		2.80
2. Bringing adult member to the doctor for a check-up	Father and Mother (7.25%)	Mother (78.24%)	2.76
3. Generally taking care of children at home	Father and Mother (15.27%)	Mother (71.37%)	4.81
4. Taking care of seniors at home	Father and Mother (27.10%)	Mother (56.49%)	3.17
5. Caring sick	Father and Mother (19.47%)	Mother (67.56%)	3.15
Food-related			
1. Preparing foods	Father and Mother (17.56%)	Mother and Female Child (46.95%)	.81
2. Cooking	Father and Mother (19.08%)	Mother and Female Child (47.33%)	1.05
Other Household Chores			
1. Washing dishes	Both children (80.15%)		.96
2. Washing clothes	Mother and Female Child (85.11%)		3.33
3. Ironing clothes	Mother and Female Child (74.43%)		.67
4. Buying vegetables/fish	Father and Mother (44.65%)		.96
5. Buying groceries	Father and Mother (79.00%)		3.41
6. Cleaning the house	Both children (82.44%)		2.30
7. House repair	Father (84.35%)		1.86
8. Tutoring children	Mother (80.53%)		2.65

Productive Activities. Table 5 presents the gender roles in productive activities. It can be observed that male and female teachers usually do all the activities. In general, female teachers spend more time in productive activities than male teachers. This might indicate that female teachers are being extra careful of the tasks assigned to them or that male teachers are doing it faster.

In addition, both male and female teachers use different teaching strategies, which are incorporated into the lesson discussion. More male teachers use film showing, inductive method, concept-mapping, inquiry approach, project-learning, metacognitive, partner-learning, round table discussion, panel discussion, and debate as teaching strategies than female teachers. On the other hand, more female teachers use the deductive method, peer tutoring, and socio-drama as teaching strategies than male teachers do.

Table 5. Gender roles and time allocation in productive activities

PRODUCTIVE ACTIVITIES	USUALLY DONE BY		TIME ALLOCATION (MINUTES)	
	M	F	M	F
Daily Productive Activities				
1. Cleaning Room before class	131	131	35.58	36.16
2. Saying a prayer	131	131	15.58	16.16
3. Taking attendance	131	131	25.58	26.16
4. Reviewing the previous lesson	129	131	45.58	46.16
5. Connecting the previous lesson with the present lesson	129	127	45.58	46.16
6. Discussing the lesson	123	131	35.58	36.16
7. Assessing student learning	131	127	116.73	118.47
8. Checking of papers and other outputs	129	127	46.73	48.47
9. Recording scores	121	131	46.73	48.47

Table 5. (Continued). Gender roles and time allocation in productive activities

PRODUCTIVE ACTIVITIES	USUALLY DONE BY		TIME ALLOCATION (MINUTES)	
	M	F	M	F
10. Cleaning room after class	131	131	95.58	96.16
12. Preparing instructional materials for the next class	130	127	41.15	42.32
17. Preparing for the next day's activities	130	130	41.15	42.32
Weekly Productive Activities				
11. Conducting tutorials to under-achieving students	129	127	147.89	151.15
15. Bringing home any unfinished work	130	131	120.00	120.00
16. Writing/Preparing lesson/lesson plan	131	127	128.89	129.25
20. Counselling students	130	131	123.89	124.12
Monthly Productive Activities				
13. Attending faculty meetings	118	131	140.19	145.39
19. Conducting home visitation	105	112	241.35	247.69
Occasional Productive Activities				
14. Designing bulletin boards	98	108	117.89	120.77
18. Conducting parent conference	102	91	207.89	210.77
21. Use of teaching strategies				
• lecture-discussion	131	131		
• demonstration	130	128		
• film showing	123	117		
• inductive	118	111		
• deductive	104	120		
• concept-mapping	122	112		
• inquiry	125	118		
• project-learning	126	116		
• metacognitive	124	114		
• constructivist	115	114		
• reflective thinking	111	116		
• cooperative learning	121	119		
• peer tutoring	119	125		
• partner-learning	123	116		
• role playing	106	107		
• socio-drama	102	108		
• round table discussion	125	118		
• panel discussion	119	110		
• debate	121	117		

Community Activities. Table 6 shows the gender roles and time allocation in community activities that family members usually do. Regarding community management activities, mothers usually participate in most activities, except in community homeowners' associations. Both mother and father sometimes do these activities. In addition, when female teachers participate in community activities, they render more time in PTA and nutrition month. In comparison, male teachers spend more time in HOA, livelihood programs, health awareness activities, and being a member of BEI (board of elections).

Table 6. Gender roles and time allocation in community activities that are primarily done by members of the family

Community Activities	USUALLY DONE	SOMETIMES DONE	TIME ALLOCATION	
			M	F
Community managing activities				
1. Engage in parents-teachers association (PTA)	Mother	Mother and Father	3.02	3.10
2. Engage in community homeowners' association (HOA)	Father	Mother and Father	3.46	3.37
3. Participate in livelihood programs	Mother	Mother and Father	3.14	3.04
4. Engage in school and community-based activities				
• Nutrition month	Mother	Mother and Father	2.85	3.00
• health awareness activities	Mother	Mother and Father	2.75	2.22
5. Engage in NGOs activities	Mother	Mother and Father	2.86	2.83

Table 6. (Continued). Gender roles and time allocation in community activities that are primarily done by members of the family

Community Activities	USUALLY DONE	SOMETIMES DONE	TIME ALLOCATION M	F
Community politics activities				
1. serve as a member of the board of election inspector (BEI)	Mother	Mother and Father	75.52	75.02

Leisure Activities. Table 7 shows the gender roles in leisure activities. Male and female teachers watch TV, play with personal gadgets, surf the internet, read books, chat with friends, and sleep daily. Male teachers spend more time playing with personal gadgets, surfing the internet, and sleeping than female teachers. Moreover, teachers watch movies and do their hobbies on a weekly basis. Male teachers spend more time watching movies, while female teachers spend more time on their hobbies. For the monthly leisure activities, teachers listen to the radio, do workout activities, go to salons, parks, and malls and dine outside. Male teachers spend more time listening to the radio, doing workout activities, and going to the park.

In comparison, female teachers spend more time going to salons and malls and dining outside. Teachers play card games, go to a spa, play sports, and swim for occasional leisure activities. Furthermore, male teachers spend relatively more time playing card games and sports, while female teachers spend more time going to the spa and swimming.

Table 7. Gender roles, time allocation, and location of leisure activities

LEISURE ACTIVITIES	PERCENTAGE SHARE		TIME ALLOCATION (HOURS)	
	M	F	M	F
Daily				
1. Watching TV	97.71	98.47	2.76	3.05
4. Playing with personal gadgets	36.64	36.64	3.97	3.24
5. Surfing the Internet	97.71	96.95	3.17	3.03
7. Reading books	98.47	94.66	2.69	2.91
13. Chatting with friends	14.5	15.27	2.20	2.60
14. Sleeping	99.24	99.24	4.91	4.62
Weekly				
2. Watching movies	20.61	38.93	3.60	3.11
18. Hobby	35.88	32.82	2.54	3.19
Monthly				
6. Listening to the Radio	16.03	17.56	2.43	2.24
8. Work out activities	14.5	23.66	2.13	1.83
9. Going to salons	16.03	29.77	1.32	3.08
11. Going to the park	13.74	35.11	3.88	3.27
12. Going to the mall	32.82	29.01	3.27	3.96
17. Dining Outside	26.72	38.93	3.00	3.26
Occasionally				
3. Playing card games	55.73	51.15	3.40	1.43
10. Going to a spa	10.69	18.32	1.50	2.17
15. Playing sports	28.24	12.98	2.41	1.83
16. Swimming	18.32	12.98	3.25	5.00

Problems, Needs, and Constraints

In the focus group discussion conducted among selected male and female teachers, there were some themes as regards the lack of male teachers at the elementary level. First, males are foremost the breadwinner of each family, but the teaching profession does not promise lucrative compensation. Most elementary teachers complain that the salaries given to teachers here in the Philippines are less promising than the ones provided in other countries such as Singapore, Japan, and the like. Hence, increasing the baseline salary for entry-level elementary schools may attract more male teachers to the academe.

Second is that meager salaries provided by the teaching profession come with a heavy workload for them to perform – from the preparation of teaching materials, the conduct of actual teaching, and assessing students' learning to classroom management and guidance facilitation. They were also compelled to fill out certain forms and reports indicative of their student's performance. These workloads seemed to be a burden for them. They suggest that if higher authorities would hire additional non-teaching staff that would help them un-load these burdens would be of great help to them. After all, they were trained to teach and assess student learning but not to become clerks doing office work after classes. Another workload problem is handling varied subject matters. Teaching at the elementary level entails handling varied subjects at a grade level. This means that different preparation is expected for each subject they must handle. An increased number of preparations requires more time to study their lessons and prepare materials for the next day's activities.

Third, the teachers found that the elementary teaching profession requires good nurturing skills, which could be observed in most females. According to them, most male teachers are dominant and more commanding inside the class and would only be better for uncontrollable students. Also, the age of the students is one of their problems since most of them do not have enough maturity level; hence a higher patience level is required.

Finally, the problem concerns raising the status quo for the teaching profession. They confessed that most love teaching but are not adequately paid according to their job. They also complain that teaching has always been a challenging job. It gets harder and harder but gets less and less respect. If this will not be solved, then the role and value of teachers and the future of public education will be at stake.

DISCUSSION and CONCLUSION

The public elementary school still consists of more feminine figures, from the principal to the teachers and staff to the students. This disparity may opt for teachers to build their environments based on customary practices and gender identities, which may be biased toward a particular group or gender of students. In return, students may create bias in their own literacy experiences towards this created bias in the classroom (Florack, 2012). Hence, elementary educational institutions may increase their attention the recruitment as this may be beneficial to elementary education considering the impacts of male teachers on the holistic well-being of elementary pupils.

Net enrolment rate (NER) for Cavite elementary schools indicates that the proportion of girls not enrolled at the specified level of education is lower than that of boys (CALABARZON Regional Social and Economic Trends, 2019). In other words, girls have a higher participation rate in schools than boys. On the other hand, the cohort survival rate indicates that a high level of retention and low incidence of dropout among girls are being observed more than with boys. In general, key performance indicators for elementary schools reveal that girls outperform boys in almost every aspect, including completion, graduation, survival rates, and the like. This result cannot be directly attributed to female teachers' school dominance. Nevertheless, the presence of both male and female teachers in classrooms allows students to learn from teachers they perceive as being like themselves (McGrath, Bhana, Bergen, & Moosa, 2014). In addition to the differences observed in the general academic performance of male and female teachers (which may reflect their performance when they were still students), it may be an eye-opener for higher authorities to consider the field of specialization when assigning teachers their subjects to teach.

Results show discrepancies in the teachers' use of teaching strategies regarding gender, and female teachers spend more time in productive activities than male teachers. Studies also show disparities in girls' and boys' academic performances showing girls outperform boys in reading (Chadwell, 2010) while boys outperform girls in mathematics and science (Dickey, 2013). These studies only looked for disparities in pupils' academic performance when primarily female teachers taught them. However, one may explore possible research studies on the impact of teachers' gender on pupils' academic performances while identifying effective gender-specific teaching strategies. Since female teachers

dominated public elementary schools, one may also explore the reasons for this domination and the possible impact of male teachers at the elementary level in terms of pupils' academic performance, attendance, and other aspects of pupil's life.

Moreover, although there are existing gender-sensitive and responsive policies in the central elementary schools, they are yet to implement these inside the classroom and schools strictly (e.g., use of gender-fair language). For example, the use of Mrs. to address a married female teacher has long been eliminated from the list of gender-fair language. A seminar-workshop on the use of Gender-Fair Language is suggested for them.

Ethics and Conflict of Interest

This study was conducted according to ethical and research standards. Authors declare and confirm that we have acted in accordance with ethical rules throughout the entire research. Authors report there are no competing interests to declare.

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GENDER ROLES AMONG PUBLIC ELEMENTARY TEACHERS: BASIS FOR GENDER-RESPONSIVE INTERVENTION ACTIVITIES

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Abstract

Teachers are usually considered the backbone of schools, and understanding teachers' roles is vital to understanding the educational system. With this as a focus, differences in the perceived gender roles of public male and female elementary teachers were collected from 262 teachers from public central elementary schools in Cavite, Philippines. Results showed that elementary teaching is still a female-dominated profession and students have only limited encounters with male and/or father figures in elementary education. It was also observed that male and female teachers share equal roles in reproductive, community, and leisure activities. However, discrepancies are observed in their productive activities as female teachers spend more time in productive activities than male teachers. Strategies for gender-responsive policies and projects for teachers and other education personnel are recommended.

Keywords: Elementary teachers, gender roles, reproductive roles, productive roles, community roles.

INTRODUCTION

Teaching mirrors the common stereotypes of women and their supposed abilities and responsibilities for young children. For several years, there has existed a discrepancy between the number of female and male teachers at the elementary level. Historically, females have dominated the teaching profession at the elementary level. Teaching children in pre-elementary and elementary schools is traditionally seen as an extension of the mother's (nurturing) roles and, therefore, a natural job for women. In 2019, female elementary teachers in the Philippines were reported at 87.35% (World Bank Group, 2020). This deficit could result in an undesirable imbalance in elementary teacher gender demographics and perceptions about female and male teachers. The inferiority of male elementary educators has evoked an educational culture that perceives the near non-existence of male primary teachers as a common predicament among other basic education institutions. The notion of male primary school teachers is a possible injustice in elementary education.

Being a female-dominated profession yields negative impacts on the teaching profession. On the one hand, this results in a decline in educational quality and student discipline as boys in schools lack social role models and thus feel less engaged and underperforming (Dai, Li, Zhu, & Zhang, 2022; Sansone, 2017; Mulji, 2016; Antecol, Eren, & Ozbeklik, 2015). On the other hand, this condition may also result

in a reduced status of teaching as a profession [Organization of Economic Cooperation and Development (OECD), 2004]. Teaching is less prestigious than law, medicine, and engineering; but is more prestigious than most blue-collar work, such as truck driving, and pink-collar work, such as secretarial work (Ingersoll, 2018). However, in most cases in the Philippines, the teaching profession in the elementary does not yield a higher status quo than in secondary and tertiary levels.

Achieving a gender balance among teachers is vital for a gender-responsive education system [United Nations Children's Fund (UNICEF)/ United Nations Educational, Scientifi c and Cultural Organization (UNESCO), 2007). Yet, many barriers and challenges have hindered this. While most research focused on the impact of teacher gender on academics and behaviors of male and female elementary students (Hentschel, Heilman & Peus, 2019; Moses, Admiraal, & Berry, 2016; Wood, 2012; Florack, 2012), this study focused on the gender roles of male and female teachers to analyze possible reasons for the underrepresentation of male educators in the elementary level and to further suggest gender-responsive policies and projects to minimize, if not eliminate, this disproportionality. The conduct of gender analysis (UNESCO), 2009 should be aimed at identifying these barriers and eventually providing information for possible response strategies.

To address the disparity between male and female teachers at the elementary level, the researchers used gender analysis to analyze the productive, reproductive, and community roles of public elementary teachers. The main goal is to recommend policies, strategies, and interventions to address the gender problems, needs, and constraints arising from gender differentiation. To achieve this, the researchers used the Input-Process-Output-Outcome Approach (Figure 1).

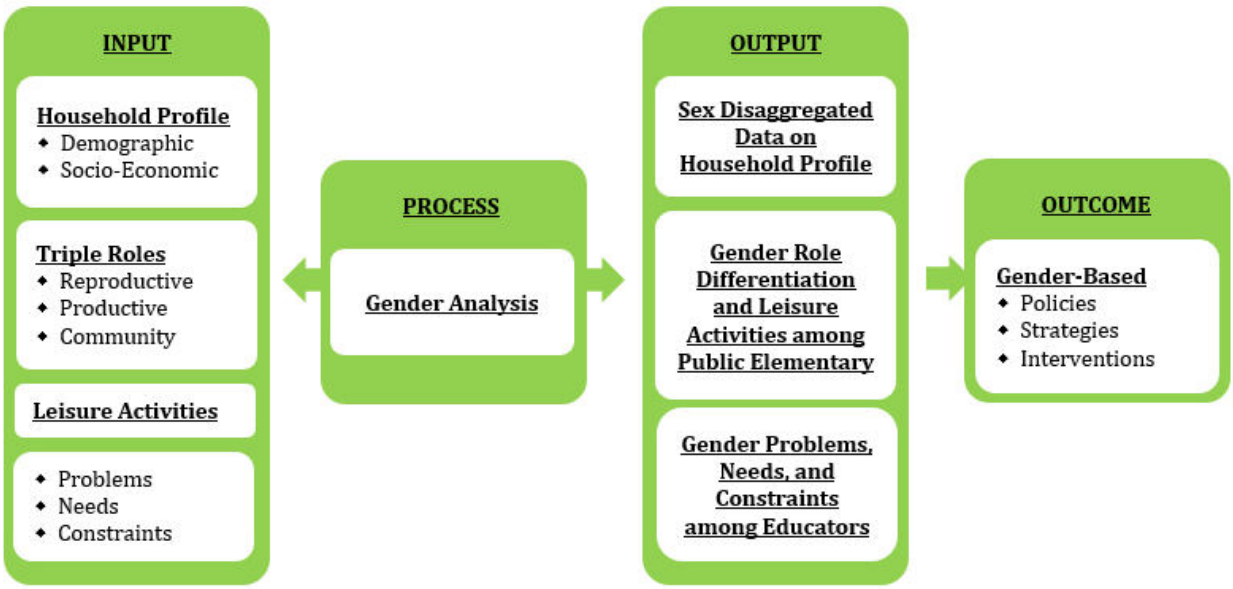

Figure 1. Conceptual framework of the study

The inputs considered were the institutional profiles, household profiles, triple roles, leisure activities, time devoted to triple roles and leisure activities, and the problems, needs, and constraints encountered in performing these roles and activities. Based on these primary data, gender analysis was conducted to create sex-disaggregated data on the household profiles and differentiate gender roles among elementary educators. Also, the identified problems, needs, and constraints among the participants served as bases for formulating policies, strategies, and interventions to develop a gender-responsive school community.

To better understand the disproportionality in the number of male and female elementary teachers, the researchers conducted a gender analysis of the participants' perceived differences in gender roles. Specifically, the study was aimed at determining answers to the following questions:

1. What are the socio-demographic characteristics of male and female elementary teachers and their households?
2. What are the perceived gender roles of male and female elementary teachers in reproductive, productive, community, and leisure activities?
3. What problems, needs, and constraints are identified based on their perceived differences in gender roles?
4. What gender-responsive and gender-equality strategies could be recommended to address the identified problems, needs, and constraints?

METHOD

Research Design

A descriptive research design has been selected for this research study. It describes gender-based differentiation among public elementary teachers in Cavite, Philippines. It was also used to determine the characterization of the participants and their households; gender roles in reproductive, productive, community, and leisure activities of the selected public elementary teachers in Cavite; and access and control over resources and benefits of males and females in the household, workplace, and the community.

Locale of the Study

The study was conducted in public central elementary schools in each town of Cavite. Central elementary schools were pre-selected to reduce time and effort in reaching the said schools as these were in the town proper.

Sampling Procedure

A total enumeration of male participants was employed, while systematic random sampling was used to select the female participants, which shall be equivalent to the number of male participants. A total of 262 elementary teachers from 23 central elementary schools in the municipalities and cities of Cavite participated in the study.

Data Collection Tool

The researchers developed the research tool used in collecting data for the study. The tool mainly contains demographic and socioeconomic characteristics (sex, age, civil status, educational attainment, academic rank, monthly income, and years in teaching) of the public elementary school teachers. Actual information was requested from them. As for the reproductive, productive, and community roles, a set of activities usually observed in the performance of various roles was listed. The participants were asked to check which are primarily done by a male or female family member, including themselves. There was a total of 36 identified activities that were validated. Three validators were asked to evaluate the activities and whether or not they agreed with the items used to measure the constructs. Fleiss' Kappa statistic was used to determine the interrater reliability. After the validation, only 32 items were used – 5 activities for the reproductive roles, 21 for the productive, and six for community roles. Items that have Fleiss' Kappa statistics of .40 and below were discarded.

Data Collection Procedure

Prior to the actual distribution of the instrument, the developed questionnaire was pre-tested on selected public elementary school teachers who were not part of the target participants. Permission from the Schools Division Superintendent of elementary schools was sought first to obtain the number and names of faculty members. Once permission was granted, the self-administered survey questionnaires were distributed to selected elementary school teachers. Also, interview with selected participants was conducted to validate their responses to the questionnaires.

Data Analysis

Data gathered were tabulated and analyzed accordingly. Descriptive statistics, frequency counts, ranks, means, and percentages, were used to describe the primary data collected among the educators. It gives information about the method and the process followed in the study.

RESULTS

Sex-Disaggregated Data

Table 1 presents the sex-disaggregated data of public elementary schools regarding the number of stakeholders, namely staff, teachers, and students, for three school years. The number of stakeholders increased from SY 2017 – 2018 to the current school year. It can be noticed that there is almost an equal number of male and female staff and students in the three school years. However, the number of female teachers outscored the number of male teachers showing that teaching is still a female-dominated profession and students have only limited encounters with male and/or father figures in elementary education. Teachers opt to build their environments based on customary practices and gender identities, which may be biased towards a particular group or gender of students; in return, students may create bias in their own literacy experiences towards this created bias in the classroom (Florack, 2012).

Table 1. Sex disaggregated data of public elementary schools in terms of the average number of staff and teachers

STAKEHOLDERS	SY 2017 – 2018		SY 2018 – 2019		SY 2019 – 2020	
	Male	Female	Male	Female	Male	Female
Staff	2.00	4.33	2.33	4.33	2.33	4.33
Teachers	5.22	96.00	5.43	97.33	5.70	97.67

Gender Roles in Reproductive, Productive, Community, and Leisure Activities of Public Elementary Teachers

The gender roles in reproductive, productive, community, and leisure activities of public elementary teachers were collected through self-administered survey questionnaires. Results were presented as follows. Table 2 presents teacher participants' sex-disaggregated data regarding demographic characteristics. It can be seen that most of the female participants are 36-40 years old, single, college graduates, have an academic rank of Teacher I with a monthly income of PhP20.000 – 24.000, and have rendered 6-10 years in service. The male participants, mainly belong to 41-45 years old, single college graduates, have an academic rank of Teacher I with a monthly income of PhP20.000 – 24.000, and have rendered 6-10 years in service.

Table 2. Sex disaggregated data of teacher participants in terms of demographic characteristics

DEMOGRAPHIC CHARACTERISTICS	FEMALE (n = 131)		MALE (n = 131)	
	Frequency	Percentage	Frequency	Percentage
Age				
21 – 25	12	9.16	10	7.63
26 – 30	15	11.45	14	10.69
31 – 35	53	40.46	41	31.30
36 – 40	27	20.61	21	16.03
41 – 45	10	7.64	27	20.61
46 – 50	9	6.87	13	9.93
51 – 55	4	3.05	4	3.05
56 – 60	1	.76	1	.76
Civil Status				
Single	102	77.86	69	52.67
Married	29	22.14	57	43.51
Separated	0	.000	5	3.82
Educational Attainment				
College Graduate	107	81.68	77	58.78
with MA/MS units	14	10.69	39	29.77
MA/MS Graduate	10	7.63	15	11.45
Academic Rank				
Teacher I	86	65.65	57	43.51
Teacher II	27	20.61	36	27.48
Teacher III	6	4.58	17	12.98
Master Teacher I	10	7.63	17	12.98
Master Teacher II	2	1.53	4	3.05

Table 2. (Continued). Sex disaggregated data of teacher participants in terms of demographic characteristics

DEMOGRAPHIC CHARACTERISTICS	FEMALE (n = 131)		MALE (n = 131)	
	Frequency	Percentage	Frequency	Percentage
Monthly Income (Php)				
20,001 – 24,000	109	83.2	78	59.54
24,001 – 28,000	9	6.87	21	16.03
28,001 – 32,000	6	4.58	25	19.09
32,001 – 36,000	5	3.82	5	3.82
36,001 – 40,000	2	1.53	1	.76
40,001 – 44,000	0	0	1	.76
Years in Teaching				
1 – 5	45	34.35	27	20.61
6 – 10	48	36.64	50	38.17
11 – 15	19	14.51	19	14.50
16 – 20	4	3.05	22	16.79
21 – 25	7	5.34	5	3.82
26 – 30	8	6.11	8	6.11

Sex-Disaggregated Data

Table 3 presents the sex-disaggregated data of public elementary schools regarding the number of stakeholders, namely staff, teachers, and students, for three school years. The number of stakeholders increased from SY 2017 – 2018 to the current school year. It can be noticed that there is almost an equal number of male and female staff and students in the three school years. However, the number of female teachers outscored the number of male teachers showing that teaching is still a female-dominated profession and students have only limited encounters with male and/or father figures in elementary education. This disparity may opt teachers to build their environments based on customary practices and gender identities, which may be biased towards a particular group or gender of students; in return, they may create bias in their own literacy experiences towards this created bias in the classroom (Florack, 2012).

Table 3. Sex-disaggregated data of public elementary schools in terms of the average number of staff and teachers

STAKEHOLDERS	SY 2017 – 2018		SY 2018 – 2019		SY 2019 – 2020	
	Male	Female	Male	Female	Male	Female
Staff	2.00	4.33	2.33	4.33	2.33	4.33
Teachers	5.22	96.00	5.43	97.33	5.70	97.67

Gender Roles of the Participants

Reproductive activities. Table 4 shows the gender roles in reproductive activities that are primarily and sometimes done by members of the family. It can be observed that the father and male child primarily do water and fuel-related activities. In terms of health-related activities, it can be observed that both mother and father are primarily doing health-related activities. However, the burden is sometimes on the shoulders of the mothers. In terms of food-related activities, these are perceived to be a primary role of mothers and fathers; but sometimes done by mother and female Child. In terms of other household chores, most activities are distributed to each family member.

Table 4. Gender roles in and time allocation of reproductive activities that are done by members of the family

REPRODUCTIVE ACTIVITIES	Who Primarily Does	Who Sometimes Does	AVE. DURATION (HOURS)
Water Related			
1. Fetching Water	Father (1.15%)		.79
2. Buying distilled/ purified water	Father (79.39%)		.55
Fuel Related			
1. Buying gas	Father (71.76%)		.67

Table 4. (Continued). Gender roles in and time allocation of reproductive activities that are done by members of the family

REPRODUCTIVE ACTIVITIES	Who Primarily Does	Who Sometimes Does	AVE. DURATION (HOURS)
Health-related			
1. Bringing children to the doctor for a check-up	Father and Mother (70.23%)		2.80
2. Bringing adult member to the doctor for a check-up	Father and Mother (7.25%)	Mother (78.24%)	2.76
3. Generally taking care of children at home	Father and Mother (15.27%)	Mother (71.37%)	4.81
4. Taking care of seniors at home	Father and Mother (27.10%)	Mother (56.49%)	3.17
5. Caring sick	Father and Mother (19.47%)	Mother (67.56%)	3.15
Food-related			
1. Preparing foods	Father and Mother (17.56%)	Mother and Female Child (46.95%)	.81
2. Cooking	Father and Mother (19.08%)	Mother and Female Child (47.33%)	1.05
Other Household Chores			
1. Washing dishes	Both children (80.15%)		.96
2. Washing clothes	Mother and Female Child (85.11%)		3.33
3. Ironing clothes	Mother and Female Child (74.43%)		.67
4. Buying vegetables/fish	Father and Mother (44.65%)		.96
5. Buying groceries	Father and Mother (79.00%)		3.41
6. Cleaning the house	Both children (82.44%)		2.30
7. House repair	Father (84.35%)		1.86
8. Tutoring children	Mother (80.53%)		2.65

Productive Activities. Table 5 presents the gender roles in productive activities. It can be observed that male and female teachers usually do all the activities. In general, female teachers spend more time in productive activities than male teachers. This might indicate that female teachers are being extra careful of the tasks assigned to them or that male teachers are doing it faster.

In addition, both male and female teachers use different teaching strategies, which are incorporated into the lesson discussion. More male teachers use film showing, inductive method, concept-mapping, inquiry approach, project-learning, metacognitive, partner-learning, round table discussion, panel discussion, and debate as teaching strategies than female teachers. On the other hand, more female teachers use the deductive method, peer tutoring, and socio-drama as teaching strategies than male teachers do.

Table 5. Gender roles and time allocation in productive activities

PRODUCTIVE ACTIVITIES	USUALLY DONE BY		TIME ALLOCATION (MINUTES)	
	M	F	M	F
Daily Productive Activities				
1. Cleaning Room before class	131	131	35.58	36.16
2. Saying a prayer	131	131	15.58	16.16
3. Taking attendance	131	131	25.58	26.16
4. Reviewing the previous lesson	129	131	45.58	46.16
5. Connecting the previous lesson with the present lesson	129	127	45.58	46.16
6. Discussing the lesson	123	131	35.58	36.16
7. Assessing student learning	131	127	116.73	118.47
8. Checking of papers and other outputs	129	127	46.73	48.47
9. Recording scores	121	131	46.73	48.47

Table 5. (Continued). Gender roles and time allocation in productive activities

PRODUCTIVE ACTIVITIES	USUALLY DONE BY		TIME ALLOCATION (MINUTES)	
	M	F	M	F
10. Cleaning room after class	131	131	95.58	96.16
12. Preparing instructional materials for the next class	130	127	41.15	42.32
17. Preparing for the next day's activities	130	130	41.15	42.32
Weekly Productive Activities				
11. Conducting tutorials to under-achieving students	129	127	147.89	151.15
15. Bringing home any unfinished work	130	131	120.00	120.00
16. Writing/Preparing lesson/lesson plan	131	127	128.89	129.25
20. Counselling students	130	131	123.89	124.12
Monthly Productive Activities				
13. Attending faculty meetings	118	131	140.19	145.39
19. Conducting home visitation	105	112	241.35	247.69
Occasional Productive Activities				
14. Designing bulletin boards	98	108	117.89	120.77
18. Conducting parent conference	102	91	207.89	210.77
21. Use of teaching strategies				
• lecture-discussion	131	131		
• demonstration	130	128		
• film showing	123	117		
• inductive	118	111		
• deductive	104	120		
• concept-mapping	122	112		
• inquiry	125	118		
• project-learning	126	116		
• metacognitive	124	114		
• constructivist	115	114		
• reflective thinking	111	116		
• cooperative learning	121	119		
• peer tutoring	119	125		
• partner-learning	123	116		
• role playing	106	107		
• socio-drama	102	108		
• round table discussion	125	118		
• panel discussion	119	110		
• debate	121	117		

Community Activities. Table 6 shows the gender roles and time allocation in community activities that family members usually do. Regarding community management activities, mothers usually participate in most activities, except in community homeowners' associations. Both mother and father sometimes do these activities. In addition, when female teachers participate in community activities, they render more time in PTA and nutrition month. In comparison, male teachers spend more time in HOA, livelihood programs, health awareness activities, and being a member of BEI (board of elections).

Table 6. Gender roles and time allocation in community activities that are primarily done by members of the family

Community Activities	USUALLY DONE	SOMETIMES DONE	TIME ALLOCATION	
			M	F
Community managing activities				
1. Engage in parents-teachers association (PTA)	Mother	Mother and Father	3.02	3.10
2. Engage in community homeowners' association (HOA)	Father	Mother and Father	3.46	3.37
3. Participate in livelihood programs	Mother	Mother and Father	3.14	3.04
4. Engage in school and community-based activities				
• Nutrition month	Mother	Mother and Father	2.85	3.00
• health awareness activities	Mother	Mother and Father	2.75	2.22
5. Engage in NGOs activities	Mother	Mother and Father	2.86	2.83

Table 6. (Continued). Gender roles and time allocation in community activities that are primarily done by members of the family

Community Activities	USUALLY DONE	SOMETIMES DONE	TIME ALLOCATION M	F
Community politics activities				
1. serve as a member of the board of election inspector (BEI)	Mother	Mother and Father	75.52	75.02

Leisure Activities. Table 7 shows the gender roles in leisure activities. Male and female teachers watch TV, play with personal gadgets, surf the internet, read books, chat with friends, and sleep daily. Male teachers spend more time playing with personal gadgets, surfing the internet, and sleeping than female teachers. Moreover, teachers watch movies and do their hobbies on a weekly basis. Male teachers spend more time watching movies, while female teachers spend more time on their hobbies. For the monthly leisure activities, teachers listen to the radio, do workout activities, go to salons, parks, and malls and dine outside. Male teachers spend more time listening to the radio, doing workout activities, and going to the park.

In comparison, female teachers spend more time going to salons and malls and dining outside. Teachers play card games, go to a spa, play sports, and swim for occasional leisure activities. Furthermore, male teachers spend relatively more time playing card games and sports, while female teachers spend more time going to the spa and swimming.

Table 7. Gender roles, time allocation, and location of leisure activities

LEISURE ACTIVITIES	PERCENTAGE SHARE		TIME ALLOCATION (HOURS)	
	M	F	M	F
Daily				
1. Watching TV	97.71	98.47	2.76	3.05
4. Playing with personal gadgets	36.64	36.64	3.97	3.24
5. Surfing the Internet	97.71	96.95	3.17	3.03
7. Reading books	98.47	94.66	2.69	2.91
13. Chatting with friends	14.5	15.27	2.20	2.60
14. Sleeping	99.24	99.24	4.91	4.62
Weekly				
2. Watching movies	20.61	38.93	3.60	3.11
18. Hobby	35.88	32.82	2.54	3.19
Monthly				
6. Listening to the Radio	16.03	17.56	2.43	2.24
8. Work out activities	14.5	23.66	2.13	1.83
9. Going to salons	16.03	29.77	1.32	3.08
11. Going to the park	13.74	35.11	3.88	3.27
12. Going to the mall	32.82	29.01	3.27	3.96
17. Dining Outside	26.72	38.93	3.00	3.26
Occasionally				
3. Playing card games	55.73	51.15	3.40	1.43
10. Going to a spa	10.69	18.32	1.50	2.17
15. Playing sports	28.24	12.98	2.41	1.83
16. Swimming	18.32	12.98	3.25	5.00

Problems, Needs, and Constraints

In the focus group discussion conducted among selected male and female teachers, there were some themes as regards the lack of male teachers at the elementary level. First, males are foremost the breadwinner of each family, but the teaching profession does not promise lucrative compensation. Most elementary teachers complain that the salaries given to teachers here in the Philippines are less promising than the ones provided in other countries such as Singapore, Japan, and the like. Hence, increasing the baseline salary for entry-level elementary schools may attract more male teachers to the academe.

Second is that meager salaries provided by the teaching profession come with a heavy workload for them to perform – from the preparation of teaching materials, the conduct of actual teaching, and assessing students' learning to classroom management and guidance facilitation. They were also compelled to fill out certain forms and reports indicative of their student's performance. These workloads seemed to be a burden for them. They suggest that if higher authorities would hire additional non-teaching staff that would help them un-load these burdens would be of great help to them. After all, they were trained to teach and assess student learning but not to become clerks doing office work after classes. Another workload problem is handling varied subject matters. Teaching at the elementary level entails handling varied subjects at a grade level. This means that different preparation is expected for each subject they must handle. An increased number of preparations requires more time to study their lessons and prepare materials for the next day's activities.

Third, the teachers found that the elementary teaching profession requires good nurturing skills, which could be observed in most females. According to them, most male teachers are dominant and more commanding inside the class and would only be better for uncontrollable students. Also, the age of the students is one of their problems since most of them do not have enough maturity level; hence a higher patience level is required.

Finally, the problem concerns raising the status quo for the teaching profession. They confessed that most love teaching but are not adequately paid according to their job. They also complain that teaching has always been a challenging job. It gets harder and harder but gets less and less respect. If this will not be solved, then the role and value of teachers and the future of public education will be at stake.

DISCUSSION and CONCLUSION

The public elementary school still consists of more feminine figures, from the principal to the teachers and staff to the students. This disparity may opt for teachers to build their environments based on customary practices and gender identities, which may be biased toward a particular group or gender of students. In return, students may create bias in their own literacy experiences towards this created bias in the classroom (Florack, 2012). Hence, elementary educational institutions may increase their attention the recruitment as this may be beneficial to elementary education considering the impacts of male teachers on the holistic well-being of elementary pupils.

Net enrolment rate (NER) for Cavite elementary schools indicates that the proportion of girls not enrolled at the specified level of education is lower than that of boys (CALABARZON Regional Social and Economic Trends, 2019). In other words, girls have a higher participation rate in schools than boys. On the other hand, the cohort survival rate indicates that a high level of retention and low incidence of dropout among girls are being observed more than with boys. In general, key performance indicators for elementary schools reveal that girls outperform boys in almost every aspect, including completion, graduation, survival rates, and the like. This result cannot be directly attributed to female teachers' school dominance. Nevertheless, the presence of both male and female teachers in classrooms allows students to learn from teachers they perceive as being like themselves (McGrath, Bhana, Bergen, & Moosa, 2014). In addition to the differences observed in the general academic performance of male and female teachers (which may reflect their performance when they were still students), it may be an eye-opener for higher authorities to consider the field of specialization when assigning teachers their subjects to teach.

Results show discrepancies in the teachers' use of teaching strategies regarding gender, and female teachers spend more time in productive activities than male teachers. Studies also show disparities in girls' and boys' academic performances showing girls outperform boys in reading (Chadwell, 2010) while boys outperform girls in mathematics and science (Dickey, 2013). These studies only looked for disparities in pupils' academic performance when primarily female teachers taught them. However, one may explore possible research studies on the impact of teachers' gender on pupils' academic performances while identifying effective gender-specific teaching strategies. Since female teachers

dominated public elementary schools, one may also explore the reasons for this domination and the possible impact of male teachers at the elementary level in terms of pupils' academic performance, attendance, and other aspects of pupil's life.

Moreover, although there are existing gender-sensitive and responsive policies in the central elementary schools, they are yet to implement these inside the classroom and schools strictly (e.g., use of gender-fair language). For example, the use of Mrs. to address a married female teacher has long been eliminated from the list of gender-fair language. A seminar-workshop on the use of Gender-Fair Language is suggested for them.

Ethics and Conflict of Interest

This study was conducted according to ethical and research standards. Authors declare and confirm that we have acted in accordance with ethical rules throughout the entire research. Authors report there are no competing interests to declare.

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THE PREDICTIVE RELATIONSHIPS BETWEEN PRE-SCHOOL TEACHERS' CLASSROOM MANAGEMENT SKILLS AND THEIR THINKING-SUPPORTIVE BEHAVIOURS

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Abstract

This is a predictive study aiming to determine the extent to which pre-school teachers' classroom management (CM) skills predict thinking-supportive behaviours. Within the study, 183 preschool teachers participated. The data of the study was collected using Pre-school Teachers' Classroom Management Skills Scale (CMSS) and Thinking Supportive Teacher Behaviours Scale (TSTBS). In the analysis of the data, Pearson correlation analysis and multi-linear regression were used. In light of the strong predictive relationships obtained from the current study, it can be said that pre-school teachers should effectively manage their classrooms in order to display behaviours that support thinking in learning environments. The sub-dimension of Communication and Behavioural Regulations yielded the highest correlation with teacher behaviours that support thinking and was found to be a significant predictor. While there is no relationship between the Plan-Program Activities sub-dimension and the predicted variables, Time Management significantly predicted the clarity needed to support thinking, and Classroom Physical Arrangements significantly predicted reflection through documentation.

Keywords: Pre-school teacher, thinking supportive teacher behaviour, classroom management skill, thinking skills.

INTRODUCTION

Pre-school teachers' thinking-supportive behaviours

Although the interest in thinking education has increased since the 1980s, previous studies largely focused on thinking education of older students. The main reason for the shifting focus towards supporting thinking during the pre-school period in the last 20 years is that it is now accepted that the development of thinking skills in children starts at an early age (Arthur & Makin, 2001). In the literature, it is argued that teaching thinking at an early age serves the purpose of "preparing the child for primary school" and is a determinant of the child's future academic success (Salmon and Lucas, 2011) and contributes to the elements of cognitive, moral and personality development as a whole such as questioning, criticizing, finding alternative solutions, approaching with suspicion, testing accuracy and consistency (Lipman, 1991).

In every country that gives importance to pre-school education in order to achieve these outcomes, the importance of curricula in developing children's thinking skills has been recognized (Arthur & Makin, 2001). Thus, countries have restructured their education systems in order to train thinking individuals

with advanced information processing skills such as separation, matching, classification, causality, recognizing and solving problems, evaluating and making decisions (Taggard, Ridley, Rudd & Benefield, 2005) and they have made skills such as reflective and creative thinking the focus of their curricula. In addition, programs such as Philosophy for Children (P4C), Reggio Emillia, and High/Scope have been implemented in many countries of the world to develop thinking (Salmon, 2008; Salmon & Lucas, 2011). Considering Turkey in particular, it is seen that thinking skills were included in the cognitive and social development areas under the influence of the constructivist approach in the pre-school curriculum developed by the Ministry of National Education [MoNE] in 2006 and updated in 2013 (MoNE, 2013).

The inclusion of thinking skills in curricula has led many researchers to empirical research on the measurement of thinking as a product (determining the extent to which teachers or students have thinking skills). On the other hand, the inclusion of thinking skills in the curriculum or the teachers' having thinking skills were not considered sufficient to develop thinking in children, and it was argued that "teacher's behaviours also play an important role in fostering thinking skills of students in the classroom having a social and organic structure" (Costa, 1991). For this reason, studies focusing on the characteristics of the classroom atmosphere in which thinking is supported, try to describe the thinking class (Beyer, 2001; Doğanay & Sarı, 2012; Kline, 2002; Ritchhart, 2002) and aim to make visible what the behaviours of teachers that support thinking in this class are (Costa, 1991; Fisher, 2005; Kaymak, 2022) are very important in the literature today. It is pleasing for pre-school education, which has a critical importance in the acquisition of thinking skills, that teacher behaviours that support thinking have been discussed among pre-school teachers in the literature in the last 10 years.

In this context, when the literature is examined, the behaviours pre-school teachers are expected to display to support thinking in the classroom environment can be summarized as follows; asking higher-order and open-ended questions (Aubrey et al., 2012; Doğan Altun & Ekinci Vural, 2017; Nayfeld, 2014; Tuncer, 2017), including small and large group works and in-class dialogues and discussions (Aubrey et al., 2012; Fisher, 1995; Isbell and Raines, 2012; Salmon, 2008), preparing a physical environment that allows children to be active, move freely and access materials (Doğan Altun & Ekinci Vural, 2017), listening to each child in the class carefully without judging them (Ezmeci & Akman, 2016, Fisher, 2005), allowing children to reflect on the process they have followed by making comments on the activities (Benson & Dresdow, 2009; Salmon, 2008), stimulating children's sense of curiosity and research skills (Ezmeci & Akman, 2016; Fisher, 2005), planning activities that will lead to thinking and ensuring active participation of children (Doğan Altun & Ekinci Vural, 2017; Tuncer, 2017; Wallace et al., 2009), using the language of thinking (Ritchhart, 2002), allowing children to make mistakes and take risks (Sharp, 2014; Sternberg, 2013; Taggard et al., 2005), allowing children to plan and think about their own activities (Butterworth & Thwaites, 2013; Dağlıoğlu & Çakır, 2007; Epstein, 2003; Ezmeci & Akman, 2016; Taggard & Wilson, 2005), using a clear and comprehensible language (Alkın-Şahin & Tunca, 2015; Paul & Elder, 2019) and being a model for all these behaviours (Beyer, 1988; Chappell et al., 2008; Tabor, 1988; Walsh et al., 2007). According to the dimensions of the data collection tool developed in Turkish culture and used in the current study, the behaviours that the pre-school teacher should show to support thinking are addressed in four categories: clarity, reflection through documentation, providing free/flexible learning environments and asking questions (Kaymak, 2022).

Pre-school teachers' CM skills

According to Evertson and Weinstein (2006), a classroom should be managed by a teacher exhibiting behaviours supportive of students' cognitive, social and emotional learning as a whole. CM is defined as the strategies that provide physical and psychological safety in the classroom, the techniques that regulate the behaviours of students and create self-discipline, and the methods that ensure the regular progress of events in the classroom (Manning & Bucher, 201). When different perspectives on the purposes and dimensions of CM are synthesized, it is seen that it includes the provision of positive social interaction between student and teacher and between peers, offering counselling to students with behavioural problems, arranging the physical environment to maximize effectiveness, motivating

children to learn, effective use of time, organizing activities in accordance with the developmental characteristics of children to support their active participation and encourage collaborative work, guiding them to be self-confident individuals who take responsibility and motivate themselves for their own learning and taking precautions by predicting possible problems that may arise in the classroom (Burden, 2003; Emmer & Stough, 2001; Jones, 1996; Lemlech, 1999; Şentürk & Oral, 2008; Terzi, 2002).

It is a thing of the past to see CM as a discipline activity by controlling students, catching their mistakes, and resorting to punishment (Blazar & Kraft, 2017; Dinçer & Akgün, 2015; Hardin, 2004). As education becomes more and more learner-centred, it is clear that new democratic and participatory approaches to CM should be brought to the fore (Türk et al., 2019). In classrooms where these contemporary approaches are adopted, teachers are responsible for taking into account the personal and psychological needs of learners, integrating positive teacher-student relations with supportive environmental conditions, applying methods that facilitate learning, creating a rich learning environment with safe and flexible processes, and seeing learners as social beings (Akgün et al., 2011; Başar, 2005). It is more important for the pre-school teacher to take the aforementioned responsibilities and to have effective CM skills, especially because there are activity times instead of classes, the curriculum consists of ongoing activities, and the children are with the teacher throughout the day without a break in pre-school education (Jacobson 2003). Pre-school CM refers to the creation of a loving and orderly environment with arrangements that include change and flexibility. Meaningful learning and socialization and participation in classroom activities are important parameters of CM in pre-school (Uyanık-Balat, 2010). In order for teachers to effectively manage the classroom in pre-school, they are expected to exhibit behaviours such as creating and maintaining rules with children, designing resource-rich environments where meaningful learning takes place, providing learning experience by observing children, giving feedback, adjusting the pace of education and using different methods, supporting their learning, self-regulation and social skills and encouraging them to take risks and be independent (Akgün et al., 2011; Denizel Güven & Cevher, 2005; Lippard et al., 2018). According to the dimensions of the data collection tool developed in Turkish culture and used in the current study, the CM skills of the pre-school teacher are addressed in 4 categories: Classroom Physical Arrangements, Plan-Program Activities, Communication and Behavioural Regulations, and Time Management (Kaplan, 2018).

This study is constructed on the hypothesis that there are predictive relationships between pre-school teachers' CM skills and their thinking-supportive behaviours. Theoretically, the reasons for the relationship between the two variables can be explained as follows; (1) Effective CM research has revealed that well-organized and planned educational environments encourage self-regulation at an early age, increase interest in learning and encourage students to be productive and free and to take risks (Denizel Güven & Cevher, 2005; Lippard et al., 2018; Trawick-Smith et al., 2016) and these findings suggest that CM can also affect thinking. (2) Research argues that an effective learning-teaching process cannot be structured in poorly managed classrooms (Emmer and Stough 2001; Finger and Bamford, 2010), which suggests that CM skills may be related to thinking-supportive behaviours. (3) For the mastery of thinking in the pre-school period, teachers should use different teaching methods and techniques together and create flexible learning environments (Akbaba & Kaya, 2015), classroom environments where democratic and multi-faceted interaction experiences are encouraged, there is no restriction, an initiative can be taken, group dynamics are felt and different views are respected should be created to foster the development of thinking (Conatser, 2000; Şahin & Sarı, 2016) and a thinking classroom should be a place where individuals who think together, learn together and construct knowledge together through discussions as well as thinking individuals live (Liljedahl, 2016) and all these indicate that supporting thinking has a common aspect with CM skills. In short, since the development of thinking is affected by classroom climate, teacher, and student behaviours (Fisher, 1995), it is expected to be affected by teacher behaviours shown in classroom management. It is unthinkable that the behaviours shown to support thinking in pre-school cannot be independent of the skills shown for effective classroom management.

However, no study has been found in the literature that statistically tests this thesis and examines the predictive relationship between the teacher's behaviours to manage the classroom and support thinking. Studies on CM skills of pre-school teachers show that children in the classrooms of teachers with high CM skills are emotionally more positive, academically more successful (Hamre & Pianta, 2005), have more developed social and emotional competence (Morris et al., 2013), are better in attention, emotion and behaviour regulation (Webster-Stratton et al., 2001) and their level of participation is higher (Akyol, 2021; La Paro et al., 2004). However, no research has been found examining how CM skills contribute to students' thinking processes. In addition, in the literature, the relationship of CM skills of preschool teachers with different variables such as self-efficacy, professional motivation (Semerci, 2015), problem-solving skills (Zembat et al., 2017), counselling qualifications (Bilgin, 2019), and inclusive education proficiency (Aküzüm & Altunhan, 2017) has been examined. However, no research has been found examining the relationship between CM skills and thinking-supportive behaviours. An important reason for this may be that there are very few quantitative data collection tools to be used in the measurement of teacher behaviours supportive of thinking in pre-school, due to the fact that teacher behaviours that support pre-school thinking are a recent topic addressed in research.

The purpose of the current study is to determine the predictive relationships between CM skills and thinking-supportive behaviours, depending on the self-perception of preschool teachers. Through this purpose, this study was aimed at answering the following research questions.

- Do the scores taken by the pre-school teachers from the CM skills scale significantly predict the total scores they have taken from the thinking-supportive behaviours scale?
- Which of the sub-dimensions of CM skills significantly predicts thinking-supportive behaviours total scale and subscale scores?

It is hoped that the current study, with the relational and predictive evidence it presents, will provide a solution to the problems arising from "the detached, fragmented, structure of knowledge that focuses on breadth rather than depth" (Bowman et al., 2001) in professional development for preschool teachers.

METHOD

Research model

This is a predictive study aiming to determine the extent to which CM skills predict thinking-supportive behaviours. Within predictive research design, the relationships between determined variables are explained, and predictions made about a variable based on the other (Büyüköztürk et. al., 2018). In the study, thinking-supportive behaviours were set to be the dependent (predicted) variable and CM skills were set to be the independent (predictor) variable.

Study Group

The target population of the study was pre-school teachers working in preschool institutions affiliated with MoNE in a province in Turkey in the 2021-2022 education year. Among these teachers, 234 pre-school teachers selected by simple random sampling method composed the sample of the research. In order to determine the outliers from among the responses of 234 teachers to the items, the items were transformed into z values and the responses of the teachers with z values outside the range of between -3 and +3 in each item were accepted as outliers. Thus, 48 teachers were excluded from the analysis according to the results of the univariate outlier analysis. Outliers within the scope of multivariate outlier analysis were examined with the help of Mahalanobis values. When the probabilities of the Maholobis distance scores in the chi-square distribution were examined, the teachers with .001 and lower scores were accepted as outliers in multiple variables, and 3 teachers who appeared as outliers were excluded from the analysis. In this context, the sample of the research consisted of 183 teachers. The personal and professional information of 183 teachers who were included in the analyses after the outliers were removed from the study group is presented in Table 1.

Table 1. Information of the participating teachers

Variable	Level	n	%
Gender	Female	173	94.5
	Male	10	5.5
Length of service	1-10 years	93	50.8
	11-20 years	81	44.3
	21-30 years	9	4.9
Program graduated	Pre-school teaching	153	83.6
	Child development	30	14.4
Type of pre-school institution	Private	29	15.8
	Public	154	84.2
Total		183	100

Instruments

Information about the scales used in the current study to measure the CM skills and thinking-supportive behaviours of the pre-school teachers is given below.

Pre-school Teachers' Classroom Management Skills Scale (CMSS): The CMSS developed by Kaplan (2018) is a five-point Likert type scale (5=very good, 1=very poor) consisting of four factors: "Communication and Behavioural Regulations", "Classroom Physical Arrangements", "Time Management" and "Plan-Program Activities" and 49 items. The number of items in the factors is 24, 10, 6, 9, and CAC are .96, .88, .85, and .91, respectively. The CAC of the whole scale is .97, and the total variance explained is 63.72%. The CAC found for the whole scale in the current study is .96, and those of the factors are .95, .85, .80, and .90, respectively.

Thinking Supportive Teacher Behaviours Scale (TSTBS): The TSTBS developed by Kaymak (2022) is a five-point Likert scale (5=Reflects me thoroughly, 1=Does not reflect me) consisting of four factors: "Clarity", "Reflection through Documentation", "Providing Free/Flexible Learning Environments", "Asking Questions" and 19 items. The number of items in the factors is 7, 5, 4, and 3 and the Cronbanch Alpha internal consistency coefficients (CAC) are .89, .84, .74, and .66, respectively. The CAC of the whole scale is .91, and the total variance explained is 64.9%. The CAC found for the whole scale in the current study is .93 and those of the factors are .87, .88, .79, and .73, respectively. The data collection process was carried out in the 2021-2022 education year, and took approximately two months. It was determined that the teachers filled out the measurement tools in an average of 30 minutes.

Data analysis

In the analysis of the data, first of all, the normality assumption and skewness and Kurtosis values calculated for the data obtained from the answers given by the teachers to the "CMSS" and the "TSTBS" were checked. The skewness and Kurtosis values obtained for the scores taken from the factors; Clarity, Reflection through Documentation, Providing Flexible/Free Learning Environments, and Asking Questions, are (-.764; -.466); (-1.128; -.028); (-.793; -.294); (-.900; -.192) and (-1.223; .385), respectively. The skewness and Kurtosis values obtained from the scores taken from the factors; Communication and Behavioural Regulations, Time Management, Classroom Physical Arrangements, and Plan-Program Activities, are (-.493; -1.052); (-.682; -.961); (-.809; -.445); (-.438; -.842) and (-.445; -1.251), respectively. In measurements with normal distribution, the skewness and Kurtosis values in the range of ±1.0 are considered to be perfect, and the skewness and Kurtosis values in the range of ±2.0 are considered to be acceptable (George & Mallery 2001); thus, the measurement tools used in the current study meet the normality assumption.

In the current study, descriptive statistics were used to determine the teachers' CM skills and thinking-supportive behaviours, and multiple regression analysis was used to determine to what extent the CMSS sub-dimensions predict the total score of the thinking-supportive behaviours scale and the total

scores of its sub-dimensions. Before applying multiple regression analysis, necessary assumptions were tested with preliminary analyses. According to the first assumption, the "level of measurement" assumption, the measurements for the dependent and independent variables examined should be in the interval scale (Pallant, 2015). Since both measurement tools used in the current study are equally spaced scales, the first assumption has been satisfied. The second assumption is that the variables show a normal distribution. Both measurement tools used in the study show a normal distribution. The third assumption is that there is a moderate linear relationship between dependent and independent variables. When the Pearson Product Moments Correlation Coefficient between the mean scores obtained from the two scales was calculated, the third assumption was also met, since it was seen that there were moderate (between .37 and .66) positive linear and significant ($p<.01$) relationships between the dependent and independent variables (The correlation values between the variables can be seen in detail in the regression tables presented in the results section). The fourth assumption is that the correlation between the independent variables is below .80. The correlation between the independent variables in the study was found to be ranging from .76 to .44. This shows that there is no multicollinearity problem. The fifth assumption is that the Variance Inflation Factor (VIF) values are below 5. In the current study, the VIF value for Classroom Physical Arrangements is 2.563<5; for Plan-Program Activities, It is 3.152<5; for Communication and Behavioural Regulations, it is 3.491<5 and for Time Management, it is 1.814<5. These values show that there is no multicollinearity between the independent variables. Thus, the assumptions of multiple regression analysis were satisfied. The significance level of .05 was accepted as a criterion in interpreting whether the findings were significant or not.

RESULTS

In this section, first, the descriptive statistics on the teachers' CM skills (predictor variables) and thinking-supportive behaviours (predicted variables) are given in Table 2.

Table 2. Descriptive statistics for the predictor and predicted variables

Scale	Dimensions	N	K	min	max	Mean	Std.Dev.	$\bar{X}_{/K}$
TSTBS	Clarity	183	7	26	35	33.05	2.51	4.72
	Reflection through Documentation	183	5	13	25	22.27	2.93	4.45
	Providing Free/Flexible Learning Environments	183	4	12	20	18.12	2.08	4.53
	Asking Questions	183	3	10	15	14.07	1.30	4.69
	TSTBS Total	183	19	66	95	87.50	7.65	4.61
CMSS	Classroom Physical Arrangements	183	10	34	50	44.72	4.31	4.47
	Plan-Program Activities	183	9	33	45	41.04	3.77	4.56
	Communication and Behavioural Regulations	183	24	94	120	111.94	8.52	4.66
	Time Management	183	6	21	30	27.84	2.36	4.64

As can be seen in Table 2, the mean scores taken from the whole TSTBS and its sub-dimensions and the whole CMSS and its sub-dimensions are quite high. The main purpose of the current study is to determine the extent to which CM skills predict thinking-supportive behaviours. The findings obtained from the multiple regression analysis conducted to this end are presented in Tables 3, 4, 5, 6, and 7.

Table 3. Multiple regression results related to the prediction of thinking supportive teacher behaviours

Predictive variables	B	Standard Error	β	T	p	Binary r	Partial r
Constant	17.526	5.937		2.952	.00		
Classroom Physical Arrangements	.178	.158	.100	1.127	.26	.526	.084
Plan-Program Activities	.182	.201	.089	.904	.37	.560	.068
Communication and Behavioural Regulations	.396	.093	.441	4.233	.00	.655	.302
Time Management	.368	.244	.113	1.512	.13	.497	.113
R=.67 R^2=.44							
$F_{(4-178)}$=36.09 p= .00							

When the pair-wise correlations shown in Table 3 between each dimension of the thinking supportive teacher behaviours and that of the CM skills are examined, it is seen that there are medium, positive, and significant correlations ($p<.01$) with the values of r=.53, r=.56, r=.66, r=.50, respectively. When the other variables were controlled, a medium (r=.30) correlation was found between the thinking supportive teacher behaviours and the sub-dimension of Communication and Behavioural Regulations and a low, positive and significant correlation with each of the other sub-dimensions. Teachers' CM skills together yield a medium and significant correlation with the scores of the thinking supportive teacher behaviours (R=.67, $p<.01$). Teachers' CM skills explain 44% of the total variance in thinking supportive teacher behaviours. According to the standardized regression coefficient (β), the relative order of importance of teachers' CM skills in terms of predicting thinking supportive teacher behaviours is as follows; "Communication and Behavioural Regulations", "Time Management", "Classroom Physical Arrangements" and "Plan-Program Activities". When the t-test results regarding the significance of the regression coefficients are examined, it is understood that only the "Communication and Behavioural Regulations" sub-dimension is a significant predictor of thinking supportive teacher behaviours while the remaining three variables are not significant predictors. According to the findings, the regression equation of thinking supportive teacher behaviours is as follows:

Thinking supportive teacher behaviours = 17.526 + .178 (Classroom Physical Arrangements), +.182 (Plan-Program Activities) + .396 (Communication and Behavioural Regulations) + .368 (Time Management)

Table 4. Multiple regression results related to prediction of "clarity"

Predictive variables	B	Standard Error	β	T	p	Binary r	Partial r
Constant	9.552	1.924		4.965	.00		
Classroom Physical Arrangements	-.001	.051	-.001	-.015	.99	.475	.001
Plan-Program Activities	.051	.065	.076	.776	.44	.539	.058
Communication and Behavioural Regulations	.143	.030	.484	4.709	.00	.664	.333
Time Management	.197	.079	.185	2.498	.01	.546	.184
R=.68 R^2=.45							
$F_{(4-178)}$=38.27 p= .00							

When the pair-wise correlations shown in Table 4 between "Clarity", a sub-dimension of thinking supportive teacher behaviours, and each sub-dimension of CM skills are examined, it is seen that there are medium, positive and significant correlations ($p<.01$) with the values of r=.48, r=.54, r=.66, r=.55, respectively. When the other variables were controlled, a medium (r=.33) correlation was found between the "Clarity" sub-dimension and the "Communication and Behavioural Regulations" sub-dimension and a low, positive and significant correlation with each of the other sub-dimensions. Teachers' CM skills together yield a medium and significant correlation with the "Clarity" sub-dimension (R=.68, $p<.01$). Teachers' CM skills explain 45% of the total variance in the "Clarity" sub-dimension. According to the standardized regression coefficient (β), the relative order of importance of teachers' CM skills in terms of predicting the "Clarity" sub-dimension is as follows; "Communication and Behavioural Regulations", "Time Management", "Plan-Program Activities" and "Classroom Physical Arrangements". When the t-test results regarding the significance of the regression coefficients are examined, it is understood that the sub-dimensions of "Communication and Behavioural Regulations" and "Time Management" are significant predictors of "Clarity" while the remaining two variables are not significant predictors. According to the findings, the regression equation of teacher behaviours supporting "Clarity" is as follows:

Teacher behaviours supporting clarity = 9.552 - .001 (Classroom Physical Arrangements), + .051 (Plan-Program Activities) + .143 (Communication and Behavioural Regulations) + .197 (Time Management)

Table 5. Multiple regression results related to the prediction of "reflection through documentation"

Predictive variables	B	Standard Error	β	T	p	Binary r	Partial r
Constant	.540	2.555		.211	.00		
Classroom Physical Arrangements	.137	.068	.200	2.003	.04	.484	.148
Plan-Program Activities	.089	.086	.115	1.034	.30	.485	.077
Communication and Behavioural Regulations	.075	.040	.218	1.868	.06	.514	.139
Time Management	.127	.105	.102	1.212	.22	.394	.090
R=.55 R^2=.29							
$F_{(4-178)}$=19.53 p= .00							

When the pair-wise correlations shown in Table 5 between "Reflection through Documentation", a sub-dimension of thinking supportive teacher behaviours, and each sub-dimension of CM skills are examined, it is seen that there are medium, positive and significant correlations (p<.01) with the values of r=.48, r=.49, r=.51, r=.39, respectively. When the other variables were controlled, low, medium and significant correlations were found between the sub-dimension of "Reflection through Documentation" and each sub-dimension of the CMSS. Teachers' CM skills together yield a medium and significant correlation with the "Reflection through Documentation" sub-dimension (R=.55, p<.01). Teachers' CM skills explain 29% of the total variance in the "Reflection through Documentation" sub-dimension. According to the standardized regression coefficient (β), the relative order of importance of teachers' CM skills in terms of predicting the "Reflection through Documentation" sub-dimension is as follows; "Communication and Behavioural Regulations", "Classroom Physical Arrangements", "Plan-Program Activities" and "Time Management". When the t-test results regarding the significance of the regression coefficients are examined, it is understood that only the "Classroom Physical Arrangements" sub-dimension is a significant predictor of "Reflection through Documentation" while the remaining three variables are not significant predictors. According to the findings, the regression equation of teacher behaviours supporting "Reflection through Documentation" is as follows:

Teacher behaviours supporting reflection through documentation = .540+ .137 (Classroom Physical Arrangements), +.089 (Plan-Program Activities) + .075 (Communication and Behavioural Regulations) + .127 (Time Management)

Table 6. Multiple regression results related to the prediction of "providing free/flexible learning environments"

Predictive variables	B	Standard Error	β	T	p	Binary r	Partial r
Constant	2.980	1.825		1.633	.00		
Classroom Physical Arrangements	.038	.049	.078	.770	.44	.419	.058
Plan-Program Activities	.008	.062	.014	.125	.90	.436	.009
Communication and Behavioural Regulations	.112	.029	.457	3.884	.00	.539	.280
Time Management	.023	.075	.027	.313	.76	.373	.023
R=.54 R^2=.28							
$F_{(4-178)}$= 18.61 p= .00							

When the pair-wise correlations shown in Table 6 between "Providing Free/Flexible Learning Environments", a sub-dimension of thinking supportive teacher behaviours, and each sub-dimension of CM skills are examined, it is seen that there are medium, positive and significant correlations (p<.01) with the values of r=.42, r=.44, r=.54, r=.37, respectively. When the other variables were controlled, low, medium, and significant correlations were found between the sub-dimension of "Providing Free/Flexible Learning Environments" and each sub-dimension of the CMSS. Teachers' CM skills together yield a medium and significant correlation with the "Providing Free/Flexible Learning Environments" sub-dimension (R=.54, p<.01). Teachers' CM skills explain 28% of the total variance in the "Providing Free/Flexible Learning Environments" sub-dimension. According to the standardized regression coefficient (β), the relative order of importance of teachers' CM skills in terms of predicting the "Providing Free/Flexible Learning Environments" sub-dimension is as follows; "Communication and Behavioural Regulations", "Classroom Physical Arrangements", "Time Management" and "Plan-Program Activities". When the t-test results regarding the significance of the

regression coefficients are examined, it is understood that the "Communication and Behavioural Regulations" sub-dimension is a significant predictor of "Providing Free/Flexible Learning Environments" while the remaining three sub-dimensions are not significant predictors. According to the findings, the regression equation of teacher behaviours supporting "Providing Free/Flexible Learning Environments" is as follows:

Teacher behaviours supporting providing free/flexible learning environments = 2.980 + .038 (Classroom Physical Arrangements), +.008 (Plan-Program Activities) + .112 (Communication and Behavioural Regulations) + .023 (Time Management)

Table 7. Multiple regression results related to the prediction of "asking questions"

Predictive variables	B	Standard Error	β	T	p	Binary r	Partial r
Constant	4.454	1.133		3.932	.00		
Classroom Physical Arrangements	.005	.030	.017	.171	.87	.411	.013
Plan-Program Activities	.034	.038	.098	.886	.38	.462	.066
Communication and Behavioural Regulations	.066	.018	.434	3.717	.00	.546	.268
Time Management	.021	.046	.037	.443	.66	.385	.033
R=.55 R^2=.29							
$F_{(4-178)}$ = 19.44 p= .00							

When the pair-wise correlations shown in Table 7 between "Asking Questions", a sub-dimension of thinking supportive teacher behaviours, and each sub-dimension of CM skills are examined, it is seen that there are medium, positive and significant correlations (p<.01) with the values of r=.41, r=.46, r=.55, r=.39, respectively. When the other variables were controlled, low, medium, and significant correlations were found between the sub-dimension of "Asking Questions" and each sub-dimension of the CMSS. Teachers' CM skills together yield a medium and significant correlation with the "Asking Questions" sub-dimension (R=.54, p<.01). Teachers' CM skills explain 29% of the total variance in the "Asking Questions" sub-dimension. According to the standardized regression coefficient (β), the relative order of importance of teachers' CM skills in terms of predicting the "Asking Questions" sub-dimension is as follows; "Communication and Behavioural Regulations", "Plan-Program Activities", "Time Management" and "Classroom Physical Arrangements". When the t-test results regarding the significance of the regression coefficients are examined, it is understood that the "Communication and Behavioural Regulations" sub-dimension is a significant predictor of "Asking Questions" while the remaining three sub-dimensions are not significant predictors. According to the findings, the regression equation of teacher behaviours supporting "Asking Questions" is as follows:

Teacher behaviours supporting asking questions = 4.454 + .005 (Classroom Physical Arrangements), +.034 (Plan-Program Activities) + .066 (Communication and Behavioural Regulations) + .021 (Time Management)

DISCUSSION and CONCLUSION

In the regression analyses conducted in the current study, the four sub-dimension of the CMSS "Classroom Physical Arrangements", "Plan-Program Activities", "Communication and Behavioural Regulations" and "Time Management" constituted the predictor variables and the total scores taken from the TSTBS and its sub-dimensions of "Clarity", "Reflection through Documentation", "Providing Free/Flexible Learning Environments" and "Asking Questions" constituted the predicted variables. The analyses revealed that the predictor variables of CM skills explain nearly half of the variance in the total score taken from the Thinking Supportive Teacher Behaviours and of the variance in its sub-dimension of "Clarity" while they explain nearly one-third of the total variance in the sub-dimensions of "Reflection through Documentation", "Providing Free/Flexible Learning Environments" and "Asking Questions". Accordingly, a significant part of the total variance in thinking-supportive teacher behaviours and its sub-dimensions stem from CM skills. These results show that the thesis put forward that the CM skills of preschool teachers will also be effective in supporting thinking has been largely confirmed. Moreover, it points out that the theoretical explanations of preschool teachers' CM skills and thinking-supportive behaviours overlap to a large extent with practices in classroom environments.

These findings obtained as a result of the regression analyses also concur with the correlation values between the dependent and independent variables. The findings show that there are medium, positive and significant correlations between the total score taken from the TSTBS and the scores taken from its sub-dimensions and the scores taken from the sub-dimensions of the CMSS. In this regard, it can be said that as the CM skills scores of the teachers increase, their level of showing the behaviours to support thinking in the classroom also increases. When the theoretical framework is considered, this result, which is expected, is, unfortunately, difficult to discuss in terms of empirical research findings. Since thinking-supportive behaviours is a current issue that has not been studied yet in the literature, no study directly contributes to the discussion of this relationship. Although it is thought that the studies on the relationship between preschool teachers' CM skills and thinking skills may contribute to the conduct of the discussion indirectly, it is remarkable that this subject has been rarely studied in the preschool education literature. In one study, significant relationships were found between preschool teachers' CM skills and problem-solving skills (Zembat et al., 2017), and in another one between Teacher Effectiveness and Critical Thinking Skills (Sim, 2019), which indirectly supports the results of the current study.

Partial correlation values in the study indicate that the highest amount of correlation is between the predicted variables and "Communication and Behavioural Regulations". In line with this finding, the results of the study show that the Communication and Behaviour Regulations sub-dimension is a significant predictor of the total thinking supportive teacher behaviours and the sub-dimensions of providing free/flexible learning environments, clarity and asking questions. In the items of the communication and behavioural regulations sub-dimension, "attention to clarity and comprehensibility when talking to children about expectations, problems and rules; effective listening; teaching children to be respectful to differences and giving children opportunities in problem-solving and decision-making processes" come to the fore (Kaplan, 2018). In the literature on supporting thinking, it is emphasized that teachers use clear language (Alkın-Şahin & Tunca, 2015; Paul & Elder, 2019), create opportunities for children to make decisions and solve problems (Akman, 2011; Craft, 2003), and listen carefully to every child in the class without judging them (Ezmeci & Akman, 2016; Fisher, 2005). Therefore, it can be said that the results of the current study are quite natural when it is considered that regulating communication and behaviours while managing the classroom is a prerequisite for supporting thinking.

In addition, the results of the current study show that the sub-dimension of time management is a significant predictor of the clarity dimension, and the sub-dimension of classroom physical arrangements is a significant predictor of the sub-dimension of reflection through documentation. Clarity is related to the careful selection and clear use of appropriate words and not using ambiguous words (Alkın-Şahin & Tunca, 2015). To ensure clarity, the subject should be made clear, exemplified and explained, and children should be asked to use clear, distinct, and understandable language (Paul & Elder, 2019). Since showing these behaviours requires teachers to use time effectively in the classroom, it is an expected finding that time management is a significant predictor of clarity.

An important result reached in the study is that the Plan-Program Activities sub-dimension, one of the predictor variables, does not significantly predict almost any of the predicted variables. It is thought that this may be due to the meaning attributed to the relevant sub-dimension in the data collection tool used. In the literature, it is stated that plan and program activities as a component of CM should be arranged in a structure that is suitable for the developmental characteristics of children, support their active participation in the learning process, and encourage collaborative work (Terzi, 2002; Burden, 2003; Emmer & Stough, 2001). A classroom environment with this structure is conducive to teacher behaviours that support thinking. However, when the items of the scale are examined, it is observed that the children's active participation in learning and working together are not emphasized in the plan and program activities, but rather their suitability for the interests and abilities of children is brought to the fore (Examples: Preparing activities that will attract children's attention, Preparing materials that will attract children's attention, Using materials that will attract children's attention, Managing the daily flow in the sequence of being active and relax, Using different transitions between activities

(song, dance, movement, etc.) (Kaplan, 2018). The difference in the meaning attributed to the relevant dimension by the literature and scale items may be due to the complexity of the structure of classroom management, which is difficult to understand comprehensively (Nancy et al., 2016).

These results are limited to the data obtained from 183 preschool teachers. In light of the strong predictive relationships obtained from the current study, it can be said that pre-school teachers should effectively manage their classrooms in order to display behaviours that support thinking in learning environments. Thus, some contributions can be made to the inculcation of thinking skills such as critical, reflective, creative thinking, problem-solving, evaluation, and decision making at an early age.

The sub-dimension of communication and behavioural regulations yielded the highest correlation with teacher behaviours that support thinking and was found to be a significant predictor. In this context, knowledge and awareness about the characteristics of the relevant dimension should be acquired by pre-service teachers in teacher training programs and by teachers in in-service training programs to be given on thinking-supportive behaviours.

In the current study, the lack of a correlation between the Plan-Program Activities sub-dimension and the predicted variables was associated with the problem of content validity of the items in the relevant dimension in the measurement tool. In this connection, the relevant dimension of the measurement tools developed in relation to CM skills within the scope of pre-school education should be reviewed in a way to cover all the meanings attributed to this dimension in the literature. In addition, using different measurement tools that measure CM skills, research can be conducted to test the relationship of the relevant dimension with thinking-supportive behaviours.

The fact that the sub-dimension of time management significantly predicts clarity required to support thinking, and that the sub-dimension of classroom physical arrangements significantly predicts reflection through documentation are among the results that should be reflected in teachers' professional development programs. It is hoped that professional development programs, which are structured by considering these predictive relationships, will move them away from the criticism that superficial and fractured information is presented with a reductionist approach. Although the number of studies on preschool CM skills is relatively high in the literature, the limited number of studies on thinking-supportive teacher behaviours has made it difficult to discuss the results of the current study in reference to the literature and to reach generalizations. Thus, teacher behaviours that support thinking in the context of pre-school education should be the subject of further research. In addition, similar studies can be carried out on different samples by using the measurement tools used in the current study so that more generalizable results can be obtained. Finally, in future research, related teacher behaviours can be examined through student opinions or classroom observations.

Ethics and Conflict of Interest

The research was conducted with ethical principles of the Human Research Ethics Committee of Kütahya Dumlupınar University (16.03.2022 – 2022/02). The authors declare that they acted in accordance with the ethical rules throughout the research process and that there is no conflict of interest between the authors.

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COPING STRATEGIES USED BY PRE-SERVICE TEACHERS TO OVERCOME WRITING CHALLENGES

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Abstract

This study aimed to determine the challenges encountered by pre-service teachers in the writing process and the coping strategies they used to cope with these challenges. For this purpose, being one of the qualitative research methods, the case study was used. Based on existing writing models in the literature, the study group of the research included 69 third-year pre-service teachers who studied in the Turkish Language Teaching program of a state university during the 2018-2019 academic-year. Prior to the data collection, the participants were asked to write a 1500-2000-word essay in the triangle of "reader-writer-context". Next, they were asked to answer two open-ended questions were asked and they were asked to answer these questions and descriptive analysis technique was used to analyze the data. When the writing difficulties experienced by the pre-service teachers in the writing process were examined, it was determined that they had the most writing challenges at the process level, followed by the writing difficulties at the control level, and the least at the resource level. Coping strategies used by pre-service teachers in response to their writing challenges in the writing process, it was determined that coping strategies aimed at providing cognitive support were used the most, which was followed by coping strategies towards providing instrumental support, and strategies towards creating affective support. In conclusion, problems encountered in the professional training process and the ability to come up with solutions for these problems will be the predictor of the potential resolutions created by pre-service teachers for the problems they might face while performing their own professions.

Keywords: Writing skills, writing challenges, coping strategies, pre-service teachers.

INTRODUCTION

To be equipped with writing skill in any language and advance this skill depends on numerous variables. While some of these variables stem from the internal dynamics of the writing itself, some are dependent upon the personal experience of those who write apart from the action of writing. On this note, over a forty-year period, several models have been developed starting with Flower and Hayes (1980). Starting from the factors that affect the act of writing, these models (Hayes & Flower, 1980; Bereiter & Scardamalia, 1987; Kellogg, 1994; Zimmerman & Risemberg, 1997; Hayes, 2012) has attempted to describe the nature of writing.

Writing is a multi-purpose communication activity, and writing instruction is performed with consideration to a certain set of standards. These standards focus on the acquisition of foundational

writing skills, such as handwriting and spelling, but writing is more than that. Writing is a process activity for writing purposes as well as the following four writing applications;

- ✓ for multiple purposes (narrate, persuade, inform/explain),
- ✓ producing and publishing well-organized text appropriate to task and purpose by increasingly applying processes involving planning, revising, editing, and collaborating with others,
- ✓ using writing to build knowledge about specific topics or materials read,
- ✓ and the last applying writing to extend and facilitate learning in a range of discipline-specific subjects as well as across purposes and audiences (Harris, Graham, Friedlander, & Laud, 2013, p. 539).

Writing is a productive skill that comprehends cognitive processes (Jebreil, Azizifar, Gowhary, & Jamalinesari, 2015) such as expressing intentions, composing ideas, problem-solving, and critical thinking (Fareed, Ashraf, & Bilal 2016). According to Erkan and Saban (2011), due to its nature as a productive skill, language learners find writing challenging. Nation (2020) argues that writing involves complex thinking skills and special ways of organizing and presenting the writing that deserves attention and can be prepared for other skills of listening, reading, and speaking. Besides, writing is not only referred to as a text in the written script but also as the acts of thinking, composing, and encoding language into such text (Cumming, Lai, & Cho, 2016) and it has precisely defined as highly required to involve an entirely different set of competencies (Brown, 2000). Because of implicating extra efforts in understanding, thinking, planning, and revising, writing has been considered as the most difficult skill to master (Pimsarn, 2013; Shukri, 2014).

Writing is a difficult skill to master, and it subjects individuals to certain challenges during writing. Considering the literature related to the challenges in writing, the studies are supported with comparative research categorized as a foreign-native language (Alsamdani, 2010; Crosby, 2009; Ghabool, Edwina & Kashef, 2012; Rabab'ah, 2003; Tahaineh, 2010) and bilingual writing skills. Challenge, in the statement of Collin (2012), means a task or situation that tests someone's ability. In this study, challenges are those difficult situations that pre-service teachers encounter in writing. These challenges were examined under three categories based on the stages of Hayes's (2012) writing model as follows: *control level*, *process level*, and *resource level*. However, in this study, writing anxiety as another variable, which is not included in the Hayes's (2012) model yet affects the writing process, was also examined. This study will contribute to the field in terms of the writing challenges encountered in the field of writing and the determination of coping strategies, based on the Hayes's (2012) model, which has been handled differently from other studies on this subject.

When writing difficulties are addressed it was revealed in many studies that anxiety as a demotivating trait affects writing. Writing anxiety, as a subject and situation-specific anxiety, was defined as a general avoidance of writing behavior and situations thought to potentially require some amount of writing accompanied by the potential for evaluation of that writing (Hassan, 2001: 4). The research has shown that language anxiety is the specific type of anxiety that is mostly associated with language performance. It has a significant and negative effect on performance in these indices of language achievement (Cheng, 2004; Horwitz, 2001). That is why, writing anxiety, which is non-existent in the Hayes's (2012) model, was handled as a constituent that impacts the writing process, and a category titled as writing challenge was constructed through the participants' responses. Hence, writing anxiety as a demotivator that affects the writing process was added to the motivation component of the Hayes's (2012) model. For this reason, the writing challenge arising from both lack of writing motivation and writing anxiety was investigated within the control level motivation component of the Hayes's (2012) model.

A challenge encountered related to any matter necessitates coping with it. As can be suggested by the related literature, studies recommended as a solution for the writing challenges were conducted in the contexts of self-evaluation and self-regulation; meanwhile, the studies addressing writing-oriented coping strategies are quite limited in number. Therefore, besides the challenges encountered during

writing, this study attempted to determine strategies to cope with these challenges. Carver (2013) defines coping as "efforts to prevent or diminish threat, harm, and loss, or to reduce the distress that is often associated with those experiences." It includes self-regulated goal attainment strategies and personal growth. On one hand, cooping is referred to as a sub-component of self-regulatory processes only occurring under stressful circumstances while, on the other hand, it can be described as the entirety of complex systems harboring the regulation of feelings. When individual faces stress, they not only have to cope with the emotional experience and the physical reactions expressing this experience, but attempt to coordinate the reactions emerging from social and physical surrounding through motor behavior, attention, and cognition (Compas, Connor-Smith, Saltzman, Thomsen, & Wadsworth, 2001). Thus, coping is "basic process integral to adaptation and survival, as it depicts how people detect, appraise, deal with, and learn from stressful encounters" (Skinner & Zimmer-Gembeck, 2014). It is also found that adopting the coping strategy largely determines how individuals experience anxiety to help an individual being shielded (Adasi, Amponsah, Mohammed, Yeboah, & Mintah, 2020). Coping also involves the use of different strategies and techniques in order to manage the situation.

Psychological coping mechanisms are commonly termed coping strategies or coping skills. Therefore, just as the challenges faced in writing are not only cognitive difficulties, coping strategies are not problem-oriented only, requiring affective-based approaches to the potential challenges in the writing process. At this point, if coping is operated against writing challenges, besides cognitive-based practices, the use of affective factors will be highlighted and Snyder (1999) listed three broad types of coping strategies as appraisal-focused, problem-focused and emotion-focused. Typically, people use a mixture of all three types of coping strategies, and coping skills usually change over time. According to the author, all these methods can prove useful, but some claim that those individuals who use problem-focused coping strategies adjust better to life. Coping, in the context of this study, is the reaction and effort needed by pre-service teachers to minimize or tolerate challenges in writing in three categories: "Towards Cognitive Structuring", "Constructing Affective Support", and "Providing Instrumental Support". Strategies used to cope with the challenges in writing were attempted to be determined under these three categories.

The capability of teachers about to serve in the field of language teaching to resolve the writing challenges faced by their students within the process itself is dependent upon their awareness of such challenges and their guiding competence for the solutions. That is why; this study seeks answers to the following questions with regards to determining the strategies used to cope with the challenges encountered in writing:

- ✓ What are the challenges faced by pre-service teachers in the writing process?
- ✓ What are the strategies used by pre-service teachers to cope with the challenges encountered in the writing process?

Hayes (2012) Writing Model and Writing Difficulties Addressed in the Model Basis

Writing production has been one of the main subject areas of language learning processes, and it has been investigated along with cognitive and metacognitive aspects and variables such as anxiety, self-efficacy and motivation that affect writing, and various models have been developed on how to write better. In this study, the writing model of Hayes (2012), which is one of the current writing models, was used as the basis. Hayes (2012) constructs his updated writing model in three phases as "Control Level", "Process Level" and "Resource Level". The control level consists of four subcomponents as follows: motivation, goal-setting (plan, write, and revise), current plan, and writing schemas. Process level is divided into two categories as writing processes and task environment. Here, the proposer, translator, transcriber, and evaluator subcomponents are located cyclically in the writing processes component, while collaborators and critics, transcribing technology, task materials and writing plans, and text written so far components interact with the task environment component. Considering the source level, it can be seen that there are subcomponents of attention, working memory, long-term memory, and reading.

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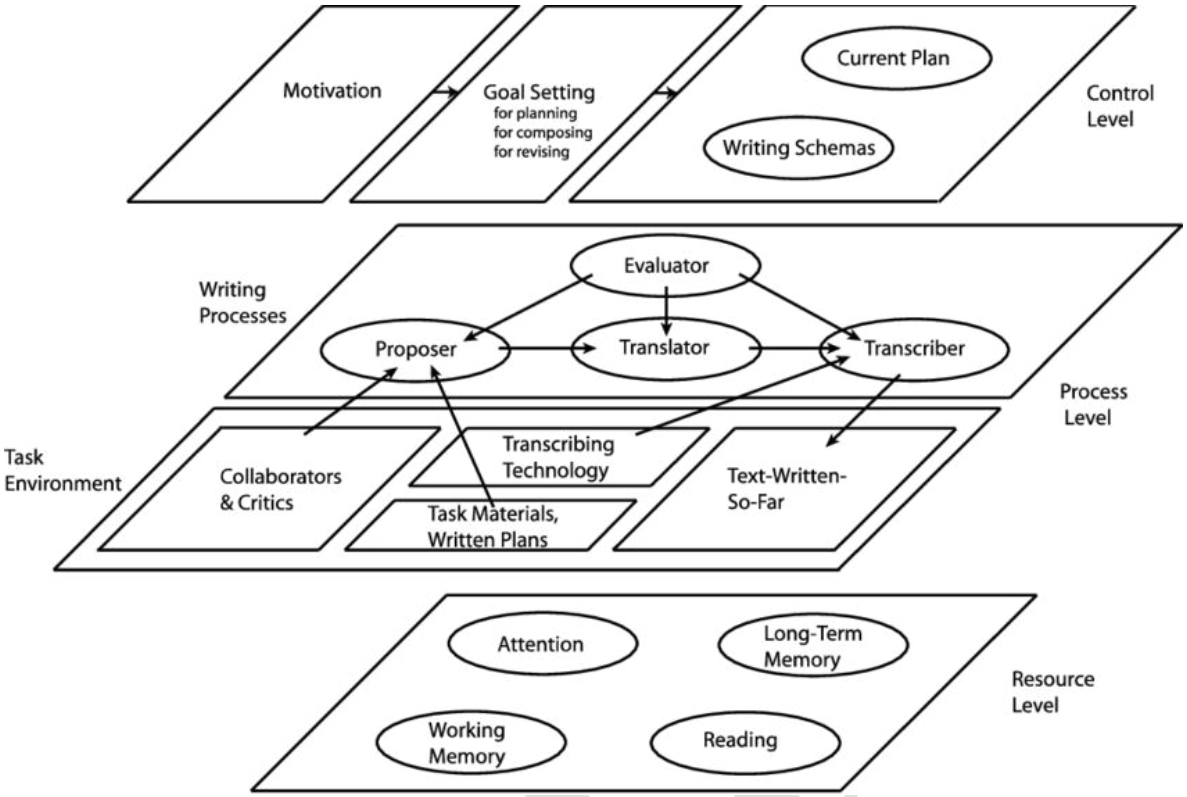

Figure 1. Model of writing proposed by Hayes (2012)

Out of these stages, the "motivation" component, which was not included in previous models, was highlighted at the control level. Emphasizing the lack of it being included in previous models, Hayes (2012) advocates that the affective dimension of writing cannot be ignored as an important element of the writing process and that it is necessary to learn how to combine motivation with cognitive processes to adequately explain how people write. Stating that the importance of motivation for writing is prioritized with the realization of its effect on people's willingness to participate in writing, Hayes (2012) suggests that through handling the affective dimension of the writing process, such feelings that are difficult to define are observed to submerge to the conscience. With these observations, it can be understood that whether people write, how much they write, how much they participate in writing activities, and the quality of their writing has a direct relationship with their motivations. Additionally, emphasizing the effect of the individual's motivation level during writing, Hayes (2012) reveals that it was found that writers with high motivation participate in the writing process more and produce more qualified sentences and texts than those with less motivation to produce quality texts (Chenoweth & Hayes, 2001).

Upon examining Hayes's (2012) writing model, it is seen that the goal-setting component is at the control level and consists of the stages of planning, writing, and reviewing. During writing (Flower & Hayes, 1981), which is a purposeful process in which the writer sets many goals in motion, what the target output will be and what actions will take place in this process are determined at the goal-setting stage. On another note, according to Alamargot and Chanquoy (2001), the goal-setting component in writing is a terrain on which what to say and how to say it in writing are supervised. Based on this, in Hayes's (2012) model, it can be noted that the writer places the goal-setting component at the control stage in order to determine and supervise their purpose during the production of the text. As a sub-component of the goal-setting component, the planning, writing, and review phases take place as separate writing processes. First, the writing process is planned; subsequently, the writing process begins, and the written text is reviewed. All these processes require the writer to go through certain

cognitive stages. For the presentation of existing information in writing, many sub-processes such as generating ideas appropriate for the purpose of the writing, ordering, and correcting thoughts are employed in the planning, and this process is maintained during writing. The written product, which has been developed to a certain point in the review stage, is evaluated in numerous dimensions, and if necessary, it is controlled and edited. Whereas Flower and Hayes (1980) state that competent writers create a more detailed plan for writing and continue to develop and change this plan throughout the labor of writing, Cho (2003), similarly, points out that competent writers use multi-faceted review processes to improve texts; states that competent writers utilize multifaceted reviewing processes to improve their texts. Conversely, incompetent authors aim to compose and complete the text completely in their first attempt. This constitutes proof that the planning and review phases should not be neglected, keeping them under control so as to become proficient in writing and increase the quality of the writing product.

At the control level of the Hayes's (2012) model, the last components are the current plan and writing schemas. The fact that the current plan and writing schemas components are included at the control level is an indicator of the point that the writing process cannot be handled independently of previous writing experiences and that the process is a cumulative action. When these components are assessed holistically, it is evident that they are constructs that control the writing processes. The current plan is described by Hayes's (2012) model as follows: Creating a written plan not only includes setting goals, generating and evaluating ideas, but also transcription and translation. That is why, creating a written plan involves a complete writing process that produces a text designed to assist the writer of the plan in producing another text. Indeed, writers may create many plans that they did not put into the text. For instance, short plans that can be easily stored in memory for the later applications do not need to be copied. Since such plans act as a supervisor in the writing process, Hayes's (2012) model harbors the current plan at the controlling level of the writing process. In addition, writing schemas reflect the writer's thoughts or beliefs about how writing processes and resources are to be used to produce the planned text. These components in their entirety take place at the control level and constitute the framework of the writing action (Bayat, 2020, p. 24).

The second section of the model is referred to as the process level. At this level, there are two main parts as writing processes and task environment. In the writing processes component of the model, proposer, translator, transcriber, and evaluator sub-components are involved whereas in the task environment component, collaborators and critics, task materials and writing plans, transcribing technology, and text written so far sub-components take place. In the writing processes component, proposer, translator, and transcriber are in active interaction with both their sub-components and the sub-components of task environment. The proposer, which is utilized for constructing the intellectual content to be included in the text, collaborators and critics present in a task environment, task materials, and writing plans all make a delivery. Through this delivery, an idea package is constructed by the proposer. Collaborators and critics aid the formation of an idea package with their support or criticism. Similarly, sub-components of task materials and writing plans in the task environment back the formation of the text through generated drafts and plans by creating various instructions. Task materials are the tools such as books, articles, etc. that form thoughts. Benefitting from such tools greatly contributes to the formation of the text. The thoughts formed are conveyed to a translator to transform into the linguistic structure; subsequently, it is transferred to the transcriber to be put into text. Here, transcribing technology, which is one of the sub-components of the task environment, makes deliveries to this component. Transcribing technology harbored in Hayes's (2012) model, shows how the text is written via keyboards or hands. Hayes (2012) asserts that transcribing technology in current technology as the component of task environment must definitely be taken into consideration. Since how a text is written is related to the act of production by transferring through copying, transcribing technology is related to text-written so far at the same time. The last sub-component of the writing process is the evaluator. This component individually evaluates the writing, supervising proposer, translator, and transcriber in the meantime. As can be seen, the process

level is a detailed stage that explains the writing process through interrelated sub-components that influence one another.

The last level in the model is the level of resources. Within the boundaries of this component, long-term memory, working memory, and attention and reading sub-components are included. Reading, which is the prominent requirement to produce a text, is an indication of how long things remain in the long-term memories of the writers and what type of experience they have regarding the topic. Providing that the writers are proficient in the text topic, the knowledge is stored in their long-term memory, and they use the knowledge in the working memory when the need arises, it will be easier for them to produce a quality writing product. Certain knowledge stored in long-term memory is used to form ideas and extract the existing knowledge during writing. The knowledge in the long-term memory is activated to derive text-appropriate knowledge by structuring it in the working memory. The knowledge present here is related to both the topic area and the coherence and cohesion of the sentences. Another emerging component during these processes is attention. Construction and textualizing of the knowledge in the memory are dependent on a certain extent of focus. The process is initiated by transferring the target knowledge to the area of the text. Following this, the knowledge is transferred to the text through working memory and adequate attention. Thus, supervision of attention is ensured while a memory-related process is performed. If the individual is of low potential at one of these stages, they encounter challenges during writing.

METHOD

Research Model

This study aimed to determine the challenges encountered by pre-service teachers in the writing process and the coping strategies they used to cope with these challenges. For this purpose, being one of the qualitative research methods, the case study was used. The case study is a research method that is used to answer how and why questions in current situations where researcher control does not exist over variables (Yin, 2003). Case studies are classified into different types according to the purposes of the research. In this study, an exploratory case study was used since the research aimed to determine the challenges encountered by pre-service teachers in the writing process and the strategies they used to cope with these challenges. The exploratory case study is a type of research where the researcher seeks to answer the question of "what" and the researched phenomenon is explored within the data they collect in line with the focus of the study. Moreover, at the end of the study, hypotheses about the phenomenon are developed and suggestions are presented for future studies (Yin, 2015).

Study Group

The study group of the research consisted of 69 third-year pre-service teachers (29 males, 40 females) who studied in the Turkish Language Teaching program of a state university during the 2018-2019 academic year. In determining the study group, the criterion sampling method was used. The criteria for determining the sample are that the participants were to complete theoretical and practical courses focusing on developing language skills such as written and oral expression and teaching language skills such as reading education, writing education, listening education, and speaking education, which meant that they reached the third grade. In criterion sampling, the researcher can construct the observation units of the research with people, events, objects, or situations with certain qualities. In such settings, units that meet the criteria determined for the sample are taken into the sample (Büyüköztürk, Çakmak, Akgün, Karadeniz, & Demirel 2017).

Data Collection

At the beginning of the data collection process, theoretical information about writing models, writing strategies, writing methods, and techniques were given to the participants by the researcher who also ran the course. In addition, the stages of the writing process are presented depending on the planned writing. In this section, which can be considered as a preparation for writing, it was tried to increase the knowledge and experience of the participants about the writing process. Then, were asked to write an article between 1500-2000 words in the triangle of “reader-writer-context”. Preparation, drafting,

revision and correction processes were carried out gradually so that the article could be realized in accordance with the planned writing model. Then, taking this practice into consideration, "What are the difficulties you encounter in the writing process?" and "What do you do to cope with the difficulties you encounter in the writing process?" In the form of two separate open-ended questions, they were asked to answer these questions. For the content validity of the questions, the opinions of four experts working in the field of language teaching were consulted and it was agreed that they reflect the purpose of the research. The data collection process was carried out over a period of eight weeks. Accordingly, the research was prepared in accordance with scientific research processes and ethical principles.

Data Analysis

In the analysis of the gathered data at the end of the research, the descriptive analysis technique was used. Descriptive analysis, which allows the research results to be presented by focusing on the research questions, is an analysis technique in which the obtained data are summarized and interpreted in accordance with the previously determined themes, excerpts are frequently used to reflect the views of the interviewed participants in a striking way, and the results are interpreted within the framework of cause-effect relationships (Yıldırım & Şimşek, 2013). In this vein, first of all, each participant's opinion was handled by taking the questions as themes and the codes pertaining to the answers given to each research question were categorized under that theme. Subsequently, the frequency values of the codes belonging to each theme were calculated.

In the study, Hayes (2012) writing model was taken as a reference in the generation of codes related to writing challenges. Studies based on the theoretical and applied dimensions of coping strategies were used in the generation of codes related to coping strategies. The data were analyzed by three independent researchers to ensure the reliability of the research. To establish consensus among experts, the percentage of coder reliability was used as the reliability formula (Reliability = Consensus / (Consensus + Disagreement) x 100) suggested by Miles and Huberman (1994). According to the formula, the percentage of agreement in the coding was calculated as %89.9. In addition, in order to increase the internal validity of the research, excerpts from the answers given by the study group were presented in the findings section.

FINDINGS

This study aimed to determine the challenges encountered by Turkish pre-service teachers in the writing process and the coping strategies they used to overcome these challenges. To serve this purpose, the obtained data towards the research problems were presented.

Findings Regarding Writing Challenges

Findings concerning the challenges faced by pre-service teachers during writing were tabulated as presented in Table 1.

Table 1. Writing challenges

Writing Challenges	***f***
Writing Challenges Encountered at Control Level	93
Writing Challenges Encountered at Process Level	114
Writing Challenges Encountered at Resource Level	19
Total	226

According to Table 1, writing challenges (f=226) were classified under three categories as challenges encountered at the control level (f=93), challenges encountered at the process level (f=114), and challenges encountered at the resource level (f=19). It was determined that pre-service teachers experienced the highest challenge at the process level and followed by the challenges experienced at the control level. The lowest amount of challenge was experienced at the resource level.

Findings Regarding the Writing Challenges Encountered at Control Level

Findings concerning control-level challenges as one of the challenges faced by pre-service teachers during writing were tabulated as presented in Table 2.

Table 2. Writing challenges encountered at control level

Writing Challenges Encountered at Control Level	*f*
Challenges Related to Motivation	58
Challenges Related to Goal-Setting (Planning, Writing, and Reviewing)	17
Challenges Related to Making Current Plan	10
Challenges Related to Writing Schemas	8
Total	93

Based on Table 2, writing challenges experienced at the control level (f=93) consisted of four sub-components as challenges related to motivation (f=58), challenges related to goal-setting (planning, writing, and reviewing) (f=17), challenges related to making current plans (f=10), and challenges related to writing schemas (f=8).

As mentioned in the theoretical framework, the data obtained in the component of challenges related to motivation were examined under two categories as anxiety-related challenges (f=40) and motive-related challenges (f=18). Considering the anxiety-related challenges, it was determined that pre-service teachers struggled with distinct types of writing anxiety as text-oriented (f=21), reader-oriented (f=12), and writer-oriented (f=7), which negatively impacted the writing processes. In text-oriented anxiety, pre-service teachers stated that they had anxiety related to the quality of the text (f=12) and style (f=9). Pre-service teacher (Ç.T.) accounted for the anxiety for the text and the reasons for this anxiety with the statement *"When I also don't like what I've written, I may be running away from writing because a person can't always create a product as they like and it causes me to have anxiety of writing"*. Pre-service teacher (E.E.) stated "*I have difficulties expressing in literary ways. I prefer using idioms rather than highly literary words. I can't keep an accurate saying."* and participant (Ş. G) remarked "*I was anxious if I could maintain my style during writing"*, addressing the challenge regarding the style. In reader-oriented anxiety, it was revealed that pre-service teachers had anxiety about being disliked (f=4) and others reading the text (f=3). For this, the pre-service teacher (Ç.Y.) remarked on their anxiety about others reading their text as *"if someone is going to read what I've written, this also prevents me from writing calmly."* and pre-service teacher (E.Ö.) as *"I feel shy reading my writings in the classroom and when others hear it*". The pre-service teacher (N.A.) refers directly to the writing challenge itself by stating *"I feel anxious my writing might be bad"*. Writer-oriented anxiety emerged as getting nervous (f=9) and getting stressed (f=3). The pre-service teacher (K.S.) addressed the challenge created by nervousness while writing: *"while writing I have unnecessary panic feeling and I get nervous."* while with the expression "*It makes me stressed when I'm writing",* the pre-service teacher (H.K.), the pre-service teacher (G.A) with the remark *"writing makes me stressed"* and the pre-service teacher (N.Ş.) with the statement "*I got overly stressed*." All addressed the challenge created by stress.

Difficulties regarding the motive (f=18) were found to be as reluctance (f=9), negative attitude (f=5), and lack of focus (f= 4). With the statement "*My biggest problem is not being able to be motivated",* the pre-service teacher (E.Ö) brought a general explanation to the motivational reason of writing difficulty. The pre-service teacher (F.K.), with the remark *"I can't get rid of the reluctance (lack of motivation) to writing",* expressed the challenge faced in writing due to the lack of motivation. Concerning the affective difficulty faced while writing with their bodies, the pre-service teacher (G.Ö.) stated "*To be uninterested in writing."* and the pre-service teacher (B.K.) noted "*Starting to the writing reluctantly"*. Another challenge for writing is the negative attitude. The pre-service teacher (C.Z.) explained this challenge with the sentence *"As in the other stages, my negative attitude towards the writing process pushes me to finish the writing as soon as possible and I do not show the necessary care"*.

Challenges regarding the goal-setting (planning, writing and revision) (f=17) are other types of challenges experienced by the pre-service teacher at the control level. In this vein, pre-service teacher (N.Z.) stated *"I'm having trouble deciding what to write before I start writing"* and the pre-service teacher (K.S.) remarked "*I can't really form a purpose and a plan in my head before the writing phase"* to address the challenge they experienced in setting their writing goals. Regarding setting plan and writing challenges, the pre-service teacher (B.K.) said "*I cannot show the necessary attention to the planning process."* and the pre-service teacher (E.Ö.) stated "*I can't make the outline of the text about where and what to include by dividing the main ideas and side ideas that I need to focus on to stay on the subject.."*. With the statement "*I want the writing to end I don't want to read and check again*", the participant (B.B.) revealed that they did not perform revision as a part of the writing stages, which posed a challenge for the writing.

Upon examining the challenges of making current plans (f=10) at the control level, it was found that some participants had difficulties with making plans while some had challenges with sticking to the plan. These challenges were addressed by the pre-service teacher (M.E.)'s statement *"I try to write what comes to my mind instantly and a mixed text appears. I can't stick to the current plan"* and the participant (S.S.)'s remark "*I'm having difficulty planning my writing and going with the plan*".

Regarding the participants' challenges experienced related to writing schemas (f=8), it was seen that they had challenges in using and managing existing resources and conforming to the writing process. For this issue, the participant (K.S.) stated *"I was challenged with scanning the resources"*, the participant (K.K.) said *"I was inadequate in finding resources"* and the participant (E.Ö.) remarked *"Because the chosen topic was abstract, I had difficulty in searching the sources on the topic.",* addressing the writing schema challenge. With the statement *"I couldn't keep up with the writing process time duration, it was incomplete",* the pre-service teacher (H.C.) and the participant (G.D.) with the remark *"I couldn't finish planning and writing in time"* mentioned the challenges they experienced regarding conforming to the writing process.

Findings Regarding Writing Challenges Encountered at Process Level

Findings concerning process-level challenges as one of the challenges faced by pre-service teachers during writing were tabulated as presented in Table 3.

Table 3. Writing challenges encountered at process level

Writing Challenges Encountered at Process Level	***f***
Challenges Related to Writing Processes	96
Challenges Related to Task Environment	18
Total	114

In accordance with Table 3, challenges encountered at the process level (f=114) consisted of two sub-components as challenged related to writing processes (f=96) and challenges related to task environment (f=17). Considering the challenges related to writing processes, it was determined that the most challenging sub-component was the proposer sub-component, and this component's interaction with collaborators and critics, task materials, and writing plans. As an example, the pre-service teacher (G.T.) stated "*I write and delete all the time, I find it hard to choose the right word"* and the pre-service teacher (M.A.) said *"When I'm writing, I make repetitions with many words, sentences, and thoughts",* addressing this challenge in collaborators and critics, and proposer sub-component. Similarly, in this sub-component, the participant (C.Y.) remarked *"I generally have difficulty finding a title."* and mentioned the challenge in choosing the title. In addition, the pre-service teacher (M.S.) remarked *"I find it hard to form a topic sentence for the text"* to refer to the challenge in forming a topic sentence. Challenges encountered by translator and transcriber in the writing process were mentioned by (B.K.) stating *"I have difficulties abiding by spelling rules and punctuations, make mistakes"* (G.Ö.) *"I can't create a page layout"*.

The pre-service teacher (K.A.) remarked, *"Even if I make a plan, I can't keep consistency in the text"* Referring to the challenges experienced in writing plans while Pre-service teacher (A.A.) mentioned the challenge experienced in collaborators and critics and evaluation sub-component in the statement "*What I write in a previous paragraph and in the later paragraphs look like two separate texts".* As an example of the challenge in text-written-so-far sub-component in the task environment component, the pre-service teacher (E.T.) stated "*I couldn't reach fluency in the writing process"*. Regarding the task materials sub-component of task environment component, the pre-service teacher (G.A.) stated "*I had difficulty doing research on the topic and finding articles."*, the pre-service teacher (N.Z.) said *"I had difficulty basing the text on scientific data, I could increase my text's validity by including scientific data and giving concrete examples.",* and the pre-service teacher (P.B.) remarked *"I tried to do research on the topic I was going to write about in various ways but it was hard. Then, I was late for my writing process".*

Findings Regarding Writing Challenges Encountered at Resource Level

Findings concerning resource-level challenges as one of the challenges faced by pre-service teachers during writing were tabulated as presented in Table 4.

Table 4. Writing challenges encountered at resource level

Writing Challenges Encountered at Resource Level	***f***
Challenges Related to Memory	6
Challenges Related to Attention	8
Challenges Related to Reading	5
Total	19

According to Table 4, writing challenges encountered at the resource level (f=19) were divided into three sub-categories as challenges related to memory (f=6), challenges related to attention (f=8), and challenges related to reading (f=5). The pre-service teacher (S.G.) responded "*We write without thinking or we can't find a template or draft in our minds"*, the pre-service teacher (Ş. Y) stated "*I find it hard to shape up the sentences and give the text a direction while writing",* and the pre-service teacher (G.F.) remarked *"Writing requires experience. Knowledge or emotional experience. Sometimes, even if I have the experience, I can't think of anything to write",* all mentioning the writing challenges stemming from long-term memory or working memory during writing.

Another challenge experienced at the resource level is related to attention. Pre-service teacher (N.G.) claimed "*Trying to pay attention to the tidiness of the writing while writing also creates problems for me to focus on the content of the text"* and pre-service teacher (E.Ö) noted "*I become distracted in the writing stage because of thinking about what to write"*, underlining the effect of cognitive load over attention. In the meantime, the pre-service teacher (Ş.Y) said "*Crowded, loud, or messy environments become problems when I want to write",* the pre-service teacher (P.B.) stated *"From time to time, I can't focus on writing because of external factors",* and the pre-service teacher (B.K.) remarked *"I find it hard to gather my attention. The smallest thing can distract me"* referring to the writing challenges due to the effect of other variables over attention.

To exemplify the writing challenge caused by insufficient reading, the pre-service teacher (R.A.) stated *"My vocabulary is inadequate because I don't read books. That's why, I have difficulty writing"* and the pre-service teacher (O.T.) noted *"Firstly, to become a good writer, one needs to be a good reader. This lack makes me have difficulties with writing".*

Findings on Strategies Used in Coping with Writing Difficulties

Strategies used by pre-service teachers to cope with the challenges encountered during writing were presented in Table 5.

Table 5. Coping strategies

Coping Strategies	*f*
Strategies towards Cognitive Structuring	109
Strategies towards Providing Instrumental Support	23
Strategies towards Creating Affective Support	19
Total	151

According to Table 5, coping strategies (f=151) were divided into three categories as coping strategies towards cognitive structuring (f=109), coping strategies towards providing instrumental support (f=23), and coping strategies towards creating affective support (f=19). It was determined that pre-service teachers mostly used coping strategies towards cognitive restructuring, followed by coping strategies towards providing instrumental support, and they used coping strategies towards creating affective support the least.

Findings Regarding Coping Strategies Used for Cognitive Structuring

Findings regarding coping strategies used by pre-service teachers towards cognitive structuring were presented in Table 6.

Table 6. Coping strategies for cognitive structuring

Codes	*f*
Planning before writing	22
Reading books, acquiring reading habit	23
Doing research from different resources	16
Practicing writing more often	11
Thinking over the writing topic	6
Making time for writing	7
Using methods/techniques	21
Self-evaluation after writing	3
Total	109

According to Table 6, reading books and acquiring reading habits (f=23) were the most used coping strategy towards cognitive structuring. The pre-service teacher (L.S.) stated *"In parts I am stuck, I scan different resources and read new things"* and the pre-service teacher (I.T.) noted *"To overcome these challenges, I am careful about reading a book I obtain and like, short articles written on any subject, etc. I try to get into the habit of reading books"*, exemplifying the most frequently used coping strategy towards cognitive structuring. This strategy was followed by planning before writing (f=22) and using methods/techniques (f=21). The statement "*I realized that to deal with these, I had to first create a plan and then draft it. Choosing the right sentences, doing research, and using techniques such as mind maps when necessary can make my job easier"* by the pre-service teacher (Y. S.) can be given as an example for both strategies. Pre-service teachers stated that they used a coping strategy for cognitive restructuring by doing research from different sources (f=16) and practicing writing more often (f=11). Making time for writing (f=7) and thinking over the writing topic (f=6) and self-evaluation after writing (f=3) were the least used coping strategies. Pre-service teacher (R.A) stated *"To overcome writing challenges, I force myself to write something by thinking about the place and importance of writing in my life..."*, implying that they overcame writing challenges by writing.

Findings Regarding Coping Strategies Used for Providing Instrumental Support

Findings regarding coping strategies used by pre-service teachers towards providing instrumental support were presented in Table 7.

In accordance with Table 7, regarding providing instrumental support, pre-service teachers used dictionaries (f=6), spelling dictionaries (f=3), and the internet (f=4). The pre-service teacher (Ç.T.) listed the instrumental supports they used by stating *"To solve my writing problems, I try to read the interviews of writers, musicians and theater actors and what is written about them in newspapers, magazines and the internet from time to time"*.

Table 7. Coping Strategies Used for Providing Instrumental Support

Codes	*f*
Benefitting from spelling dictionary	3
Benefitting from dictionary	6
Using the internet	4
Keeping diary/journal	1
Asking for others' opinions	5
Changing the environment	3
Attending the writing education lesson regularly	1
Total	23

Asking for others' opinions (f=5) and changing the environment (f=3) are among the coping strategies used to provide instrumental support. In terms of using changing the environment as a coping strategy, the pre-service teacher (P.Ç.) remarked *"Showing enough flexibility about the space"* and the pre-service teacher (E.A.) stated *"Space is also a factor that affects writing. Good light, fresh air, refreshing scents make it easy for us to relax our minds"*. Keeping diary/journal (f=1) and attending the writing education lesson regularly (f=1) were the least used coping strategies towards providing instrumental support.

Findings Regarding Coping Strategies Used for Providing Affective Support

Findings regarding coping strategies used by pre-service teachers towards providing affective support were presented in Table 8.

Table 8. Coping strategies used for providing affective support

Codes	*f*
Self-motivating	10
Relaxing the self	5
Listening to music/watching documentaries-films	4
Total	19

According to Table 8, self-motivating (f=10) is the most preferred coping strategy regarding providing affective support. The pre-service teacher (N.Ş.İ)'s remark *"I try to get myself motivated to start my writing"* and the pre-service teacher (O.T.)'s statement *"I prevent my motivation from decreasing during writing"* can be given as an example. Relaxing the self as an affective support tool (f=5) and music (f=4) are the remaining commonly used coping strategies. The pre-service teacher (D.S.) underlines the preferred coping strategy as affective support with the remark *"I try to relax with music playing in the background"*.

CONCLUSION, DISCUSSION, and RECOMMENDATIONS

When the writing difficulties experienced by the pre-service teachers in the writing process were examined, it was determined that they had the most writing challenges at the process level, followed by the writing difficulties at the control level, and the least at the resource level. Writing challenges at the process level consisted of two sub-components: challenges related to writing processes and challenges related to the task environment. Regarding the challenges related to the writing processes, it was determined that there were mostly challenges in the proposer sub-component and in the interaction of this component with the collaborators and critics, task materials, and writing plans. It was determined that the proposer component, which is used to create the intellectual content in the text, and the collaborators and critics units, where the processes of choosing the right words and presenting the ideas in cohesion are carried out, were the areas where pre-service teachers had the most difficulty.

In many studies in the literature, it was similarly determined that pre-service teachers had challenges in forming the intellectual content of the text and in ordering the thoughts in cohesion, and they made various mistakes in word selection and syntax. Baki and Karakuş (2017) determined that Pre-service

teachers had difficulties in choosing words, forming sentences, connecting sentences, creating paragraphs, paragraph integrity, introduction, development, and conclusion in the writing process. Bayat (2013), in his study to identify errors in the academic writings of pre-service teachers, found that there were many types of errors in the dimensions of word choice and syntax. Coşkun and Sidekli (2012) examined pre-service teachers' writings in terms of textuality criteria and determined that pre-service teachers had problems in forming sentences, connecting sentences, creating paragraphs, and connecting paragraphs while Arıcı (2008) found that 33% of pre-service teachers used words in the wrong place and in the wrong meanings. Dyan (2010) added that college students had problems dealing with writing as they lacked vocabulary mastery, cannot express their idea in good writing, and lacked in the content of the topic. Khuwaileh and Al Shoumali (2000) reported that in their study 55% of the students wrote compositions in their first language that lacked organization of thoughts and with no appropriate linking of an idea. In other research it has found that most students in their writing, focus almost exclusively on the word and sentence levels rather than the level of the whole discourse, that is, textual coherence (Ferris & Hedgecock, 1998).

Another challenge experienced in the writing process is the challenge experienced in relation to translator and transcriber. The difficulties experienced in this component, which included formal elements such as page layout, spelling rules, and punctuation, were also emphasized in many studies in the literature. In his study, Kemiksiz (2020) underlined that success in written expression depends on attention to form features such as spelling and punctuation, as well as expressive power, and determined that pre-service teachers mostly make spelling mistakes in their written expressions. Baki and Karakuş (2017) stated that pre-service teachers mostly had problems with the use of spelling rules and punctuation, and that pre-service teachers did not comply with the basic spelling rules and punctuation marks (Coşkun & Sidekli, 2012; Bayrak Cömert & Aktaş, 2011). In his study, Bayat (2013) found that when the level of mistakes made in the dimension of word selection in the writings of pre-service teachers was examined, spelling errors were the most common. In the study conducted by Topuzkanamış (2009) on determining the spelling knowledge levels of Turkish pre-service teachers, it was determined that the participants were insufficient in some spelling rules and made many spelling and punctuation mistakes (Aydın, 2014). Babacan (2003) stated that there were many misspellings as well as spelling mistakes in the writings of pre-service teachers. Sülükçü and Kırboğa (2020) analyzed the reasons for using the punctuation marks correctly or incorrectly and demonstrated that the students made mistakes mostly in complex sentences and sentences that lack a clear clue about the punctuation marks. Their study findings demonstrated that the students did not learn knowledge on punctuation marks that should be learned during primary and secondary education and cannot use the punctuation marks when required and these findings demonstrated that the majority of freshmen college students experienced difficulties in correctly using the punctuation marks included in the curriculum.

Another one of the writing challenges experienced at the process level is the challenge experienced in the writing plans component in the task environment. It was determined that the students who did not make a plan had errors in their studies such as not being able to establish logical cohesion, not providing paragraph cohesion, and not being able to limit the subject. Because of not making an essay plan, students were able to make a thesis statement that showed their opinion, but were unable to develop the essay well and had writing problems including that they lacked ideas and organizing ideas (Setyowati, 2016). Baki and Karakuş (2017) determined that primary education pre-service teachers had the most difficulty in planning the writing. Genç (1997), in the study that aimed to reveal the factors constituting the students' writing challenges, found that 51,12% of the students wrote essays by simultaneously writing what came to their minds. This indicated that students did not make preparatory activities such as planning and noting down the associations. This study found that pre-service teachers similarly had challenges in this component.

Pre-service teachers stated that they had difficulty with collaborators and critics and the evaluation component as another writing challenge. In the collaborators and critics and evaluation component, the

content is reviewed by taking into account the re-reading of the draft, sharing the draft text that was written in a writing group created in the classroom, and the feedback from peers in the writing group. Kapka and Oberman (2001) stated that reviewing the content is a difficult stage for students. As an example of the difficulty experienced in the text written so far sub-component in the task environment component, it was found that pre-service teachers had difficulties in maintaining fluency in the writing process. Oğuz (2008) stated that 43% of the pre-service teachers in the study group stated that their written expressions were not fluent and underdeveloped. In this study, when the pre-service teachers evaluated their written expressions, they believed they did not write fluently. The finding of this study supports the literature.

Considering the writing challenges experienced by the pre-service teachers in the writing process, it was determined that they had writing challenges at the control level. Here, it was determined that they had the most difficulties related to writing anxiety among the difficulties related to motivation. Of many affective factors, anxiety can cause difficulties in language learning (Balta, 2018) since writing is a complex cognitive activity, it might cause as much anxiety as other language skills. Writing anxiety is a condition unique to individual distinctions of individuals that demonstrate general predispositions to writing such as their approach or avoidance of writing and more of a fear of the writing process that outweighs the projected gain from the ability to write (Takahashi, 2009). To define the combination of feelings, beliefs, or behaviors that interfere with a person's ability to start, work on, or finish a given writing task, Karakaya and Ulper (2011) stated that determination of writing anxiety determines the production of effective texts. Similarly, Katrancı (2015) states that the successful completion of the writing process is closely related to writing anxiety, and that the level of anxiety in writing plays a decisive role in starting, continuing and completing the activity, as in other areas.

The common ground of the studies in which the writing anxiety of pre-service teachers examined in various dimensions is that pre-service teachers, no matter the level, all had writing anxiety in the writing process (Cheng, 2002; Pajares, 2003; Yaman, 2010; Tiryaki, 2012; İşeri & Ünal, 2012; Topuzkanamış, 2014; Katrancı, 2015; Kalaycı & Erdoğan, 2017; Ürün Karahan, 2017; Altunkaya & Topuzkanamış, 2018; Deniz & Demir, 2019; Demir & Çiftçi, 2019; Ahıskalı & Akkaya, 2021). The findings retrieved from the literature show similarities with this study. In the study, it was also concluded that some of the pre-service teachers were afraid to read the articles they wrote in the classroom and were hesitant for others to hear them, and they were worried about the teacher's evaluation. In addition, in the literature, it was asserted that anxiety, which is one of the factors that ignite the writing problem, may arise from the possibility of negative consequences, the possibility of punishment, the difference between what the individual believes and their reactions, or uncertainty about the future. The findings of this study indicated that pre-service teachers experienced anxiety during the writing process are similar to the findings of many studies. It was determined that, among motivation difficulties, pre-service teachers secondly had challenges in motivation to write. Because language use is an essential part of the writing process, difficulty with language is likely to negatively affect writing outcomes and attitudes towards writing, including perceived writing competence (Scott, 2002). Writing, which requires adequate knowledge and experience as well as effective use of language thinking skills, causes students to have the reluctance to write, and lack of attention and motivation (Karadağ & Kayabaşı, 2013); and, these challenges related to motivation in the writing process makes it difficult for pre-service teachers to enjoy the writing activity and transforming writing into a lifelong skill (Yaman, 2010).

Regarding the writing difficulties experienced by the pre-service teachers at the control level, it was determined that they had difficulties in setting goals (planning, writing, and reviewing) and creating current plans. Considering goal-setting, Akyol (2010) states that at the beginning of writing problems, starting to write is quite a problematic area. Yıldız, Okur, Arı, and Yılmaz (2013) list the inability to start writing during the writing process and the lack of planning, the inability to sequence and associate thoughts as one of the writing difficulties experienced at the control level. Karatay (2011),

making a plan in written expression, emphasizes that it is necessary to create a writing draft that will form a meaningful and coherent whole from the thoughts, but many studies in the literature show that pre-service teachers have difficulties in planning their written expressions. Arıcı (2008), in his study, revealed that 37% of pre-service teachers could not plan in their writings or they made wrong plans. Baki and Karakuş (2017) found that primary school pre-service teachers had problems in planning the writing. Similarly, Esendemir (2019) stated that pre-service teachers had a problem of not knowing what to write about the internal dimension of writings due to a lack of planning.

Upon examining the writing difficulties of the pre-service teachers at the resource level, it was seen that they had difficulties related to memory, attention and reading. Findings obtained in memory challenges generally showed that pre-service teachers tried to write without making a plan. Similarly, Ülper and Çeliktürk Zengin (2019), in their study examining the writing habits of pre-service teachers, determined that pre-service teachers had the habit of writing with instant reflexes and in a way that starts and ends without any planning beforehand. There is information in the literature that unplanned writing will burden the memory and reduce the quality of the writing. In this direction, it can be interpreted that not making a plan does not only affect the writing in terms of content, and that there is difficulty in the writing process as a burden on the memory during writing. Another difficulty experienced at the resource level is the difficulty in attention. Pre-service teachers stated that they had difficulty in the writing process due to not being able to focus and being distracted by the slightest thing. Demir (2016) mentioned that it may be difficult to focus on writing due to anxiety while writing. It is very important to determine this difficulty since the individuals having difficulty in focusing and the accompanying lack of attention may prevent them from doing even simple tasks that they can do in a normal situation. It was found that the emphasis on the writing challenge experienced from the lack of reading at the source level was generally made on not reading and the inadequacy of the vocabulary stemming from not reading. Whereas Aydın (2014) argued that one of the challenges experienced in written expression is due to the very limited vocabulary of the students, Karadağ and Kayabaşı (2013) found that insufficient vocabulary of pre-service teachers was one of the factors that prevented writing.

Coping strategies used by pre-service teachers in response to their writing challenges in the writing process were examined in three categories: cognitive restructuring, providing instrumental support, and creating affective support. It was determined that coping strategies aimed at providing cognitive support were used the most, which was followed by coping strategies towards providing instrumental support, and strategies towards creating affective support. Information similar to the finding of reading books and gaining the habit of reading, which was the most used strategy as a coping strategy for providing cognitive support, were included in the literature. According to Karataş (2009, p. 144), the prerequisite for writing is to be a regular reader. Similarly, Göçer (2013) stated that the richness of the individual's vocabulary and the power of observation directly affect the writing skill just as the effect reading habit imposes on the acquisition and development of writing skills. Deniz (2003), on the other hand, stated that reading and a wide vocabulary are effective in achieving successful writing skills.

Planning before writing is another coping strategy most commonly used by pre-service teachers to provide cognitive support. Long-term memory is needed in order to convey thoughts, feelings, and messages in the form of a composition according to the determined goal (Boscolo & Hidi, 2007). Writers prepare goals for their texts and make conceptual plans to achieve them through the “long-term-memory” which creates the content related to the subject, reader and other conceptual writing plans in the text and includes the writer's accumulation and knowledge (Hayes & Flower, 1980 & 1986). Thus, the writers prepare themselves cognitively for the writing process. In general, while competent writers move rapidly between the planning, transcription, evaluation and editing sub-processes, non-competent writers see text production as a linear process and plan the text first, then produce a sentence and perform the revision only after a text has been produced (Randsdell, Levy, & Kellogg, 2002). In many studies, it was stated that planning before writing has a positive and significant relationship with the quality of composition (Berninger, Fuller, & Whitaker 1996). Based

on this insight, coping strategies frequently used by pre-service teachers in the study were also suggested in the literature. One of the coping strategies used to provide cognitive support was found to be more frequent writing practice.

It was determined that pre-service teachers tried to cope with the difficulties encountered while writing with tools such as a dictionary, spelling dictionaries and the internet as the most frequent instrumental support among the strategies for providing instrumental support. It was stated in the literature that the lack of knowledge of spelling rules causes pre-service teachers to create a negative perception about writing (Karadağ & Kayabaşı, 2013). Therefore, it is important for pre-service teachers to use a dictionary and spelling dictionaries to cope with this negative perception. Changing the environment is another coping strategy used to provide instrumental support. Similarly, in a study in the literature, the importance of the writing environment and its contribution to focusing were mentioned (Ülper & Çeliktürk Zengin, 2019). Additionally, Golda (2015) stated that having a comfortable writing environment enables the writing process to take place without any difficulties. These views of pre-service teachers about using change in the environment as a coping strategy bear resemblance to the findings in the literature.

It was determined that pre-service teachers mostly used self-motivation strategy among the coping strategies aimed at providing affective support. Motivation, which urges one to perform an action and keep one in this action and is one of the fundamental factors effective in the learning and teaching processes, is defined by Ormrod (2018) as “the process whereby goal-directed activity is instigated and sustained” (Schunk, Meece, & Pintrich, 2008). Writing motivation enables students to develop their writing skills as well as gain the habit of writing with lifelong interest, desire and pleasure (Deniz & Demir, 2020). Therefore, writing motivation was investigated with many of its dimensions in the literature and it was found that students had low writing motivation in a general sense (Bruning & Horn, 2000; Graham, Harris & Mason, 2005; Garcia-Sánchez & Fidalgo-Redondo, 2006; Harris, Graham & Mason, 2006; Hidi & Boscolo, 2006; Bayülgen, 2011; Baş & Şahin, 2013; Karadağ & Kayabaşı, 2013; Canıtezer, 2014; Katrancı, 2015; Deniz & Demir, 2019). Therefore, it was supported by the findings of the related literature in the field that the most needed coping strategy by pre-service teachers during writing was self-motivation.

In conclusion, problems encountered in the professional training process and the ability to come up with solutions for these problems will be the predictor of the potential resolutions created by pre-service teachers for the problems they might face while performing their own professions. That is why the ability of teachers working in the field of language education to overcome the writing challenges faced by students in the process also depends on their awareness of these difficulties and abilities to guide them in their solutions. On the other hand, coping strategies are not only problem-oriented but also require an affective-based approach to the challenges that may be encountered in the writing process. At this point, determining the problems encountered in writing and determining the strategies to cope with them highlights the importance of using cognitive-based practices in writing instruction, as well as using affective factors. As a result of the research, it can be suggested that necessary studies should be carried out in the future so as to ensure the competence of both pre-service teachers and in-service Turkish teachers, and that trainings should be designed by creating syllabi for coping with difficulties encountered in writing.

Ethics and Conflict of Interest

We declare that the data used in this research were collected between “September 01, 2019” and “September 31, 2019”, and that research and publication ethics have been considered carefully. During the research process, all the rules specified to be followed within the scope of "Higher Education Institutions Scientific Research and Publication Ethics Directive" were complied with, and none of the "Acts Contrary to Scientific Research and Publication Ethics" stated in the second section were carried out. There is no situation or relationship that may constitute a conflict of interest in this research. All authors contributed equally.

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TEACHERS' OPINIONS ON PEER RELATIONS BETWEEN STUDENTS WITH SPECIAL NEEDS IN PRIMARY EDUCATION

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Abstract

Determining the factors affecting peer relations among students who need special education at the primary education level; peer relations have an important place in determining the problem situations encountered and in solving these problems. Therefore, this study aimed to determine the opinions of teachers about peer relations of students with special needs. For this purpose, the research was designed according to the qualitative research method. The research "content analysis model," one of the qualitative research methods, was used as a research model. The study group of the research consisted of 17 teachers working in two special education schools at the primary education level in Famagusta district of the Northern Cyprus. Teachers' opinions were collected from semi-structured interview techniques. According to teachers' opinions, the main problems encountered in peer relations among students are the problem of adaptation to school and aggressive behaviors. It has been concluded that the peer relationships of students with special education needs are essential for their cognitive development, adaptation to school, and development of learning skills.

Keywords: Peer relations, a student with special needs, teacher views.

INTRODUCTION

Successful communication with an individual primarily depends on knowing and understanding himself/herself correctly and making sense of his/her behaviors and attitudes. In this context, children need to understand each other correctly in their relationships with each other (Ümit, 2010). As well as the time they spend with their families, and children also spend time with the individuals they feel close to, at school, in the neighborhood, or around them. The quality of the child's time with his friends also reveals the importance of peer relationships in social development (Erten, 2012).

The relationship the child establishes with his mother, father, teacher, and other adults is vertical and has an important place in his social development. However, horizontal relationships with their peers also determine the child's self-perception and social development. Thus, it is important in social development (Ollendick, et al., 1992). In the literature, there are studies showing that students who need special education experience difficulties in social skills (Freire et al., 2019; Wiener & Schneider, 2002). Students with special educational needs tend to exhibit lower social behaviors compared to their classmates (Dasioti & Kolaitis, 2018), are less accepted (Avcıoğlu, 2017; Smith & Broomhead, 2019), and have fewer or no friends (Banks et al., 2018; Pinto, et al., 2019). They also show lower friendship quality, higher levels of conflict, more problems in relationship repair, and less stable relationships than their peers (Wiener & Schneider, 2002).

The development process of peer relations provides learning opportunities for children to understand each other better (Hartup, 1989) and to learn about social standards and acceptable social behaviors

about how they should behave (Xinyin, et al., 2003). Thus, the child gets the opportunity to be successful in peer relations by gaining experiences with the experiences he has created with his peers, observing, and imitating (Brandley, 2001). These experiences, which are important for developing peer relations, allow the development of peer relations and behaviors among children (Köse, 2015).

A correlation was found between peer relationships regarding school success, school adjustment, problematic behavior, and loneliness (Birch & Ladd, 1998). Examples of the child's adaptation to school and his friends and the first friendships he establishes are also experienced when he first starts school. The positive behaviors that will exist in the child's life in the preschool period, the sense of trust, and academic success are directly effective with the right relationships to be established (Akman & Gülay, 2010). Progress in peer relations improves the child's sense of belonging to that group and increases social interaction. Children who can adapt to school gain success in the academic field, social interaction, and the use of their skills and are loved by their peers. Children accepted by their social environment are more compatible and willing to go to school. However, the negative dimensions of peer relationships (violence, aggression, etc.) reduce the level of adjustment of children in academic and social areas (Klima & Repetti, 2008; Ladd, 2006; Pianta & Stuhlman, 2004). Children with negative friendship relations, social relations, and social skills deficiency during the school period; during childhood and adolescence, it is seen that their peers reject, dislike, and do not accept them and that they experience communication problems and academic failures (Leve et al., 2007).

A study by Riese, et al. (2012) revealed that peer relationships are effective in children's school success and that learning skills, understanding, and applying activities reflect the importance of peer relationships. In another study, Powers & Bierman (2013) stated that students' relationships with their classmates are important for their classroom environment. They also stated that children who behaved aggressively in primary school had less positive relationships with their peers. Students who do not have strong, positive relationships with their peers experience more problems and difficulties. Positive peer relationships and especially positive emotional support from friends can support the development of academic success (Garcia-Reid, 2007; Perdue, et al., 2009; Shin, et al., 2007). However, there are studies in the literature showing that students with special educational needs have fewer friends, have negative peer relationships, and are less accepted than their classmates without special educational needs (Banks, et al., 2018; Chamberlain et al., 2007; Humphrey & Symes, 2010).

In the study by Uz Baş and Siyez (2011), the perceptions of individuals who are accepted or not accepted by their peers towards peer relations were examined. It has been concluded that children who are better in friendship relations, that is, those who can be friends and maintain this friendship more are more successful in solving the problems that may arise between their friends. In addition, it has been determined that individuals who are accepted by their friends have more social skills than those who are not. These results show that peer relations and social skills interact with each other. Social skills developed among peers have a positive effect on social competence. Children who show progress and exhibit these skills are accepted by their peers and therefore exhibit positive behaviors among peers (Gülay, 2011).

It is necessary for individuals with special needs to be accepted without being marginalized and to have a place in society (Atalay, 2010). For children with special needs to be accepted into or integrated into society, providing specially prepared services to these children and ensuring the competence of school environments and teachers play an important role (Öncül, 2003). Peer relations are a method used to increase the quality of teaching activities of individuals with special needs and to adopt social rules (McKellar, 1986). If my children feel comfortable with their classmates, a more collaborative environment in which classroom rules are adopted has been identified (Urdan & Schoenfelder, 2006). Teachers' attitudes regarding peer relations are important regarding children's adaptation to school, success in lessons, social development, gaining skills, and solving the problems they encounter. In this context, it is necessary to determine the opinions of teachers working in special education on peer relations, determine the factors affecting peer relations among children, develop strategies for peer relations, and identify the problem situations encountered, both for the teacher and the student. In

addition, the lack of studies on peer relations in individuals with special needs within the borders of the TRNC was seen as a deficiency in the literature.

In this context, it will be possible to identify what factors affect peer relations among students, what strategies are used for peer relations, and what teachers do in the face of problems encountered by examining teachers' opinions on peer relations. This information that can be obtained will be important for teachers and students for successful peer interaction among students. Therefore, this study reflects teachers' opinions about peer relations among special needs students. For this purpose, answers to the following questions were sought.

(a) What are the variables that affect peer relationships among students?

(b) What strategies do teachers follow to improve student-peer relationships?

(c) What problems do teachers face regarding peer relationships among students?

(d) What are the strategies teachers follow to solve problems related to peer relationships among students?

METHOD

In this study, the qualitative research method was preferred based on the need to deeply understand the research topic and examine a social phenomenon with research questions. A semi-structured interview was used based on the qualitative research method to collect data suitable for the research. A semi-structured interview is a type of research that is flexible according to the structured interview technique, the topics of which are determined beforehand, the interviewer can get out of the subject, but the researcher can shape the interview in a way that does not copy (Tavşancıl & Aslan, 2001).

Study Group and Scoping

The teachers who provide education to students with special needs at the primary level in the TRNC formed the target group of the research. To determine the research group, first, an application was made to the TRNC Primary Education Directorate. Then the schools and the teachers to be interviewed were determined. The schools where the teachers were to be interviewed were determined by obtaining the necessary permissions. Afterward, the responsible administrators of the selected schools were interviewed, and information was given about the research. In this study, it was stated that it was aimed at getting the teachers' opinions about the students' peer relations. In this framework, teachers who voluntarily agreed to participate in the research at schools were determined. Preliminary interviews were done with the teachers, and an appointment was requested. Preliminary interviews were conducted with 19 teachers working in two different schools. However, 2 of the pre-interviewed teachers stated that they could not participate in this study, and therefore, 17 teachers were interviewed, and the research data were collected. Demographic information about teachers is given in Table 1.

Table 1. Demographic information of teachers

Variables		N
Gender	Female	8
	Male	9
	Total	17
Age	20-30 years	3
	31-40 years	6
	41-50 years	6
	51 years and older	2
	Total	17
Graduated Area	Special Education	7
	Class Teacher	2
	Technology and Design Teaching	4
	Education Programs and Programs	1

Table 1. (Continued). Demographic information of teachers

Variables		N
Graduated Area	Computer Engineering	1
	Economics and Administrative Sciences	1
	Psychology	1
	Total	17

Eight teachers participating in the research are female, and nine are male. Three teachers are 20-30, six are 31-40, six are 41-50, and two are 50 and over. Seven teachers graduated from education for the Mentally Handicapped, four from Technology and Design Teaching, two from Classroom Teaching, one from Curriculum and Curriculum, one from Computer Engineering Department, one from Psychology Department, and one from Economics and Administrative Sciences.

Data Collection Tool

The data collection tool consisted of demographic information and semi-structured interview questions. While preparing the interview questions in the semi-structured interview form, 11 open-ended questions were created for teachers by scanning the relevant literature to delve into the peer relations among the students with special needs in the class of special education teachers, peer relations in the school and classroom environment, and possible problems in peer relations. Attention was paid to ensuring that the semi-structured interview questions were clear and understandable. If the questions were not understood, when necessary, some hints or alternative questions were prepared to eliminate such situations. In addition, semi-structured interview questions were qualified to access detailed answers instead of getting short answers. Two special education experts and two assessment and evaluation experts examined the semi-structured interview questions. It was decided that these questions could be used in the interview as they were. Afterward, a pilot study was conducted with two teachers to control the prepared research questions. To collect data for the research, the following questions were included.

These were:

1. What problems do you encounter regarding peer relations among students in your class? Moreover, how often do you encounter these problems?
2. When you encounter problems related to peer relations among students in your class, what do you do to solve these problems?
3. What are the factors that positively affect peer relations?
4. What are the factors that negatively affect peer relations?
5. What do you do when your students are confronted with aggressive behavior by their peers?
6. What do you do when your students are excluded by their peers?
7. Which methods and techniques do you use to evaluate peer relations among your students?
8. When there are problems among the students in your class, how do the students solve these problems?
9. When there are problems among the students in your class, how do you solve these problems?
10. Have you attended a seminar, conference, or in-service training on peer relations? If so, how did what you learned from this participation contribute to improving relations among students in your classroom?
11. What do you do to improve peer relations in your classroom?

Data Collection Process

Research data were collected between April 1 and May 30, 2017. The researcher and teacher interviews were conducted within the appropriate time to collect the data. Interviews were conducted with each teacher participating in the research using an interview form consisting of semi-structured questions and a voice recorder. The interviews lasted between 7 and 15 minutes. The interviews were completed one-on-one in an environment where the researcher and the participant were alone, without being interrupted by anyone. The interviews were held at the designated time, in a classroom deemed appropriate by the school administration. The environment is arranged in such a way that the

participants feel comfortable. In cases where the answers given during the interview were not clear enough, answers were obtained by asking alternative questions. The first researcher who conducted the interview displayed a neutral, unbiased attitude and did not affect the answers. At the same time, the first researcher assumed a role in the natural environment, far enough not to affect the participants' answers and close enough not to lose the information. Thus, it took place in the field to obtain accurate data, and one-on-one interviews were conducted with the participants. The interviews were conducted in a natural environment, so distant that the participants' answers would not be affected and so close that the information would not be lost. The opportunity to see the teachers' experiences was taken by making observations.

Data Inventory and Analysis

The research data were analyzed quantitatively. As a research approach, it was designed in line with the qualitative research approach and analyzed with the content analysis technique. This technique analyzes verbal, written, and other materials with objective and systematic methods (Tavşancıl & Aslan, 2001).

In this study, the data were collected by analyzing it in four stages. These stages are coding the data, determining the theme of the coded data, arranging the codes and themes, and ending with interpreting the findings. The interviews, transcribed for each special education teacher, were read and evaluated. After the interviews with the teachers were completed, the researcher deciphered the audio recordings without changing them.

Code numbers (T1 for Teacher 1 or T10 for Teacher 10) were given to the teachers whose opinions were consulted, and necessary explanations were given. The data obtained from the interviews were digitized and expressed as frequency and percentage. Similar items in the expressions were grouped and appropriately themed.

After the interview was transcribed, the suitability of three interview forms and the categories with the interview coding key was determined by the impartial assignment. For this purpose, an empty interview coding key was duplicated for each of the three selected interview forms and presented to evaluate two experts working in the field. In this case, it was ensured that two field experts independently evaluated the interviews, which were converted into written form according to the interview coding key. It was checked whether coding was done on the opinions obtained from the teachers interviewed. To determine whether these codings were processed into the appropriate coding key, the interview coding key, in which the markings were made, compared with the answers given to each question, was taken into account one by one.

Validity and Reliability

To give an idea to other researchers if they do similar work, the results obtained in the study were detailed in-depth. In this study, the researcher personally interviewed the participants face-to-face, and the questions in case of need were asked again without being changed by giving more explanatory information. In addition, the participants were given explanations regarding the purpose of the research before and during the interviews. Participants were notified by signing the agreement that the information obtained during the interviews would only be used for scientific purposes and that their names would be coded and included in the relevant research. The information gathered during the interviews was presented in detail. The themes and codes that emerged from the data obtained from the participants and the relationship of each theme with each other were examined within themselves to ensure integrity.

FINDINGS

In this section of the study, the data obtained within the scope of the research aim were presented.

Findings Regarding the Factors Affecting the Peer Relationships between Students Positively and Negatively According to the Opinions of the Teachers

Teachers stated that the prevalence of exemplary behaviors among students (10 teachers), group activities (teachers), and the feeling of love among students increased (2 teachers) have been at the forefront of the factors that positively affected peer relations among students in their classrooms. At the lowest percent, two teachers expressed that it enabled them to socialize, and the other two stated that the increased feeling of love positively affected peer relations among students.

> T4 expressed this situation as: *"Positively, if students have behavioral disorders or exhibit undesirable behaviors, better students can discourage them, they can set an example. Being a model and the teacher is a model can cause that child to quit that behavior."* T10 said, *"Group work comes first, of course. As I have mentioned earlier, although we encounter problems more frequently when children first come, they get used to and adapt as long as the work in the group continues. This problem disappears over time."*

Teachers declared that the effect of negative behaviors (11 teachers), social environment (4 teachers), and not being in the same age group (4 teachers) were at the top of the list of the factors that negatively affected peer relations among students in their classrooms. On the other hand, sexual urges (1 teacher) and grouping (1 teacher) were the least.

> T4 expressed this circumstance as takes after: *"The negative thing is that if the child has a negative behavior (such as spitting, swearing, gesturing, and lying on the floor) because they mostly imitate each other by seeing each other, this time, the children can take them as an example. The child is also trying to deteriorate the behavior immediately. For example, a child who does not use the toilet and poos on himself/herself, that is, a child who does not have toilet control, the other children who see this situation start to do the toilet on themselves. Alternatively, seeing a child taking off his/her clothes and undressing, the others also undress; when one of them lies on the ground, the others try to lie. In other words, the child accepts what he/she did as right and sees it as right.*
> T11 stated: *"If the child comes from a negative socio-economic environment, this inevitably reflects on the child's attitudes and behaviors. Applying what he/she sees around him/her in the class causes the child to gain negative attitudes and behaviors." Moreover, because he/she sees it, he/she begins to imitate again."*

Findings Regarding Strategies Followed by Teachers to Develop Peer Relationships among Students

Teachers said that they mostly performed game and music activities (8 teachers) and group activities (6 teachers) to improve peer relations. At the very least, they stated that they followed a behavior development program (2 teachers) and do drama work (1 teacher).

> T1 pointed out this situation in the following lines: *"I do ring exercises in music classes to improve peer relations. I do group activities, simple rhythm exercises, and play simple games. It is like hiding and seeking, hiding something and finding it, so I try to complete this dialogue with play and music*". T9 described it as *"Group studies to improve friendship relations. One can hold material while the other paints it collaboratively."* also, 14 said: *"We are trying to determine group activities in general terms. We are trying to bring together the children who do not get along well to keep the children together. Alternatively, we determine those kinds of activities on how we can bring the two together at a common point."*

Findings Concerning the Problems that Teachers Encounter in their Classes Regarding Peer Relationships among Students and Solving the Problems

Teachers included the problems of adjustment (7 teachers), aggressive behaviors (6 teachers), and verbal teasing (4 teachers) at the beginning of the problems related to peer relations among students they encountered in their classrooms. They stated that they had the least amount of disobedience (1

teacher), manipulating younger ones (1 teacher), negative things (1 teacher), lack of communication (1 teacher), and emotional problems (1 teacher).

> This situation was expressed by T12 as: *"I mean, they can get angry very quickly. There may be irritability with each other if they do not get along. If they get along, they can have good communication. They can communicate. They do not speak louder anymore. If they have problems, there will be problems in their development process. Their sexual drive is already high. I do not know, probably because they are over 18, so they get into the boyfriend-girlfriend thing. There, they are sometimes influenced by movies or something else. Most likely, they get into girlfriend-boyfriend fights with each other. There are cases of disagreement. It forces us a little bit, like going to the corner and holding hands, kissing, or something. We try not to leave them alone. Alternatively, if there is an individual in that situation, we follow them. We think of where he is and where she is to find them and see where they are. It usually happens every day."* In addition, T14 stated: *"Now we accept all kinds of students. We also focus on hyperactive ones. Since it is a ceramic workshop, we thought it would calm the children down. Some students cannot handle their mobility. We have more problems with them. So, when they yell at each other, the other responds or wants to silence them. That is the kind of trouble we usually have. We find ourselves facing these situations at least once a day."*

Teachers stated that they exhibited verbal warnings (8 teachers), modeling (7 teachers), and keeping students in separate places (7 teachers) were the behaviors at the beginning of their attitudes toward solving the problems they encountered in their classrooms related to peer relations among students. They also expressed that they practiced punishment (1 teacher), keeping students under observation (1 teacher), and informing the family (1 teacher) were the least level they tend to do.

> T1 expressed this situation: *"As three of my four children have expressive and receptive language, I am explaining the issue. What do I do? First, I verbally stated that they must agree that this is a class and that they are friends. Afterward, I try to overcome these problems by assigning roles and responsibilities by grouping them into music or acting lessons as a game."* T4 said: *"First, we inform the families about this issue. Then we keep those children under constant observation in the classroom. We make them sit in different places, and they do not communicate during the lesson. We keep them under constant observation during breaks, so they do not affect the others and cause no harm."*

Findings of the Strategies Followed by Teachers to Solve Problems Experienced Regarding Peer Relationships among Students

In this section, the place has been given to several issues such as what teachers do when they face aggressive behavior and when their peer's peer relations exclude students, the methods and techniques teachers use in peer assessment, how students solve problems that they encounter, among themselves, and teachers' views on what they do to solve the problems they encounter and what they do for their participation in seminars, conferences, and in-service training.

Teachers stated that when there were aggressive behaviors among students regarding peer relations among students, intervening (14 teachers), removing them from the environment (5 teachers), and speaking for the solution to the problem (5 teachers) were the main strategies they follow in solving the problems experienced. They also stated that they took a break for 5 minutes (1 teacher) and applied punishment (1 teacher) at the least level.

> T1 expressed this situation: *"We go next to them and try to warn them verbally. Then, separately from each other, we ask them why they are behaving this way so that we can understand the reason to find the solution accordingly."* T13 mentioned: "*We ask what do we mean by deliberately attacking by someone else, normally too much with the situation, we intervene at that moment, of course, we separate them, then we talk about what can be the problems of both of them. We describe the behavior and why they behave this way, and it will*

not be resolved that way. If the case repeats, we apply negative reinforcement by depriving a loved one of something."

Teachers pointed out that when they faced the behaviors that students did in case of exclusion by their peers, they mostly involved students in playing games or activities that students could perform jointly (7 teachers), while they least received support from the guidance service (1 teacher) and included their students in different groups (1 teacher).

T1 expressed this situation as follows: *"This is so bad. When such a thing happens, we talk to the children and direct them to the guidance service. Miss Sedef, as the consultant, deals with them and tries to find out exactly what the problem is, what is not and why."* S14 expressed: *"For example, I determine group activities they will do together. I determine the tasks to be done together. I usually bring students together around those studies."*

Teachers stated that while evaluating peer relations among students, the method and technique they used most is observation (10 teachers). In contrast, they used interviews (1 teacher) and peer evaluation forms (1 teacher) the least.

T13 expressed this situation in the following lines: *"Usually we do it through observation, sitting among their instructors and teachers, I follow up, find out and learn what they do not know or what is happening in their class, or I tell them something that they missed in my class or something that I observed. We do this collaboratively, but our evaluations are much more through observation."* T10 declared: *"Observation technique is first and foremost. Apart from observing children, we have guidance teachers about this. The guidance service also observations or individual interviews about this and informs us about it. When the guidance teacher says that this child has some problems with these children and says that this child does not have some problems in terms of peer relations, we increase our observations on those children who need guidance. We can say that it is rather about observation."*

While the teachers stated that they mostly solved the problems that the students encountered among themselves under the teacher's guidance (10 teachers), on the other hand, they stated that the least students solved the problems by talking among themselves (5 teachers).

T7 expressed this situation in the following lines: *"Of course, they can't because I do not have any students in that situation. If I speak from the point of view of my students, I usually become a model, and then students become independent."* While T5 expressed: *"They cannot solve it. They are very young. They need an adult's help, and they need an adult's direction."* T3 stated: *"I see that they cannot solve it. Again, problems are solved due to our trainee teachers and teachers joining the children with some activities and games."*

While the teachers expressed that they mostly paid special attention to the problem (10 teachers) and solved it by talking (5 teachers), they stated that they followed the way of keeping students away from each other (1 teacher) and ignoring (1 teacher) the least.

T3 expressed this situation: *"We solve their problems with activities, games, painting or music activities, playing games in the garden, trying to integrate children somehow because I see that they cannot solve their problems independently." T4* declared: *"I usually try to solve problems by myself as long as I can. I would take it to the family and administration the last time; it is beyond me. I act decisively. I certainly do not allow students. In other words, I never ignore a behavior because sometimes a behavior you ignore gets stronger and settles in time. This time you cannot stop this behavior. Behaviors that are ignored include: If the child is trying to get attention, especially unnecessarily trying to gather people around himself/herself by thinking that someone somehow hears him, you can ignore him/her. However, you cannot ignore when a child hurts another person, hurts himself/herself, or swears. Because when you ignore it, it gets bigger and goes beyond, and it is reflected in society and becomes a negative example. Therefore, it is necessary to intervene immediately and decisively."*

While 12 teachers answered no, five teachers answered yes regarding the participation of teachers in a seminar, conference, and in-service training on peer relations.

> T3 expressed this situation: *"They have a lot of positive contributions, and we apply them to students. Of course, we see positive benefits both in education and training and in educating children in terms of behavior."* T4 said*: "I participated, and I even gave a speech on this subject myself. Since I am the Director of Guidance and Research, I have given many seminars on inclusive Education, Special Education, these disabled students, and disadvantaged children. Of course, every job you do will return you like experience. The examples you see, the memories you experience, the seminar parents share these experiences within the scope of in-service training and seminar, administrators' sharing, and teachers' sharing of examples in their classrooms and their schools all set an example for you. Therefore you change how you act and how you intervene differently over time. It sure is very helpful."* T5 indicated as: *"Yeah. I ran into something about inclusive education. I received an education. It was not too much about children who want special education but about how special education children can accommodate and adapt to children with normal development. I have done a lot with peer relationships. Because I worked in all the schools, I worked in all normal schools in England, in primary schools. There is already a different system out there. According to the system there, children are already integrated with other children. However, there is no distinction in any way. They can take the same curriculum with them. More real events and examples were shown. They all were beautiful stuff. You could grab something from each of them because they had been lived through. Because I am not fond of presentations too much but lived events. Also, when you go to seminars and conferences, you go in slides and do not get much attention. You see, but you do not hear. You cannot take in some points. However, you wonder how the events are given, especially in that way. It flows very well, you wonder, there are things you can take for yourself, and you are taking it."*

DISCUSSION, CONCLUSION, and SUGGESTIONS

In line with the first sub-objective of the study, when the problems faced by teachers regarding peer relations between students in their classrooms are examined, it is seen that students mostly have adaptation problems towards school and aggressive behaviors (physical or verbal aggression behaviors). These results are similar to the results of the study conducted by Ogelman et al. (2015), in which aggressive behaviors emerged among the factors affecting peer relations. According to these results, students' adaptation problems and aggressive behaviors are among the negative behaviors frequently encountered in peer relations. In parallel with this result, in the study conducted by Schwartz et al. (2000), it was determined that negative behaviors are an important factor in the emergence of problems among peers. Based on this result, the fact that children are separated from their families in a different environment and are among people they do not know can be considered the reason for the emergence of the adaptation problem. When children show aggression physically or verbally, unrest in the family, being exposed to violence in the environment or witnessing events, and the effect of visual media may lead children to aggression.

Practices such as verbal stimulation applied by teachers, ensuring that they are in separate corners, and modeling students who exhibit exemplary behavior have been identified as strategies for maintaining healthy peer relations. The use of violence against children, who are generally seen as weak because they know or think they are strong, is a hindering factor in establishing a healthy relationship between children (Olweus, 2003). In this context, it is important to distance students from each other to eliminate this situation. Modeling strategy is an important strategy implemented among peers (Song, 2006; Schwartz, et al., 2000). Students who do not have strong and positive relationships with their peers; experience more problems and difficulties in peer relationships. In the literature, there are studies showing that students with special educational needs have fewer friends, have negative peer relationships, and are less accepting than their classmates without special education needs (Banks, et

al., 2018; Chamberlain et al. 2007; Humphrey & Symes 2010). Considering the results in this context, there may be a situation of abandoning the behavior with the perception that the children's behavior is noticed by the teacher with the stimulation by the teachers in the conduct of a healthy peer relationship. Children can be calm by staying away from each other. We can show an example of a stimulant situation in the emergence of positive behavior in the child.

When the positive aspects of peer relations are looked at, it has been determined that it allows the spread of exemplary behaviors. The determination of this is understood from the fact that exemplary students influence the students, and it is a method preferred by classroom teachers to increase the desired behaviors. The importance of increasing the behaviors that would be right for the individual to see himself in peer relations is emphasized. In this regard, it was determined that similar results were obtained in the study of Akpınar and Kranda (2016) on the positive aspects of peer relations. Children can model many behaviors of their teachers (Ostrosky & Jung, n.d.). For this reason, it can be thought that teachers help their peers by taking their helping behaviors as an example.

When teachers encounter students exhibiting aggressive behavior, immediate intervention is the most preferred behavior to prevent this situation. In addition to this, enabling students to move away from the environment they are in is another solution. The negative relationship between the parents and the child under aggressive behaviors (Papalia, et al., 2003) affects the tendency of violence in children due to egocentrism (Ogelman et al., 2015). In this context, it is a precaution that teachers immediately intervene in such situations or remove them from the environment as a precaution for children who tend to be aggressive. In addition, considering that aggressive behaviors are affected by the negative events around them (Bandura, 1977), health education and training situations will be in question in the classroom environment by taking precautions in these issues.

It has been determined that in case of exclusion of students by their peers, teachers try to eliminate this situation by choosing activities or games where they can meet on a common denominator. In addition, it is another method that they try to explain that there is a wrong behavior by talking to children. Game preference also plays an important role in developing students with special needs (Sevinç, 2004). In the study by Özyürek and Saka (2017), the unhappiness of the individual being left alone and the aimless spending of time was mentioned. However, it was stated that play activities with their peers are the most preferred situation; they always want to interact and are happy. In this case, it has been determined that the choice of play activities is important in the recovery of the individual, who is excluded by his peers, to the environment, in the elimination of negative behaviors or situations.

Observation methods and techniques used for peer assessment of teachers appear before us. In the study titled school adjustment and peer relations in children conducted by Gülay (2011) on this subject, the importance of using the observation technique is emphasized. In the literature, it is seen that teachers' behaviors against aggressive behaviors of students are mostly; verbal communication (Güven & Cevher, 2005), they frequently use imperative sentences, direct their attention more towards children who exhibit undesirable behavior, offer solutions, cognitive persuasion, provide guidance and II. type of punishment (Dobbs, et al., 2004), responding to problem behavior (Asi & Karabay). In this sense, the observation method and technique are important tools for achieving a successful peer relations process. In addition, in the study conducted by Ogelman et al. (2015), they expressed observation as the easiest way to understand peer relationships. Based on this result, we can emphasize the importance of keeping students under observation to have a successful process and prevent undesirable behaviors.

In case of a problem among the students, it is the first solution that they receive support from their teachers. In this case, it can be emphasized how important the guidance teachers of students with special needs are. It is seen that teachers have priority preferences in finding solutions for their students in the face of problems, and they take shelter in them. Referring to the importance of teachers, Rowe (2003) mentioned that the development of students' cognitive, affective, and behavioral skills comes to the forefront in creating a healthy environment and having a successful process. From this

point of view, students' getting support from their teachers in finding solutions and sheltering them in the face of problems reveals the importance of classroom teachers. It is seen that the teachers look for solutions to the problem by showing special interest in the solution of the problems they encounter among the students, and the causes of the problem are discussed and tried to be eliminated. Being in interaction with students and establishing a dialogue with them can eliminate the problems to be experienced. Because children can be influenced by adults, namely their teachers, and their teachers can influence their students (Rodkin & Hodges, 2003). In this context, the interaction between teacher and student is important (Baker, 2006; Chudgar & Sankar, 2008). It can be emphasized how important teacher relations are for special-needs individuals.

It has been observed that teachers need to participate in seminars, conferences, and in-service training for peer relations in the majority. It is important to meet society's needs and renew and develop the teacher in parallel with our world's technological and scientific developments (Oral, 2014). From this point of view, it is important for individuals who do the teaching profession, such seminars, conferences, in-service training, and so on to improve themselves. In this regard, it was determined by Karasu & Mutlu (2014) that children with special needs are more successful in raising individuals with teachers who have received adequate training in this field. The importance of the development of teachers in understanding peer relations emerges (Ogelman & Sarıkaya, 2013). Based on this result, we can say that it is possible to prepare teachers for todaywith seminars, conferences, and in-service training, and to cope with problems in different ways through training.

It has been determined that the teachers' preferences for games, music activities, and group work, where they can meet on common ground, are used in developing peer relations. The importance of joint activities to be carried out in this sense will contribute to developing peer relations. In addition, the support given by teachers for the development of peer relations reveals the importance of their social and psychological adjustment (Szewczyk-Sokolowski, et al., 2005). In the study of Ogelman et al. (2015), findings parallel these results.

In line with the results obtained from this research, teachers can contribute to developing students' peer relations by preparing an environment for activities to help students adapt to school more easily. Teachers must take precautions against students' physical or verbal negative behaviors. Recognizing children prone to violence beforehand will be an important step in preventing such situations. Teachers who provide education to individuals with special needs are not appointed from outside the field is important for developing peer relations and the academic development of these children. Once and for all, the participation of teachers in conferences, seminars, and in-service training for self-improvement will contribute to their personal development.

Ethics and Conflict of Interest

This research is produced from the first author's master thesis under the supervision of the second author. The authors declare that the study has not unethical issues and that research and publication ethics have been considered carefully. The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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IMPROVING HOME LITERACY SKILLS OF PARENTS DURING THE COVID-19 PANDEMIC

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Abstract

The first years of human life are critical in all developmental areas. In these years, shared family experiences, social interaction, and safe, responsive, and nurturing environments provided to a child constitute the determining factor in their future life. The home environment is considered to be a place where the foundations of language and literacy skills are stimulated for many children. The COVID-19 pandemic, which affected the whole world, has caused non-formal education to be carried out remotely and via digital tools to an unprecedented extent. This situation has necessitated parents to be more aware of the possibilities of the home environment and its impact on children and to better understand the importance of taking responsibility. However, very few scholars in this pandemic situation have pointed out how language and literacy opportunities can be offered in the home environment, which is the first place of education for children. Therefore, this study aims to increase parents' home literacy skills and attitudes in order to develop opportunities and resources for children's participation in literacy-related interactions. Over a semester, 11 preschool and 12 first-year elementary school parents participated in this action research from Buca district of Izmir province in Turkey. Before implementing the action plans, parental attitudes towards home literacy competencies were assessed using a semi-structured survey prepared by the researchers. After the action plan, the parents' developmental status and attitudes towards home literacy were again evaluated with a semi-structured survey, and all data were analyzed using descriptive, percentage, frequency, and Cramer V analysis methods. According to the results, the action plan steps had a positive impact on raising awareness of the home literacy environment, building language and literacy activities, and supporting extension skills in essential language development (listening/watching, speaking, reading, and writing).

Keywords: Covid-19, home literacy, distance education, action research.

INTRODUCTION

COVID-19, which was declared a pandemic by the World Health Organization, has taken all the countries of the world under its influence in a short time. The disease has had negative effects in many areas, including education, agriculture, economy, and tourism with a number of restrictions made in daily life. In this context, as a result of the suspension of face-to-face education for precautionary purposes and the cessation of activities in areas, where free time is used, there has been an increase in the duration of children staying at home. In addition to suspending educational activities, as Benner and Mistry (2020) stated, macro-level crises, such as the COVID-19 pandemic, are thought to have long-term effects on children's development. At this point, parents have needed to be guided about

which activities they could engage in with their children in order to lessen the negative impacts of the restrictions brought on by the pandemic. During this stay-at-home period, a unique opportunity has emerged to examine how families spend time at home with their kids. Although there are studies on the problems faced by families during the pandemic (Patrick et al., 2020; Prime et al., 2020; Russell et al., 2020), there has been little empirical research on home literacy activities performed by parents and students (Barnett et al., 2021; Gayatri et al., 2020; Stites & Ross, 2021; Stites et al., 2021). A limited study examines what parents need in terms of home literacy and family involvement and how they can improve these skills during the pandemic process. Studies generally focus on the problems that families experience during the COVID-19 period. During the pandemic, family members have had to spend most of their time at home, trying to cope with difficulties such as masking, social distancing, isolation, and quarantine (Çelik & Çak, 2021) in addition to helping their children overcome their fears and anxieties (Çetin & Kıral, 2021). According to different studies, parents also experienced difficulties in the distance education process, such as not being able to make adequate use of the applications used in distance education; deficiencies on the internet and technological tools; not being able to connect to the course and not being able to access course materials; and a decrease in the sense of responsibility of students versus an increase in technology and social media addictions (Arslan, Görgülü Arı, & Hayır Kanat, 2021; Üstündağ, 2021).

The preschool period has an important role in human life. During this time, in which rapid changes are experienced in different areas of development (physical, mental, emotional, etc.), many building blocks for the future life of children are formed and shaped (Aryanti, Warsini, & Haryanti, 2018; Blair, McKinnon & Daneri, 2018). It is important at this time to provide children with basic skills in reading, writing, arithmetic, cognitive, physical, social, and emotional areas that they can benefit from throughout their lives (Topcu, 2012). The impact of home literacy cannot be ignored in terms of developing these skills. Although schools clearly play an important role in children's literacy development, literacy begins at home before formal education (Phillips & Lonigan, 2009; Serpell et al., 2005). Since the pandemic has led to the closure of schools, parental involvement has become even more important, as the home has become the place where children learn to read and write and continue their literacy practices. Accordingly, the role of the teacher has passed on to parents, especially in cases where children have no access to online learning. The importance of home literacy has increased even further in this period in terms of ensuring that children can access information and improve their problem-solving skills. The home literacy environment is defined as the opportunities offered to children through various sources and the abilities, skills, and tendencies that parents must have in order to present these opportunities (Burgess, Hecht, & Lonigan, 2002). Beauty (2000) underlines that providing a suitable learning environment at home by the parents contributes significantly to the education process of the student. The literacy environment is handled in different dimensions. These are the sub-dimensions of the active environment (parents planning and implementing literacy activities with their children), passive environment (the child's exposure to a rich physical environment in the home environment where there are books, library, etc.), and modeling (parents modeling for the child by engaging in literacy behaviors) (Van Vechten, 2013). In that study, supportive practices were presented to the children of parents in accordance with the active, passive, and modeling sub-dimensions.

The interest of children in literacy is closely related to their participation in literacy activities from early childhood (ages 0-6) (López-Escribano, Escudero, & Pérez-López, 2021). Studies by many researchers show that the home environment plays an important role in facilitating both spoken and written language skills in various languages and cultural contexts (Bornstein, 2015; Gül, 2007; Krijnen et al., 2020; Liu et al., 2018; Mol, Bus, De Jong, & Smeets, 2008; Puranik, Philips, Lonigan, & Gibson, 2018; Silinskas, Sénéchal et al., 2020; Van Voorgis et al., 2013; Weigel, Martin, & Bennett, 2006). In addition, studies show that parent-child activities other than reading at home have multifaceted effects on the development of traditional oral and written language skills, as well as cognitive and social development (Griffin & Morrison, 1997; Hindman & Morrison, 2007, 2012; López-Escribano, Escudero, &

Pérez-López, 2021). As children learn some skills, the role of parents in home literacy work is expected to change (Whitehurst & Lonigan, 1998; Alston-Abel & Berninger, 2018). In this respect, there is a need for parents to diversify their home literacy activities and direct them to different activities that will be more interesting for children. Research on children's literacy development reveals that there are several home-based factors often associated with the development of children's early literacy skills. These factors include parents' beliefs about their role in their children's learning, literacy opportunities that parents provide for their children as well as parents who are role models for literacy and the quality of parent/child literacy interactions (Baker et al., 2001; Sénéchal, Sénéchal, & LeFevre, 2014; Serpell et al., 2005; Sonnenschein & Munsterman, 2002; Sonnenschein et al., 2016). The beliefs of parents on how to increase their children's interest in reading are related to the types of reading activities they offer to their children (Sonnenschein et al., 2000). The education of parents, the environment they live in, and their perspectives on education differ; thus, not every family's ability to cope with the education of their children is the same. However, according to a study conducted by Van Voorgis et al. (2013), parents, who were given guidance on home literacy, did more work at home to improve their children's literacy skills compared to families who were not guided, regardless of their backgrounds.

Involvement of Parents in Children's Education in the Home Environment

During the Covid-19 pandemic, learning loss (Saavedra, 2020) and inequality of opportunity in accessing online education were two critical problems (Saran, 2020). In this process, families were caught unprepared for the home education process; and it was determined that there were difficulties in creating, maintaining, and developing distance learning (Sarı & Nayır, 2020). Due to the lack of sufficient technological and pedagogical readiness of students, teachers, and parents, many countries had to disrupt distance education processes (Li & Lalani, 2020). The process experienced during the Covid-19 pandemic firmly puts suggestions, such as increasing parental participation in education, empowering parents in this regard, strengthening the school-family bond, and involving parents in curriculum creation, on the agenda of the education system. One of the opportunities that can guide the new understanding of education in the research is to increase the participation of parents in the education process and to provide parents with proficiency in curriculum and educational functioning (Özdoğru, 2021; Sarı & Nayır, 2020; TEDMEM, 2020). Before the pandemic, it was considered a significant problem that families saw the education process as only school and did not have enough information about their children's learning processes and skill development (Sarı & Nayır, 2020). In the current process, the school-centered education process has evolved from home and distance education, and in this case, the need for parents to be more involved in the process has emerged (Özdoğru, 2021; Haşıloğlu, Durak & Arslan, 2020). UNESCO (United Nations Educational, Scientific and Cultural Organization, 2020) recommends that parents be included in the process and supported in the use of educational technologies to ensure the effectiveness of education during the pandemic period.

Home literacy practices have important effects on the development of children's school literacy skills (Frijters, Barron & Brunello, 2000; Sénéchal & LeFevre, 2002; Suizzo & Soon, 2006). Much of the research conducted to date on home literacy practices focus on shared reading frequency and characteristics (e.g., amount of interaction; Mol, Bus, De Jong, & Smeets, 2008) and its relationship to children's oral language or reading skills. In the literature, it is noteworthy that there are few studies on the training of parents to develop home literacy and what kind of changes they provide at home. In line with this need, the aim of this study, together with the findings obtained from previous studies examining the relationship between home literacy practices and children's oral language, reading, and writing skills, is to contribute to the growing knowledge regarding the fact that home literacy practices have an important and multifaceted impact on development in the early childhood and primary education period. This study was conducted with the parents of 23 preschool and first-year primary school students, and the data were obtained through the surveys prepared by the researchers with the aim to develop the parents' home literacy skills. As a result of the analysis, it was aimed to provide clear and easily accessible information through various activities that parents could benefit from their children's literacy development at home and perform with their children, and inferences were made in

terms of conceptualizing home literacy practices in the light of the findings. In addition, in this period, when the pandemic is still being experienced, studying the circumstances encountered in the education process by applying scientific methods could enable us to be prepared for crisis and disaster situations that may occur in the future. In this direction, the research aims to develop home literacy skills that parents need during the COVID-19 pandemic.

According to the purpose of the research, the sub-objectives were determined as follows:

1. In what ways do parents support their children at home?
    1.1. At what level do parents consider themselves capable of supporting their children's home activities/assignments?
    1.2. At what level do parents implement practices that support their children's basic language skills (reading, writing, listening, and speaking) and writing skills?
    1.3. At what level do parents engage in story-reading or listening activities with their children at home?
    1.4. At what level do parents use the drama method in their children's home activities/assignments?
    1.5. At what level do parents use digital teaching tools/games in their children's home activities/assignments?

2. What are the implications for "parent literacy education"?
    2.1. At what level do parents consider themselves capable of supporting their children's home activities/assignments after the training?
    2.2. At what level do parents practice their children's basic language (reading, writing, listening, and speaking) and writing skills after the training?
    2.3. After the training, parents can write stories/tales, etc. with their children at home. At what level do they perform reading or listening activities?
    2.4. At what level do parents use the drama method in their children's home activities/works after the training?
    2.5. At what level do parents use digital teaching tools/games in their children's home activities/assignments after the training?

3. What are the views of parents on "parental literacy training"?

METHOD

Information on the research design, study group, data collection tools, data collection process, and data analysis related to the research are given in this section.

Research Pattern

The study aimed to develop parents' home literacy skills. The research was designed according to the action research model. Action research is based on the critical and practical experiences of participants about the situation studied (Tezcan, Sefer, & Baysal, 2016). It is important for action research to reveal problems during the process or to solve problems by making sense of them. Action research develops teachers' practices in the classroom and how they learn new information by working with others (Özaslan, 2016). This research include processes for understanding, examining, and solving the problems that arise in practice. Practitioners can perform these processes alone or with a researcher (Yıldırım & Şimşek, 2018). There are different classifications of action research. Grundy (1988) classifies action research as "technical, practitioner, and liberating", whereas McKernan (1991) classifies it as "scientific-technical and problem-solving-based, practical, and critical-emancipatory". Holter and Schwartz-Barcott (1993) classify them as "depending on technical cooperation, mutual cooperation, and development". Berg (2001) brings these different approaches together and classifies action research into three types as "technical/scientific collaborative action research, practice/mutual collaboration/discussion-oriented action research, and liberating/developing/critical action research" (As cited in: Yıldırım & Şimşek, 2018, p. 308-309). "A fourth type can be added to this classification

made by Berg, taking into account that the practitioner can also conduct action research. In the approach where the practitioner is also a researcher, the researcher should be able to collect data on the problem s/he has identified while continuing the practice" (Yıldırım & Şimşek, p. 308-309). In this study, the specified type was chosen because it was aimed to improve the home literacy skills of parents.

Working Group

The participants of the study consisted of 43 parents of the students studying in two private schools (one (n=11) kindergarten and one primary school (n=32) in Buca, the central district of İzmir, Turkey) during the first semester of the 2021-2022 academic year. 11 of the preschool parents and 12 of the primary school parents, 23 in total, participated in all the studies, and the pre-and post-application data were obtained from these parents. The study group was determined according to the convenience sampling method. The convenience sampling method is among the most widely used methods in educational science (Jager et al., 2017). However, the nature of the sample limits the generalizability of the findings and causal explanations (Dearing & Zachrisson, 2019; Etikan et al., 2016). 23 parents, who participated in the study, took part voluntarily. The personal information of the parents is given in Table 1.

Table 1. Personal information regarding parents

Gender	Frequency	Percent
Woman	19	81
Man	4	19
Total	23	100

When the gender status of the 23 parents, who participated in the pre- and final application of the research, was examined, it consisted of 19 women and 4 men. In addition, the number of children of the parents was also asked; and it was seen that the parents usually had 1 or 2 children and that there was only 1 parent with 6 children.

Data Collection Tools

To collect the research data, semi-structured surveys were prepared by the researchers. The semi-structured survey is a type of survey that includes closed and open-ended questions and tries to reveal opinions based on purpose (Sarantakos, 2005, cited in Çermik, 2013, p. 141). After the surveys were prepared, experts were asked to evaluate the clarity and comprehensibility of the questions and their adequacy in the subject. The arrangement was made based on the suggestions and opinions of the experts. In the semi-structured surveys, a total of six questions (1 open-ended and 5 closed-ended questions) were asked, based on personal information about the gender of the parents and the number of children, as well as the purpose of the research. One of the semi-structured surveys was used to determine the current status of the parents' knowledge and skills on home literacy before the study, whereas the other one was used after the training to determine the views of the parents on spending more effective time with their children and to evaluate their level of implementation after the training they received. The data were obtained through the "Google Form."

Data Collection Process

In the COVID-19 process, concepts such as mother-father-child interaction, in-home educational activities, family participation, home literacy, etc., which are known to be very important in the days when the rate of spending time together with their children at home increases, has gained even more importance (Daşçı Sönmez & Cemaloğlu, 2021). From this point of view, the research problem was determined, the causes of the problem were revealed, the literature was searched for the solution, and the data were collected. After the due diligence was made, an action plan was prepared by preparing a training program in order to improve the skills of the parents, known as home literacy, in order to solve the research problem. The prepared action plan was implemented and evaluated after the implementation. The action plan of the research consisted of a five-week process, with one training per week. The details of the training program are given below. The participants were informed about the training program by the researchers.

1. With the training given, it was aimed to improve the home literacy skills of the parents and to spend the time they spend at home with their children more efficiently.

2. Technological infrastructure, tools, and equipment were prepared, and the training was held online (Zoom).

3. The training was given in a single session (60 minutes) or within two sessions (45+45) following the plan.

4. The training started in November and ended in December.

Table 2. Action plan of the research

Weeks	Training Content	Expert	Training Duration
1	Teaching Makes a Difference!	Expert1- (Associate professor)	60 min.
2	Interactive Book Reading Program	Expert2- (Teacher, PhD Student)	60 min.
3	Every Child is a Writer!	Expert3- (Assistant professor)	60 min.
4	Supporting Home Literacy with Digital Tools	Expert4- (Teacher)	45 min.+ 45 min.
5	Mathematics with Creative Drama	Expert5- (Associate professor)	60 min.

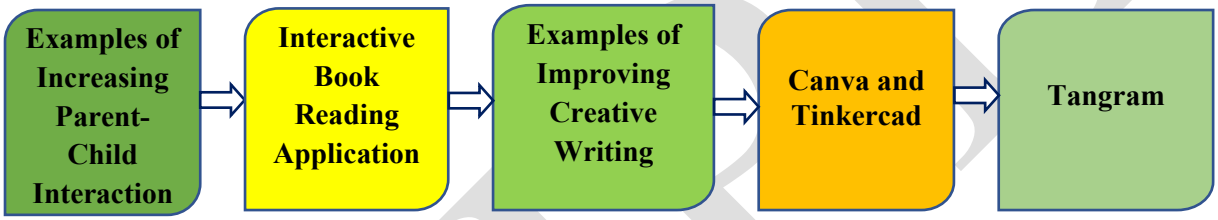

Figure 1. Applications made in educational content

The applications made in the training content were carried out in line with the prepared action plan (Table 2) and the action plans are shown, respectively (Figure 1). Information on the training given each week is given below:

Week 1- Within the scope of the “Teaching Makes a Difference!” training, information on activities, materials, and practices that would increase the interaction between the parent and the child was given.

Week 2- Within the scope of the "Interactive Book Reading Program" training, the interactive reading program was introduced to the parents, the stages of the process were explained, and examples were given. In addition, an application was made using the "Little Rain Drop" book.

Week 3- Within the scope of the “Every Child is a Writer!” training, the subject of creative writing was explained, and the process was supported with examples from the activities.

Week 4- Within the scope of the "Supporting Home Literacy with Digital Tools" training, “Canva” and “Tinkercad” programs, which are among Web 2.0 tools, were introduced to the parents. The features of the programs were explained, examples were shown, and applications were made.

Week 5- Within the scope of the "Mathematics with Creative Drama" training, how drama could be used was explained with examples and associated with Mathematics using Tangram, and an application was made.

During the practice, it was observed that the participants were interested in, and willingly participated in the training. At the end of the action research conducted to develop the parents' home literacy skills, a semi-structured survey prepared by the researchers was applied to enable the parents to evaluate the process in order to reveal how they experienced this process. In this semi-structured survey, after the training they received, the participants were asked to evaluate their level of practice and to share their views on the training.

Analysis of Data

In this research, which was conducted to improve the home literacy skills of parents, the data were applied before and after the action plan was carried out through the developed survey. Five closed-ended questions in the semi-structured surveys were prepared in accordance with triple grading. The rating ranges of the questions consisted of "no", "partly", and "yes" options. Responses to positive statements were scored by giving numerical values from "no" to "yes" and from 1 to 3. Considering the coefficient (3–1=2) and (2/3=.66) in the calculation of the score range of the survey, the evaluation range of the weighted arithmetic averages was formed, as in Table 3 (Kaya, 2008).

Table 3. Rating ranges

Evaluation Intervals	Rating Items
Between 1.00 – 1.66	No
Between 1.67 – 2.33	Partly
Between 2.34 – 3.00	Yes

Cramer's V test was used to determine the significance of the difference between the mean scores of the data obtained from the surveys regarding the pre-and post-survey applications. Cramer's V coefficient is the correlation coefficient used to determine the relationship between classifiable variables (Cramer, 1946; Karagöz, 2018). The answers given by the parents to the open-ended question about the training provided were analyzed through descriptive analysis. In the descriptive analysis, direct quotations are frequently used in order to reflect the views of the individual interviewed or observed in a striking way (Altunışık et al., 2012).

FINDINGS and INTERPRETATION

Findings Related to the First Aim

Before the parental literacy training, it was aimed to find out the level of the parents' self-efficacy in supporting their children's home activities/homework and to determine in which subjects the parents, who considered themselves competent, supported their children. Activities that the parents did with their children are given in Table 4.

Table 4. Other activities parents did with their children

Names of Other Activities	Frequency	%
Homework	37	86
Activity books	20	47
Literacy preparation	32	74
Board games	3	7
Family participation books	7	16

When Table 4 is examined in the case of the other activities that the parents did with their children, it is seen that the parents (86%) helped with homework (47%), used activity books (74%), and did literacy preparation studies (7%). It is also seen that 6% played board games and 16% used family participation books. The descriptive analyzes made in accordance with the sub-aims are given below.

Findings Related to the 1.1. Sub-Aim

1.1. The descriptive analyzes were made in accordance with 1.1. sub-aim is given in Table 5.

Table 5. Level of support for home activities

Home Activities	n	Mean	Std.Dev.	Median	Range	Min and Max Values
Level of Support	43	2.37	.57	2.00	2.00	1.00-3.00

Considering the level of the parents' support for their children's home activities/homework before the parental literacy training, it was determined that the average was 2.37. When this level was examined

within the scope of the evaluation intervals, it was determined that the rate was at the level of "yes". According to this, it can be stated that the majority of the parents participating in the study supported their children's home activities/homework.

Findings Related to the 1.2. Sub-Aim

In 1.2. sub-aim of the study, the level of the parents' support for their children's basic language (reading, writing, listening, and speaking) and writing skills were evaluated. The analyzes carried out in accordance with the purpose are given in Table 6.

Table 6. Basic language and authoring skills level of support

Basic language and writing skills	n	Mean	Std.Dev.	Median	Range	Min and Max values
Level of Support	43	1.62	.92	1.00	2.00	1.00-3.00

Considering the level of support of the parents in basic language and writing skills before the parental literacy training, it was determined that the average was 1.62. When this level was examined within the scope of the evaluation intervals, it was determined that the rate was at the "no" level. According to this, it can be stated that the majority of the parents participating in the study did not carry out activities to develop basic language and writing skills.

Findings Related to the 1.3. Sub-Aim

In the 1.3. sub-aim of the research, the cases of the parents making applications that supported reading or listening skills with their children at home were evaluated. The analyzes made in accordance with the purpose are given in Table 7.

Table 7. The level of making practices that supported reading and listening skills together

Applications that support reading and listening skills together	n	Mean	Std.Dev.	Median	Range	Min and Max values
Level of doing	43	2.58	.58	3.00	2.00	1.00-3.00

Considering the level of making applications that support reading and listening skills before the parenting literacy training, it was determined that the average was 2.58. When this level was examined within the scope of the evaluation intervals, it was determined that the rate was at the level of "yes". According to this, it can be stated that the majority of the parents participating in the study used applications that supported reading and listening skills.

Findings Related to the 1.4. Sub-Aim

In the 1.4. sub-aim of the study, the use of the drama method of the parents in their children's home activities/homework was evaluated. The analyzes carried out in accordance with the purpose are given in Table 8.

Table 8. Level of using drama method in activities and games

Drama in Activities and Games	n	Mean	Std.Dev.	Median	Range	Min and Max values
Level of using	43	2.18	.73	2.00	2.00	1.00-3.00

Considering the level of the parents' use of the drama method in activities and games before the parental literacy training, it was determined that the average was 2.18. When this level is examined within the scope of the evaluation intervals, it was determined that the rate was at the "partly" level.

Findings Related to the 1.5. Sub-Aim

In the 1.5. sub-aim of the study, the use of digital teaching tools/games of the parents in their children's home activities/homework was evaluated. The analyzes carried out in accordance with the purpose are given in Table 9.

Table 9. Level of the utilization of digital teaching tools

Digital teaching tools	n	Mean	Std.Dev.	Median	Range	Min and Max values
Level of utilization	43	1.88	1.00	1.00	2.00	1.00-3.00

Considering the level of the parents' use of digital teaching tools before the parental literacy training, it was determined that the average was 1.88. When this level is examined within the scope of the evaluation intervals, it was determined that the rate was at the "partly" level.

Findings Related to the Second Sub-Aims

Answers were searched about the implications of parental literacy training in relation to 2.1., 2.2., 2.3., 2.4., 2.5. sub-aims of the research. Cramer V analysis was conducted to test the relationship between the initial and final educational competencies of 23 parents participating in the pre-and post-application regarding the initial and final competences before and after the training, and the results are given in Table 10.

Table 10. The relationship coefficients between the activity participation status of children and test types

Activity type	Subcategory	Test		χ^2	Cramer V
		Pre-Test	Final Test		
Indoor Activity (IA)	No	1	1		
	Partly	13	0	18.45*	.63*
	Yes	9	22		
Basic Language and Authorship (BLA)	No	14	0		
	Partly	1	0	22.26*	.70*
	Yes	8	23		
Drama-Game (DG)	No	3	0		
	Partly	13	1	21.04*	.68*
	Yes	7	22		
Interactive Reading (IA)	No	2	1		
	Partly	4	2	1.24	.16
	Yes	17	20		
Digital Teaching Tools/Games (DTT)	No	11	0		
	Partly	0	4	16.58*	.60*
	Yes	12	19		

* Significant value at the p<.001 level.

In Table 10, the chi-square origin correlation coefficients between the pre-and post-test related to the children's home activity, language writing, drama activity, book reading, and digital literacy participation status are given. Accordingly, it was decided that the children's home activity participation status was not independent of the test type; in other words, there was a relationship between them ($\chi2$=18.45, V=.63, p<.001). When the results of another activity were examined, it was determined that the language authorship participation status of the children was not independent of the test type and that there was a relationship between them ($\chi2$=22.26, V=.70, p<.001). It was determined that the drama activity participation status of the children was not independent of the test type; in other words, there

was a relationship between them ($\chi 2$=21.04, V=.68, p<.001). It was decided that the digital literacy activity participation status of the children was not independent of the test type; in other words, there was a relationship between them ($\chi 2$=16.58, V=.60, p<.001). Finally, it was decided that the children's participation in reading activities was independent of the test type; in other words, there was no relationship between them ($\chi 2$=1.24, V=.16, p>.001). It was observed that there was an increase in all averages after the applications. The mean scores of the 23 parents who participated in the pre-and post-tests were ($\bar{X}_{IA=}$2.37; $\bar{X}_{BLA=}$1.62; $\bar{X}_{DG=}$2.58; $\bar{X}_{IR=}$2.18; $\bar{X}_{DTT=}$ 1.88), respectively, while the final application average scores were ($\bar{X}_{IA=}$2.91; $\bar{X}_{BLA=}$3.00; $\bar{X}_{DG=}$2.82; $\bar{X}_{IR=}$2.95; $\bar{X}_{DTT=}$2.82), respectively. It is seen that there is an increase in all average scores after the applications.

Findings Related to the Third Aim

In the last aim of the study, it was aimed to determine the views of the parents on "parental literacy training". The obtained data were subjected to descriptive analysis, and the results are given in Table 11.

Table 11. Views of parents

		F	%
Views	Positive	23	100
	Negative	0	0

P2: We have seen many activities and creative idea applications that we were not aware of. It was a good training for more effective and memorable lessons.

P3: I would like to thank everyone who contributed to this opportunity, which is very beautiful and will not come easily anywhere. Kind regards.

P6: As a result of the training received, we observed that by developing effective communication ways with our child, we developed the positive aspects of our child's behavior within the family and in the social environment.

P7: I was very satisfied with these trainings. While I was reading a book, I was not doing a straight reading, I was doing interactive work, but after Elif teacher's interactive book reading training, my awareness increased. While reading the book, I realized that I did not pay attention to some issues, and we continued our reading by correcting them. Thank you.

P8: We used to spend time together with my child before the training. Thank you very much to our teachers who contributed. I saw how efficiently time could be used, especially by experiencing the difference in reading comprehension.

P9: I am very happy to have attended your training. With the Canva program, we write English story-reading and listening texts, add the words that my daughter does not know in the text, and get printouts. We have a lot of fun and learn at the same time. Thank you.

P10: Having learned the information that we did not know, I learned how to follow a path for my child. Thank you.

P15: In one word, thank you very much for such training.

P16: After the training I received, we had much more enjoyable reading hours thanks to the interactive book. I was very satisfied with the training.

P19: It makes reading children's books more enjoyable for us.

P21: First of all, I would like to thank you for the training. I started to do the activities we did before, reading and understanding books more consciously. My awareness has increased. The time I spend with the child is now more valuable and quality. Thanks to these trainings, both my wife and I are more careful when criticizing the child or listening to the truth.

P23: I got a lot out of the presentations I attended and started to practice them at home with my son. We all appreciate your efforts...

When the answers given by the parents to the research question were examined, all of the parents (f:19, 100% frequency) reported positive opinions about the effectiveness of the parental literacy training. The opinions of the parents numbered 2, 3, 10, 15, and 23 show that the training was effective and efficient and that the parents were satisfied with the training provided. It can be stated that the words of the parents numbered 7, 16, and 19 about the interactive book reading training positively affected the reading practices that the parents had with their children, increased the awareness of the parents, and contributed to the reading hours being more enjoyable. According to the opinion of the parent numbered 6, the examples, which increased the parent-child interaction given in the training called "Teaching Makes a Difference!", suggest that there were positive reflections on the parent-child communication. The opinion of the parent numbered 9 shows that the application (Canva) introduced in the "Supporting Home Literacy with Digital Tools" training was used for both learning and entertainment purposes. The parents numbered 8 and 21 reported positive views on awareness of reading comprehension activities. These views given in the "Every Child is a Writer!" training suggest that the examples, which improved creative writing skills, had a positive contribution.

CONCLUSION, DISCUSSION, and RECOMMENDATIONS

The current study aimed to improve the home literacy skills of parents during the COVID-19 pandemic process. In addition, it was aimed to contribute to the growing knowledge regarding the fact that home literacy practices have an important and multifaceted effect on development at the beginning of preschool and primary education. According to the results obtained, before the parental literacy training, the majority of the parents stated that they participated in their children's "home activities/homework" and supported their "reading or listening skills". This support was mostly in the form of helping with homework, supporting the literacy process, completing activity books, and reading stories, respectively. Before the parental literacy training, the majority of the parents stated that they could support their children "partially, at a limited level" in terms of using the drama method in activities and games and using digital teaching tools/games in home activities/homework. Finally, the parents stated that they were insufficient in supporting their children's basic language (reading, writing, listening, and speaking) and writing skills. As a result of the five-week action research, it was concluded that the parents' views on their children's skills from pre-test to post-test changed positively in cases of supporting their children in home activities, striving to develop basic language and writing skills, using drama-games in activities, interactive reading together, and using digital teaching tools/games in activities. In the interviews with the parents, all of the parents stated that the training was beneficial; therefore, according to this result, it can be concluded that if parents are educated, they help their children more. Considering that the most common problem in the pandemic process in many studies is reported as not having the digital competencies to use online education applications used in the distance education process sufficiently (Arslan, Görgülü Arı, & Hayır Kanat, 2021; Akın & Aslan, 2021; TEDMEM, 2020), it can be stated that this research achieved its purpose. It is thought that the effective execution of the education process during the pandemic depends on the support and active participation of parents (Duban & Şen, 2020; Özdoğru, 2021; Haşıloğlu, Durak, & Arslan, (2020). Özdoğru (2021) stated that some of the responsibilities of parents regarding the effectiveness of the distance education process were to support the continuity of learning at home, to provide the necessary support to students when they do not understand a subject in the distance education, to provide students with additional content, and to provide technical support to students on educational technologies. It can be stated that the results of this research aim to develop the skills needed by parents, which are included in the research findings of Özdoğru (2021) and provide a data source regarding the importance of educating parents on home literacy in a similar pandemic process. In addition, the finding of the TEDMEM (2020) regarding the limited ability of students and parents to use technological tools coincides with the educational effort of parents to increase their ability to use technological tools in this study.

This study provided the initial data that could be used as a starting point to conduct longitudinal studies and to explore how the home literacy landscape changed during the pandemic and what families could do. In the study, although we asked the parents how they applied and got efficiency in, home literacy activities after receiving supportive training for themselves and their children, these interactions could not be observed. Therefore, it was not concluded whether or how the training provided was conclusively related to the growth in literacy skills. Our findings were not based on actual children's activities, but on parents' reports of their children's activity. In addition, no questions were asked about the income of the families, their marital status, and other psychosocial situations. Such information and observation of families could be incorporated into future research. Another point is that there are many studies that criticize parents' taking responsibility in supporting children's home-school activities, which as their homework (Gürlevik, 2006; Öcal, 2009). In those studies, it was argued that the relationship between the child and the teacher should continue without the intervention of the parent. However, what has suggested in this study was that appropriate activities and materials for the development of parental home literacy skills and the intellectual development of the child should be available to children at home and that parents should be role models for them. In this research, home literacy skills are expressed as practicing the collective learning process in learning and experiencing with their children, unlike the parents playing the role of teacher at home. In this context, guidance activities can be carried out by conducting a needs analysis in order to identify the obstacles to the active participation of parents in the education process without taking on the role of teacher. In addition, training activities can be organized to raise awareness of parents about the roles expected from parents in the home education process where distance education takes place. Since comprehensive action research was conducted, the researchers selected the study group from two voluntary private schools, one kindergarten, and one primary school, considering the accessibility and continuity criteria of the research. The fact that the study group was easily accessible and that there were only a few studies on the pandemic process in private schools was thought to be important to understand how this process is experienced in private schools. Because of this limitation, the findings may not apply to less-educated parents or low-income families. Since low-income families are less likely to have digital tools and internet access than wealthier families, families need time not only to access digital devices and the internet but also to help their children. This may vary according to family income. Despite the limitations of this study, it is thought that it will contribute to the understanding of children's learning environments at home due to COVID-19, increase our understanding of domestic literacy activities, and improve parental skills in Turkey and all countries experiencing the pandemic process.

Ethics and Conflict of Interest

All authors of this study confirm that they have contributed sufficiently to the research 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 Dokuz Eylül University (Date:07.07.2021, number: E-10042736-900.99-85130). We declare that there is no conflict of interest between the authors in the study.

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