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The Use of Professional Learning Community in the Development of Students' Teacher Curriculum Design Skills and Thai L1 Young Learner Reading Comprehension

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Abstract

This paper focuses on investigating the effectiveness of the professional learning community (PLC) on student teachers' curriculum development skills, as well as the effectiveness of the professional learning community (PLC) on Thai L1 young students' reading comprehension. The instruments utilized for the study include the following: a professional learning community activity, learning management for developing students' reading comprehension, a test for student teachers' curriculum design skills, and a test for students' reading comprehension. The data were analyzed using percentage, mean score, standard deviation, a pair samples-test, and the effectiveness index, with the criterion of 80%. The results of the study indicate that the professional learning community (PLC) positively affected student teachers' curriculum design skills as the effectiveness of the method was 94.57/94.96 (E1 94.57/E2 = 94.96), reaching the criterion of 80. The professional learning community (PLC) was also beneficial in developing students' reading comprehension. The effectiveness index of the method was 83.54/85.77 (E1 = 83.54/E2 = 85.77), reaching the criteria set at 80. The results of the study therefore suggest the benefits of the professional learning community (PLC) for both teacher education and student skill development.

Keywords: Professional learning community (PLC), Teacher Education, Reading comprehension

Introduction

Reading is an essential skill for young learners as it opens opportunities to explore the textual communication offered through texts. Once a child can read, he or she can access the information necessary for learning in both the education system and the real-world context (Langan, 1992). To be specific, the success of reading depends on students' comprehension of texts as learners have to put effort into decoding both textual and contextual input to understand the meaning expressed through the texts. According to Hellyer, Robinson, and Sherwood (2001), reading comprehension is the end product of reading instruction since learners need to invest what they learn in vocabulary, grammar, and text interpretation lessons to comprehend the written text. Therefore, the ability to comprehend written texts becomes a priority in the processes of young learners' development in the official education system for most of the world (Alderson, 2000).

Unfortunately, reading comprehension comes as both an opportunity and a challenge of learning because developing the skill is complicated. Many components of successful reading comprehension must be considered, especially for young learners who are at the beginning of their educational path as decoding texts is a new thing learned in school. According to Krashen and Terrel (1983), children acquire their first language naturally through imitating caretakers' words, using them in sentences, and evaluating the success of communication. When they enter school, these words are exposed in the sign system. Therefore, they have to learn the alphabet, vowels, punctuation, and how they are put together in a spelling system to make up a word. However, the organization of texts is different from spoken language. To demonstrate comprehension of texts, learners need to analyze the main ideas, supporting details, and conclusions. This organization is not normally found in daily conversations that young learners are familiar with (Zhang, 2009). The difficulties result in problems in language classrooms around the globe (Cai & Oakhill, 2011), including in Thailand (Phothirach, Suykaduang, & Athan, 2019).

Although reading comprehension is important for students' growth in education, teacher education is also important in developing student teachers with abilities to design curriculum and lesson plans to solve the problems in language classrooms. Furthermore, student teachers need to be aware of their learners' backgrounds and apply an appropriate solution to solve their problems (Labaree, 2000). In designing a curriculum, purposes, principles, expected outcomes, content, sequencing, and evaluation need to be taken into consideration (Graves, 1996). Curriculum designers are expected to create a learning environment that could match the needs of learners. This would contribute to success in finding class solutions and developing students' skills.

Therefore, developing curriculum design skills for students teachers plays a great role in developing students' reading comprehension.

As mentioned, understanding the nature of students' learning is crucial for developing curriculum design skills. Once designers can assess the conditions, problems, and needs of students in learning, they can plan learning activities that could improve students' abilities (Richards, 2001). In this case, the discussion among stakeholders in an educational context could benefit students' needs analysis and curriculum development. The professional learning community could be a learning management method that provides opportunities for teachers, department heads, and school administrators to discuss the possibility. According to DuFour, DuFour, and Eaker (2008), the processes of the professional learning community (PLC) include the collaboration of teaching staff and administrators having a specific purpose of enhancing teaching and learning quality and conducting research projects. This could allow student teachers to discuss with experienced staff in school in terms of problems and needs in developing reading instruction. The results of the discussion could be beneficial in developing students' reading comprehension and student teachers' curriculum design skills. With these rationales, the current study aims to employ the processes of the professional learning community (PLC) to develop student's reading comprehension and student teachers' curriculum design skills in order to investigate the effectiveness of the professional learning community (PLC) on student teachers' curriculum development skills, as well as the effectiveness of the professional learning community (PLC) on Thai L1 young students' reading comprehension.

Literature Review
The Development of Child Reading Comprehension
The ability to comprehend written output in young learners is a complicated process that involves components in development. Flax, Realpe-Bonilla, Roesler, Choudhury, and Benasich (2009) suggested that children develop their language comprehension in the first three years. The processes start from the understanding of words and signs given by parents or caretakers. Children who develop language comprehension would respond to the input correctly using eye contact, movement, and language output. Bast and Reitsma (1998) indicate that children who develop language comprehension earlier tend to better develop reading comprehension in schools. Nonetheless, reading comprehension development needs intensive vocabulary instruction. Hu and Nation (2000) found that learners need to understand 98% of words in a written text to understand the content. Bonk (2000) also indicated that learners with less than 75% vocabulary knowledge of the text they are reading are not capable of analyzing the main idea and understanding the text.

Therefore, to enable students to read, instructors should make sure that a great size of vocabulary knowledge is developed. In addition, learners need to learn the structure of the text. The organization of the articles, essays, or passages needs to be analyzed to comprehend the messages. These components make it complicated for young learners to master the skills, and specific instructional methods should be involved in the development of reading comprehension.

Teacher Education and Curriculum Design Skills

Teacher education plays an important role in developing the quality of education in each nation. The quality of teachers in managing classes, understanding learners, and designing curricula signifies how successful a class is (Green, Eady, & Andersen, 2018). According to Darling-Hammond (2017), curriculum design skill is one of the major concerns in teacher education around the globe. Student teachers should be able to understand the principles of curriculum design and use them in real practice effectively. Grant (2006) presented components that the designers of the curriculum need to consider in creating an effective learning environment for the class. The knowledge of educational objectives, curriculum structure and design, content, teaching and assessment, curriculum management, roles and responsibilities, and evaluation of curriculum effectiveness is expected to be developed in the path of teacher career development. These skills take time and effort to master, and students and teachers need to prepare themselves before facing difficulties in the real context.

Professional Learning Community (PLC)

Since reading comprehension is an issue in the Thai context, including developing student teachers to be able to design a curriculum that could lead to the solution of the problem, the professional learning community (PLC) could be implemented to improve the quality of both aspects. According to DuFour, DuFour, and Eaker (2008), a professional learning community (PLC) could be defined as the way teaching staff and administrators work together to achieve a specific aim, such as improving teaching and learning quality or completing a research study. Similarly, Barth (2006) suggested that PLC is a learning management method that enables instructors and administrators to share ideas and practices to improve teaching, learning, and student accomplishment. Toole and Louis (2002) also suggested that the benefits of PLC rely on opportunities provided by teacher collaboration. Experiences from expert teachers and student teachers could be shared to develop the desired learning atmosphere.

In addition, scholars have given a model for putting the concepts of the professional learning community into practice (DuFour, 2004; Hord, 1997; Senge, 1990). 5 dimensions of the professional learning community (PLC),

including shared vision and mission, leadership sharing and supportive leadership, collective learning and learning application, personal practice sharing, and organization support were presented by Hord (1997) and became influential in the area. The detail of Hord's professional learning community (1997) is presented below.
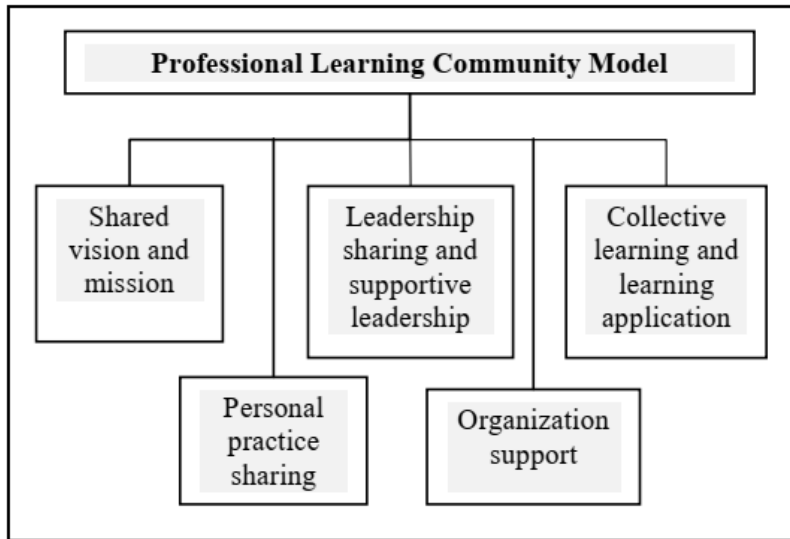
Figure 1. Hord's Professional Learning Community (1997)

It is important to note that the professional learning community (PLC) encourages the participation of stakeholders in an educational setting. In the current study, the experiences of teaching staff and administrators are used in both teacher education and student skill development. Student teachers could learn from professionals by sharing ideas and discussions. At this point, they could develop their curriculum design skills, and the developed curriculum could be beneficial in improving students' reading comprehension.

Previous Studies

Since the effectiveness of PLC could influence both the managerial and the student development aspects, the principle is employed in previous studies in teacher and student development. For example, Owen (2014) studied the uses of PLC in teacher and student development in Australia. It was found that there was teacher development in terms of the ability to engage in insightful discussions, awareness of responsibility, and teamwork in schools with PLC activities. Teachers also reported that they could improve their teaching quality, and this benefited students' skill development. Hairon and Tan (2015) also found the benefits of PLC in teachers' development in Singapore and China as the method encouraged teacher mentoring processes that could point out strengths, weaknesses, and opportunities. In the language

classroom, Slack (2019) indicated that PLC brought about meaningful changes in teachers' mindsets and practices, which led to the improvement of students' English skills in a middle school in the USA. Furthermore, Pawan and Craig (2015) also suggested that collaboration between English language instructors and content area teachers is beneficial in designing a course that could build students' background knowledge, provide comprehensible input, and develop language and content objectives. It is noteworthy that previous studies mostly focused on professional teacher development and the size effect of the project. However, the potential of PLC in teacher education is under-explored. The current study employed the professional learning community in developing student teachers by encouraging insightful discussion between the experienced teaching staff and administrators in a primary school in Thailand in order to develop both student teachers' curriculum design skills and students' reading comprehension. The research questions are as follows:

1. To what extent does the professional learning community (PLC) improve student teachers' curriculum design skills?

2. To what extent does the effectiveness of the professional learning community (PLC) improve Thai L1 young learners students' reading comprehension?

Methodology
Participants
There were 3 groups of participants including a group of 44 student teachers in the Faculty of Education, Mahasarakham University, Thailand, a group of 10 professional teachers and administrators in Huakua School, a primary school in the area, and a group of 26 students of the upper level of primary school (grade 4-6). All participants were selected using the purposive sampling method. The participants were treated anonymously.

Instruments
The instruments utilized for the study include a professional learning community activity, learning management for developing students' reading comprehension, a test for student teachers' curriculum design skills, and a test for students' reading comprehension. The professional learning community activity consists of 12 discussion sessions for professional teaching staff, administrators, and student teachers. The aim of these sessions is to allow the participants to discuss the current situation, problems, and needs of teaching reading comprehension to students in the school. The learning management for developing students' reading comprehension was designed in brain-based learning, considering the data gained from the PLC. The test for student teachers' curriculum design skills was outlined in 30 multiple-choice question items with the difficulty of .20-.80, discrimination of .20-1.0, and reliability

of 0.93. The test for students' reading comprehension consists of 40 question items designed in multiple choices. The difficulty, discrimination, and reliability of the items were at .51-.86, .30-1.0, and 0.87 respectively.

Data Collection

The data were collected in the 2019 academic year. Student teachers were assigned to take a day within the week to observe professional teaching in the Hua Khua school. They participated in the professional learning community sessions for the whole semester and took part in the learning management design. The student teachers' performances during the process and at the end of the process were used in evaluating their curriculum design skills. The learning management was employed in the second semester, and the students' performances during the process and at the end of the process were used in evaluating their reading comprehension.

Data Analysis

The data were analyzed using percentage, mean score, standard deviation, a pair samples-test, and the effectiveness index, with the criterion of 80%.

Results

Table 1. The effectiveness of the professional learning community (PLC) on student teachers' curriculum design skills

	Full marks	$\overline{\mathbf{X}}$	**S.D.**	**%**
Process effectiveness (E_1)	100	94.57	5.47	94.57
Outcome effectiveness (E_2)	30	28.49	2.18	94.96
Effectiveness Index (E_1/E_2) 84.57/83.97				

During 12 weeks of the professional learning community (PLC) activities, students' teachers in the current study took 10 curriculum design exercises. The result of the study indicates that the average score of student teachers during the use of PLC was 94.57% ($\overline{x}$= 94.57, S.D = 5.47) of the full score. Also, student teachers' average score after the processes of PLC was 94.96 % ($\overline{x}$= 28.49, S.D = 2.18). Therefore, the effectiveness index of the professional learning community (PLC) on the student teachers' curriculum design skills was 94.57/94.96 (E_1 94.57/E_2 = 94.96), reaching the criteria set at 80. It could be interpreted that encouraging student teachers to participate in the insightful discussion of professional teaching staff and administrators benefits the development of their curriculum design skills.

Table 2. The effectiveness of the professional learning community (PLC) on students' reading comprehension

	Full marks	$\overline{\mathbf{x}}$	**S.D.**	**%**
Process effectiveness (E$_1$)	100	83.54	4.56	83.54
Outcome effectiveness (E$_2$)	40	34.03	2.53	85.77
Effectiveness Index (E$_1$/E$_2$) 84.57/83.97				

The data gained from PLC activities indicates that the reading comprehension problems of the students in the target school varied from word to organization level. The problems of illiteracy, incomprehension of word meaning, and incapabilities in synthesizing text organization were found. The PLC decided to employ learning management using the principle of brain-based learning to solve problems as it could address student learning and learning outcomes from the human brain's point of view. The learning management was collaboratively designed by the professional teaching staff and student teachers. It consists of 6 lesson plans of 12 hours. The students took reading comprehension exercises accounting for 100 marks during learning in the learning management and a test at the end of the process.

The result of the study indicates that the average score of students during the use of learning management was 83.54% of the full score ($\overline{x}$= 83.54, S.D = 4.56). Accordingly, students' average score after the processes of learning management was 85.77% of the full mark ($\overline{x}$= 34.03, S.D = 2.53). Therefore, the effectiveness index of the professional learning management on the student teachers' curriculum design skills was 83.54/85.77 (E$_1$ = 83.54/E$_2$ = 85.77), reaching the criteria set at 80. Thus, it could be interpreted that the learning management designed by the data gained from the professional learning community session was beneficial in improving students' reading comprehension.

Discussion

It could be noted that the professional learning community (PLC) was effective in developing student teachers' curriculum design skills. Participating in collaborative discussions of idea sharing and reflection with professional teaching staff and administrators helped in the progress of student teachers' career paths. The result of the study was in line with Salleh and Tan (2015), who also suggest that the benefits of PLC rely upon how it allows teaching mentoring. This could contribute to the reasonable working culture in schools, the effectiveness of teaching, and teamwork among teaching staff. These factors are also important in teacher education.

Subsequently, the data gathered from the PLC was beneficial in designing an instruction method that could serve the needs of contexts. In the current study, PLC sessions were concluded with the idea of using brain-based learning as the core principle to design a curriculum for solving reading problems in a context with student skill diversity. The fact that the selected method proved to be beneficial in improving reading comprehension confirmed the benefit of PLC in developing teaching quality as suggested by the previous studies in the area (Barth, 2006; DuFour, DuFour, & Eaker, 2008; Worapun, Khamdit, and Siridhrungsri, 2022). It seems that insightful analysis of an educational context provided by the processes of PLC could lead to positive results in solving class problems.

In addition, it was also found that brain-based learning was an effective instructional approach in developing Thai young L1 learners' reading comprehension. According to Cornnell (2009), Brain-based learning (BBL) is a set of educational "techniques" derived from neurology and cognitive science research. The method can improve students' learning in a comprehendible but challenging learning atmosphere. Therefore, it could improve the quality of teaching as well. In the current study, the BBL helped Thai young L1 learners acquire the knowledge that benefits the processes of decoding sign language, analyzing word meaning, and understanding text organization as it results in the improvement of their reading comprehension.

Conclusion

The results of the study identified that the professional learning community (PLC) positively affected student teachers' curriculum design skills. The method was also beneficial in developing students' reading comprehension. Thus, the results of the study could be implicated in the pedagogical aspect as teachers and school administrators could employ the processes of PLC to bring the expected outcomes into their educational context. Clear goals, collaborative working, and open-minded working culture could result in camaraderie among working staff and students' learning achievement, which is the ultimate goal of education management. Furthermore, teacher education personnel should be aware that the professional learning community (PLC) could also be used to develop student teachers' skills. They could learn to develop curricula from experienced professional teachers who could provide information about real practice in an educational context. Further studies are encouraged to use PLC in developing other skills of language learning such as speaking, listening, and writing. In addition, further studies could also employ the PLC in developing other skills of teacher education.

In terms of methodology, the student sample size of the current study might not cover the size of quantitative research due to the size of the school

that participated in the project. Therefore, further studies should include more participants to provide validity of statistics. Similarly, qualitative research instruments should be employed to provide a broader understanding of how the professional learning community (PLC) improves student teachers' skills and students' abilities.

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Determiantion of Reading Anxiety of Primary School 4th Grade Students

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Abstract

One of the factors that emotionally affect the education-learning process is anxiety. Considering students' anxiety in teaching how to read and write, anxiety will positively contribute to effective and productive learning. This study aimed to determine the "Reading Anxiety" of primary school students. A 29-item "Reading Anxiety Scale" was developed based on the 42-item draft scale that Çeliktürk and Yamaç (2015) used in her research titled "Developing a Reading Anxiety Scale for Primary and Secondary School Students: Validity and Reliability Analysis." Çeliktürk and Yamaç permitted using the developed "Reading Anxiety Scale" in this study titled "Determination of Reading Anxiety of Primary School 4th-grade Students". Descriptive survey model was used in the study. This study was conducted with the voluntary participation of 1049 students attending the 4th grade of primary school in the central districts of Eskisehir (Odunpazari and Tepebasi). Convenience sampling determined the schools, and the data obtained were tabulated and interpreted using the SPSS program in the computer environment. The reliability coefficient of the 29-item reading anxiety scale was 0.957 (95.7%). Confirmatory Factor Analysis (CFA) was applied, and the acceptable fit of $0.90 \leq CFI \leq 0.95$ was checked. Standardized factor loads were higher than 0.3 and at an acceptable level of fit. No significant difference was found regarding the district of the school, gender, and father's working status. However, there were significant differences in reading anxiety according to age, parents' education level, and mother's working status within the 95% confidence interval. Accordingly, it was concluded that students' age, parents' education level, and mothers' working status affect students' reading anxiety. However, no significant difference was found regarding the district of the school, gender, and fathers' working status. No significant difference was found between the reading anxiety levels of the students according to the district where the school is located, their gender and the working status of their fathers. It was determined that as the education level of the students' parents increased, the level of reading anxiety decreased. It was determined that the

working status of the mothers of the students caused a significant difference between the reading anxiety levels, while the working status of the fathers did not cause a significant difference.

Keywords: Reading, Anxiety, Reading Anxiety, Fluent Reading, Reading Motivation

Introduction

The two most essential elements in the development and survival of a language are the act of reading and writing. A language that is not written, read, and spoken adequately is doomed to be forgotten and lost. Language is defined in TDK's Turkish Dictionary as "A system of consensual audible or visual signs that enable understanding between people" (Türk Dil Kurumu, 2023). Taking language as a tool that helps express feelings and thoughts and provide an agreement between people is the correct approach (Demir, 2016). Providing students with fluent and correct reading skills is vital for transferring the language to future generations.

Reading

Reading is a complex process in which various cognitive and linguistic processes are intertwined (Babür, 2018). Reading skill has an important place in the school and daily life of the individual. Individuals who read fluently and correctly are successful in school and daily life to the extent that they understand, make sense of and interpret what they read. Reading skill is extremely important for an individual's self-development and realization. Dozens of definitions have been made in the literature on reading. Anderson, Hiebert, Scott & Wilkinson (1985) defined reading as the process of extracting meaning from written texts, while Harris and Sipay (1990) defined reading as a meaningful interpretation of written language. Razon (1992) defined reading as vocalizing written and printed signs by following specific rules; The Turkish Language Association defines reading as "Understanding a text only by looking at letters and signs or vocalizing the text." (Türk Dil Kurumu, 2023). Ontario (2003) defined reading as the process of giving meaning to written text. Effective primary reading education ensures that children become good readers who understand what they read, apply their knowledge and skills to new cases, and are highly motivated to read. According to Coltheart (2005), reading is information processing by transforming writing into oral language or writing into meaning. According to Güneş (2007), reading is a complex process in the brain, including seeing, perceiving, vocalizing, understanding, and restructuring things, like images, sound, and perception, in the brain. Johnson (2008) defines reading as using text to make sense; according to Akyol (2011), reading is a dynamic meaning-making process that requires a

dynamic and interactive relationship between the author and the reader. These definitions emphasize that reading skill requires the harmony of many relevant information sources (Çevik et al., 2019). According to Wixson et al. (1987), reading is a meaning-making process that includes the reader's prior knowledge, textual knowledge, and reading context. Grabe (1991) defines reading as an interactive process between readers and texts, resulting in reading fluency. Based on these definitions, defined reading as an activity of perceiving, interpreting and structuring in the mind the shapes, symbols and pictures determined according to the societies in order to make universal feelings, thoughts, experiences and impressions permanent and to transfer them to the other party (Bay, 2010). The definitions underline that reading is a multifaceted activity, having cognitive, affective, and behavioral dimensions.

Anxiety

The concept of anxiety emerges in the act of reading. There are many different definitions of anxiety; for example, the online dictionary of Türk Dil Kurumu (2023) defines anxiety as "Sadness, worrying thought, grief, worry." Freud (1936) defines anxiety as an unpleasant emotional state characterized by subjective feelings of tension, sadness, and worry. According to Elliott and Smith (2010), anxiety is the occurrence of emotions such as restlessness, worry, delusion, and fear. Other definitions of anxiety are examined "suffocation, dizziness, anxiety, a heavy fist sitting on the heart, vague fear" (Burkovik, 2010; Karataş, 2011; Köroğlu & Güleç, 1997; Özcan & Karakaya, 2020; Ünlü, 2007). According to Rachman (2013), anxiety is a threatening but uncertain tension and an unsettling expectation, a feeling of tension that causes restlessness (Cited by Dursun & Özenç, 2019).

Jalongo and Hirsh (2010) define anxiety as a feeling that threatens an individual's self-esteem and negatively affects learning. Pekrun et al. (2011) emphasized that anxiety should have a motivational dimension besides affective, physiological, and cognitive dimensions. Pekrun et al.'s control value theory states that emotions, affective, cognitive, motivational, and physiological elements are of primary importance, and they are formed by a series of psychological processes that interact with each other (Pekrun et al., 2005, Pekrun, 2006; Pekrun et al., 2011). An excessive and uncontrollable level of anxiety causes mental and physical health problems and negatively affects an individual's personal and social life and professional and educational work (Zahrakar, 2008). Excessive anxiety carries the individual's daily life to an irregular and disturbing dimension (Crişan & Copaci, 2014). Excessive anxiety causes children to fail to realize and care about their own skills (Jalongo & Hirsh, 2010).

Reading Anxiety

Reading skill has an important place in the lives of individuals. A significant part of what an individual learns at school or in his daily life occurs through reading (Dursun & Özenç, 2019). There is numerous research on reading. However, research on the affective dimension of reading is limited. For example, the individual's reading anxiety during the reading activity underlines the affective aspect of the reading act (Alverman & Guthrie, 1993). Reading anxiety is assumed to be one of the biggest obstacles to gaining the habit of reading (İzci & Kaya, 2021). Reading anxiety is based in primary school years, and this anxiety negatively affects an individual's reading habits and attitudes toward reading (Yıldız & Ceyhan, 2016).

Especially primary school students, who are at the beginning of their education life, often have problems with fluent reading and reading comprehension, which can cause students to feel anxiety about reading (Çeliktürk & Yamaç, 2015). Reading anxiety is a negative attitude that an individual shows towards reading. This negative attitude emerges as a state of thrill, fear, and uneasiness that the individual shows during the reading process (Kuşdemir & Katrancı, 2016). According to Piccolo et al. (2017), reading anxiety causes an individual to show an unusual emotional reaction while reading. Psychologists consider anxiety an emotional state that negatively affects learning (Daly & Miller, 1975; Jalongo & Hirsh, 2010). Getting rid of reading anxiety will positively affect children's academic and professional life (Özcan & Karakaya, 2020). However, recent studies have shown that reading anxiety is a phenomenon that affects students' fluent reading and reading comprehension processes. Therefore, it is crucial to reveal how reading anxiety affects students' reading skills through comprehensive studies.

The studies on reading anxiety are mainly related to foreign language teaching, and they examine the effect of reading anxiety on foreign language acquisition (Altunkaya, 2017; Brantmeier, 2005; Capan & Karaca, 2013; Ialongo et al., 1995; Mills, et al., 2006; Liu & Hu, 2009; Saito, et al., 1999). These studies on bilingualism; In addition to determining the reading anxiety of students, it reveals striking results related to foreign language acquisition (MacIntyre & Gardner, 1989; Mills et al., 2013; Rajaba et al., 2012; Young, 1986; Zhao et al., 2013; Zoghi, 2012). In recent years, studies were conducted to determine the effects of primary and secondary school students' reading anxiety on fluent reading, reading comprehension and reading motivation (Aygün, 2021; Baki, 2017; Baki, 2019; Çeliktürk & Yamaç, 2015; Çevik et al., 2019; Dursun & Özenç, 2019; Grills-Taquechel et al., 2012). The common purpose of these studies was to determine the effect of reading anxiety on fluent reading, reading comprehension, reading performance, and reading motivation (İzci & Kaya, 2021; Katrancı & Kuşdemir, 2016; Melanlıoğlu, 2014; Özcan & Karakaya, 2020; Şahin, 2019; Taşdemir & Taşdemir, 2020;

Tonka, 2020; Uçgun, 2016; Yamaç & Sezgin, 2018; Yıldız & Akyol, 2011; Yıldız & Ceyhan, 2016).

Fluent Reading

Although there is no standard definition for fluent reading yet, numerous research has recently been done on fluent reading skills (Rasinski et al., 2011). Edmund Burke Huey first defined fluent reading in 1908. According to Huey (1968), encountering the exact words several times will help the readers read the related word more fluently with less attention and effort in their next reading. Therefore, fluency in teaching, development, and evaluation should always be related to reading comprehension (Pikulski & Chard, 2005). Another variable of successful reading skills is the reading comprehension strategies. For example, Ateş and Yıldırım (2014) emphasize fluent reading and word recognition as two critical prerequisites. In addition, cognitive processes come into play in deriving meaning from texts, and these processes include various comprehension strategies. Finally, there is a significant relationship between fluent reading and reading comprehension strategies, where fluent reading is known to support reading comprehension strategies (Beydoğan, 2012).

Fluent reading requires performing three different skills simultaneously in the reading process (Zarain, 2007). The development of these skills interacts with each other. For example, Dowhower (1991) reported that as students' reading speed increases, they read fluently and correctly, and accordingly, their comprehension level increases. He determined that prosodic reading levels also improved with a fluent and correct reading. Regarding the relationships between fluent reading and reading comprehension, fluent reading contributes to reading comprehension and positive reading. All elements of fluent reading improve the reading comprehension process holistically (Hudson et al., 2005; Klauda & Guthrie, 2008; Kuhn et al., 2010). In addition, reading fluency indirectly and positively contributes to reading comprehension through reading anxiety. For example, the level of reading comprehension increases as fluent reading reduces reading anxiety. Therefore, fluent reading enables cognitive capacity to focus more on understanding what is read, resulting in an increase in comprehension (Klauda & Guthrie, 2008). This finding is supported by many studies (Denton et al., 2011; Kim, 2015; Kim et al., 2014; Klauda & Guthrie, 2008; Schwanenflugel et al., 2006).

Fluent reading consists of three basic components: correct reading, reading speed, and prosodic reading (Aşıkcan & Saban, 2021; Hudson et al., 2005; Schrauben, 2010). Correct reading, reading speed, and prosodic reading exercises are extremely important for fluent reading.
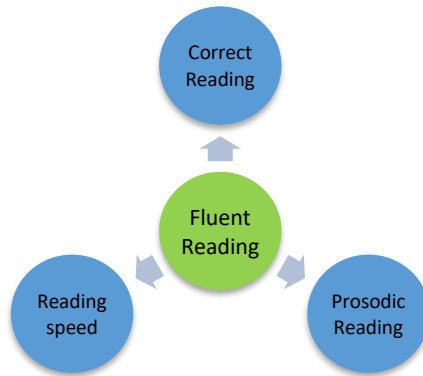
Figure 1. Fluent Reading Skills

Reading Comprehension

RRSG (RAND Reading Study Group, 2002) defines reading comprehension as the simultaneous extraction and restructuring of meaning in the mind while reading written texts and interacting with them. According to Güneş (2009), it is the process of restructuring the meanings that are formed through the processing of reading comprehension in various mental processes (i.e., examining, sorting, classifying, associating, questioning, and evaluating the information obtained through reading) and associating it with the reader's prior knowledge. In order to improve reading comprehension skills, factors related to the student's intrinsic and extrinsic motivation should be taken into consideration, as well as cognitive processes because motivation plays a role as necessary as cognitive processes in understanding the text read (Wang & Guthrie, 2004). Comprehension is the activity of extracting and constructing meaning from spoken or written texts. This action is a constructivist process (Duke & Carlisle, 2011). Kintsch and Rawson (2005) addressed understanding the text read as a complex process that occurs in the mind. Comprehension emerges from the interaction of different elements, different knowledge, and complex mental processes. Reading anxiety is assumed to affect students' reading comprehension skills and reading motivation.

Reading Motivation

"Motivational Structural Model of Text Comprehension" was developed by Wang and Guthrie (2004). This model emphasizes that students' reading skills affect their intrinsic and extrinsic motivation, affecting the joy of reading, fluency, reading level, and reading amount. The reading comprehension arising from intrinsic motivation and extrinsic motivation is different. A student is very likely to have both intrinsic and extrinsic motivation (Lepper & Henderlong, 2000; Linnenbrink & Pintrich, 2000). Students can exhibit intrinsically and extrinsically motivated behaviors to

meet their own interests and school needs. Intrinsic motivation is assumed to be effective. There are two types of reading done by students. Reading for their own interests and school reading are assumed to be related to intrinsic and extrinsic motivation (Gottfried, 1990; Guthrie et al., 1998). Yıldız and Akyol (2011) analyzed the model in their study, concluding that reading comprehension is positively affected by internal motivation and negatively by extrinsic motivation. There is no significant relationship between reading amount and reading comprehension level. In this research, it is assumed that students' reading anxiety affects both intrinsic and extrinsic motivation.
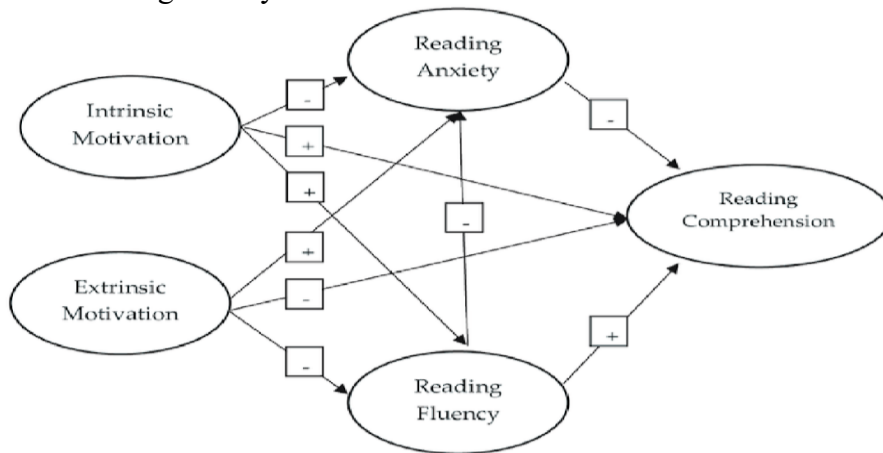
Figure 2. Hypothesized Structural Model of Reading Motivation, Reading Anxiety, Reading Fluency and Reading Comprehension (Yamaç & Sezgin, 2018).

Reading anxiety is one of the situations students encounter during reading and oral expression activities, and it negatively affects the reading process. For example, it aimed to determine primary school students' reading anxiety considering the negative effect of fluent and meaningful reading anxiety. A measurement tool, whose validity and reliability had been checked, was used in the study to determine reading anxiety.

Purpose

This study aimed to determine the reading anxiety of primary school 4th-grade students. It is expected to contribute to the field by offering suggestions to classroom teachers and parents who aim to provide a more qualified and efficient reading education.

The sub-objectives addressed for this purpose are listed below:

Do primary school 4th-grade students' Reading Anxiety differ significantly according to the followings?

- The district where their school is located
- Gender and age
- Education level of their parents

- Working status of their parents

Method
Research Model

A descriptive survey model was used in this study, which aims to determine the reading anxiety of primary school students. The descriptive survey model reveals and explains what is present, lived, and experienced at a particular time (Sönmez & Alacapınar, 2017).

Study Group

This study, which was designed to determine the reading anxiety of 4th grade primary school students, was conducted with the voluntary participation of 4th grade primary school students studying in schools with different socio-economic levels in Odunpazari and Tepebasi, the central districts of Eskisehir. In addition, a short interview was held with classroom teachers of the students to whom the measurement tool was applied. Finally, they evaluated the items on the scale and expressed their opinions about where the students' reading anxiety stemmed from among them.

Regarding the participants' demographic information, 47.5% of the students attended primary schools in Tepebasi and 52.5% in Odunpazari districts. 49% of the students were female, 51% were male, and the distribution by age was 9.5% 9-year-old, 77% 10-year-old, 13% 11-year-old, and 0.5% 12-year-old. Regarding students' mothers, 20.9% were primary school graduates, 19.9% were secondary school graduates, 31.9% were high school graduates, 27.3% were university/master's graduates, 65.4% were homemakers, and 34.6% were working. Regarding students' fathers, 10% were primary school graduates, 17.9% were secondary school graduates, 35.6% were high school graduates, and 36.5% were university/master's graduates; 6.5% were unemployed, 93.3% were working.

Data Collection Tool

Within the scope of this study, the reading anxiety of primary school 4th-grade students in the central districts of Ekişehir was determined by using the "Reading Anxiety Scale" developed by Çeliktürk and Yamaç (2015) within the scope of "Developing the Reading Anxiety Scale for Primary and Secondary School Students: Validity and Reliability Analysis." The permission to use the scale was obtained via e-mail.

The scale consists of 29 items to determine students' reading anxiety and has one dimension. In order to determine the demographic status of the students, variables such as the school district, gender, age, parent's education level, and working status were investigated.

Data Collection and Analysis

The researcher administered the developed scale form to the students attending the 4th grade of primary school. Students and teachers were informed of the principle of volunteering before the implementation, and those who wanted to participate were informed about the research topic. During the data collection process, scale forms were given to students who wanted to participate in the research, and a total of 1,049 students filled out the form. Since the students are at the 4th-grade level of primary school, the classroom teachers informed the students about the scale beforehand.

The obtained data were transferred to the SPSS™ (version 28), and the extreme, outlier, missing, or erroneous values were corrected before starting the analysis. Frequencies and percentages of personal data were determined and tabulated. A normality test was applied to the data, and the normal distribution was confirmed. After the corrections, normality distribution was checked, validity and reliability analyzes were made, and confirmatory factor analysis was performed.

The Independent Mann-Whitney U test was performed to see whether the district of the school and gender created a significant difference in Reading Anxiety (p<0.05). The independent Kruskal-Wallis test was applied to see the differentiation of Reading Anxiety of primary school 4th-grade students according to age, parent's education level, and working status (p<0.05). The results of the tests were tabulated and interpreted according to their significance level.

Reliability Validity Analysis

Before starting the factor analysis for students' reading anxiety, Cronbach's Alpha test was performed to test the reliability of the measurement method, and the results are shown below.

Tablo 1. Reliability Analysis Results for Reading Anxiety Scale

Cronbach's Alpha	Number of Items
.957	29

Table 1 shows that the reliability coefficient of the 29-item Reading Anxiety Scale applied to 1,049 students participating in the research is 0.957 (95.7%), showing that the reliability of the measurement method is excellent and suitable for the analysis.

In addition, the item-total correlations of all statements were higher than 0.30. Then, the existing items were subjected to Explanatory Factor Analysis (EFA) by choosing the Principal Components method. The 29-item structure was factored in a single dimension. Moreover, the adequacy of the sample size was tested before factor analysis.

Table 2. *Kaiser-Meyer-Olkin (KMO)* Test Results performed before the Factor Analysis of the Reading Anxiety Scale

Kaiser-Meyer-Olkin (KMO) Sample Size Test Statistics		.976
Bartlett's Test of Sphericity	X^2	16646.691
	df	406
	p	.000

X^2: Approximate chi-square value, df: Degrees of freedom, p: Bartlett Sphericity test statistic probability

Kaiser-Meyer-Olkin Test (1960) and Bartlett's Test (1950) measure the sampling adequacy. KMO values closer to 1.0 are considered ideal, while values greater than 0.5 are acceptable. The Barlett (1950) test of sphericity checks if there is a redundancy between the variables. The test's null hypothesis is that the variables are orthogonal, i.e., not correlated. The null hypothesis is accepted or rejected regarding the P-value and significance levels.

Regarding Table 2, the KMO value is close to 1, and the p-value is less than 0.05 for the Ateş, Ateş test. Therefore, it can be said that the data are suitable for factor analysis. The results of the factor analysis are given in the table below. The obtained factor loads are from a single factor.

Table 3. Factor Loads for the Reading Anxiety Scale

Items	Factor
	1
Reading1	.623
Reading2	.590
Reading3	.626
Reading4	.631
Reading5	.703
Reading6	.716
Reading7	.707
Reading8	.637
Reading9	.641
Reading10	.617
Reading11	.630
Reading12	.583
Reading13	.701
Reading14	.679
Reading15	.676
Reading16	.662
Reading17	.681
Reading18	.685
Reading19	.689

Reading20	.717
Reading21	.752
Reading22	.655
Reading23	.682
Reading24	.738
Reading25	.700
Reading26	.741
Reading27	.726
Reading28	.747
Reading29	.729

As a result of the Principal Component Analysis iterations, the optimum model was obtained from the structure consisting of 1 factor. In this factor structure, factor loads take values between 0.58 and 0.76, and the validity of the structure is ensured as the factor loads over 0.3 are within acceptable limits. In addition, this structure explains 46.1% of the changes in the total variance. Confirmatory Factor Analysis (CFA) was performed on the structure obtained from EFA using the Lisrel 8.5™ program, and the results are given below.

Confirmatory Factor Analysis

CFA was carried out to test the suitability of the scale items. Since the Reading Anxiety Scale consists of one dimension, the reliability in Table 2 is also valid for CFA. The results are given in the table below.

Table 4. CFA Goodness of Fit Values for the Reading Anxiety Scale

Fit Parameter	Fit Statistics	Acceptable Fit	Good Fit
RMSEA	0.078	$0.05 \leq$ RMSEA ≤ 0.08	$0 \leq$ RMSEA ≤ 0.05
SRMR	0.043	$0.05 \leq$ SRMR ≤ 0.08	$0 \leq$ SRMR ≤ 0.05
GFI	0.84	$0.90 \leq$ GFI ≤ 0.95	$0.95 \leq$ GFI ≤ 1.00
AGFI	0.82	$0.85 \leq$ AGFI ≤ 0.90	$0.90 \leq$ AGFI ≤ 1.00
CFI	0.98	$0.90 \leq$ CFI ≤ 0.95	$0.95 \leq$ CFI ≤ 1.00
NFI	0.97	$0.90 \leq$ CFI ≤ 0.95	$0.95 \leq$ CFI ≤ 1.00

RMSEA: Root Mean Square Error of Approximation, **NFI:** Normed Fit Index, **GFI:** Goodness Of Fit Index, **AGFI:** Adjusted Goodness of Fit Index, **CFI:** Comparative Fit Index, SRMR: Standardized Root Mean Square Residual.

The criteria taken for acceptable and good fits are as follows: $0.90 \leq$ CFI ≤ 0.95 acceptable fit, $0.95 \leq$ CFI ≤ 1.00 good fit; $0.05 \leq$ SRMR ≤ 0.08 acceptable fit, $0.00 \leq$ SRMR ≤ 0.05 good fit, $0.05 \leq$ RMSEA ≤ 0.08 acceptable

fit, 0.00 ≤ RMSEA ≤ 0.05 good fit, 0.90 ≤ GFI ≤ 0.95 acceptable fit, 0.95 ≤ GFI ≤ 1.00 good fit, 0.85 ≤ AGFI ≤ 0.90 acceptable fit, 0.90 ≤ AGFI ≤ 1.00. The values equal to or higher than 0.30 were taken regarding the standardized factor loads. The CFA PATH diagram showing standardized factor loads is given below.
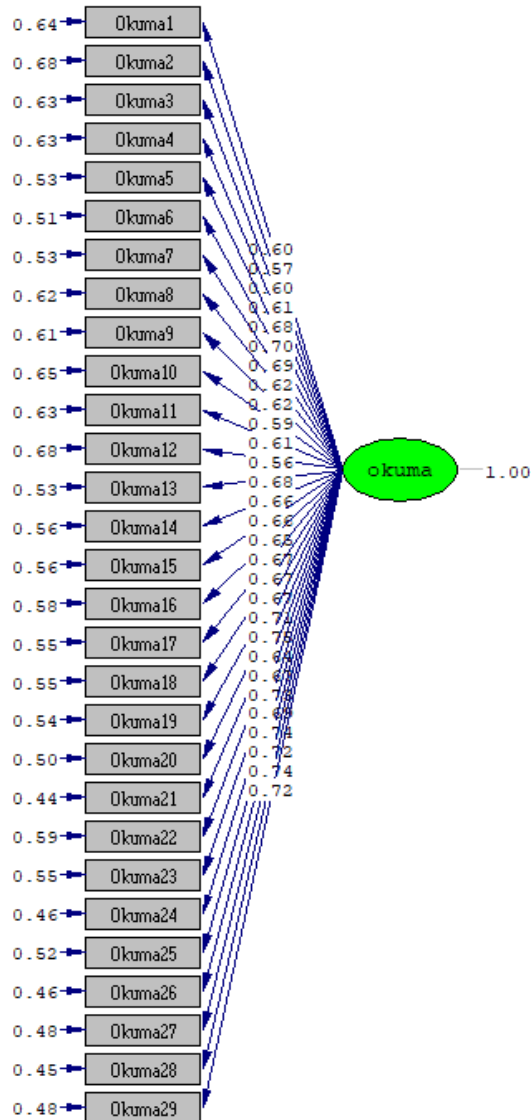
Figure 3. PATH Diagram for Reading Anxiety Scale

Figure 3 shows that the standardized factor loads are higher than 0.3 and are at an acceptable level of fit. After the validity and reliability of the

scale were confirmed, difference tests were applied to investigate the effect of demographic variables on reading anxiety.
Descriptive statistics and normality tests of the scale are given below.

Table 5. Descriptive Statistics

Dimension	Minimum	Maximum	Mean	Std.Deviation	KG.	p
Reading Anxiety	1.00	5.00	1.6958	.74123	.174	.000
Number of Observations (N):			1,049			

Kolmogorov and Smirnov (KS) Test Statistics (Massey, 1951), *H_0: The data distribution fits the normal distribution.*

Regarding Table 5, the null hypothesis, which assumes that the calculated dimensions fit the normal distribution, is rejected with 95% confidence according to the Kolmogorov & Smirnov Test. Therefore, non-parametric methods should be preferred in different tests.

Findings and Interpretation

The results of the different tests were tabulated, and the results were interpreted. The results' differentiation according to the school district, gender, age, parent's education level, and working status were examined.
Mann-Whitney U test results, showing the significance of the difference between students' reading anxiety according to their school's district, are given below.

Table 6. Mann-Whitney U Test Results for the District of School

Dimension	District	N	Mean	Std.Deviation	p
Reading Anxiety	Tepebasi	498	1.6729	.70149	0.860
	Odunpazari	551	1.7164	.77545	

*p<0,05, $H_0: \mu_1 = \mu_2$

Table 6 analyzed, the null hypothesis claiming that the difference between students' reading anxiety is statistically insignificant according to their school district cannot be rejected with 95% confidence. In this case, it can be said that their school's district is not effective on their reading anxiety. Mann-Whitney U test results, showing the significance of the difference between students' reading anxiety according to gender, are given below.

Table 7. Mann-Whitney U Test Results for Gender

Dimension	Gender	N	Mean	Std.Deviation	p
Reading Anxiety	Female	514	1.6614	.69083	0.528
	Male	535	1.7288	.78584	

*p<0,05, $H_0: \mu_1 = \mu_2$

According to Table 7, the null hypothesis claiming that the difference between students' reading anxiety is statistically insignificant according to their gender cannot be rejected with 95% confidence. Therefore, gender does not significantly affect students' reading anxiety.

Kruskal-Wallis test results, showing the significance of the difference between students' reading anxiety according to age, are given below.

Table 8. Kruskal-Wallis Test Results for Age

Dimension	Age	Mean	Std.Deviation	p
Reading Anxiety	9	1.8890	.86350	0.019*
	10	1.6509	.70579	
	11	1.8111	.81138	
	12	1.9448	.95112	

*p<0,05, $H_0: \mu_1 = \mu_2 = \cdots \mu_n$

Table 8 analyzed, the null hypothesis claiming that the difference between the means of students' age groups is statistically insignificant ($H_0: \mu_1 = \mu_2 = \cdots \mu_n$) can be rejected (*p<0,05). In this case, it can be said with 95% confidence that age makes a statistically significant difference in reading anxiety. This difference is in favor of 10-year-old students. Considering that the texts read by the students mainly belong to 4th-grade, 10-year-olds are more appropriate for 4th-graders regarding reading anxiety. Considering that only 0.05% of the students participating in the study were 12 years old, there is no linear relationship between the student's ages and reading anxiety.

Kruskal-Wallis test results, showing the significance of the difference between students' reading anxiety according to their mother's education, are given below.

Table 9. Kruskal-Wallis Test Results for Mother's Education

Dimension	Mother's Education	Mean	Std.Deviation	p
Reading Anxiety	Primary School	1.7726	.71021	0.000*
	Secondary School	1.7811	.74371	
	High School	1.6123	.67935	
	University/Master	1.6016	.73256	

*p<0,05, $H_0: \mu_1 = \mu_2 = \cdots \mu_n$

According to Table 9, the null hypothesis claiming that the difference between the means of the groups is statistically insignificant ($H_0: \mu_1 = \mu_2 = \cdots \mu_n$) can be rejected with 95% confidence (*p<0,05). So, mothers' education is effective on students' reading anxiety. In other words, the higher the mother's education level, the lower the students' reading anxiety.

Kruskal-Wallis test results, showing the significance of the difference between students' reading anxiety according to their father's education, are given below.

Table 10. Kruskal-Wallis Test Results for Father's Education

Dimension	Father's Education	Mean	Std.Deviation	p
Reading Anxiety	Primary School	1.8555	.74112	0.000*
	Secondary School	1.7931	.71958	
	High School	1.6322	.70291	
	University/Master	1.6142	.70830	

*p<0,05, $H_0: \mu_1 = \mu_2 = \cdots \mu_n$

Table 10 analyzed, the null hypothesis claiming that the difference between the means of the groups is statistically insignificant ($H_0: \mu_1 = \mu_2 = \cdots \mu_n$) can be rejected with 95% confidence for reading anxiety (*p<0,05). Therefore, fathers' education is effective on children's reading anxiety. In other words, the higher the father's education level, the lower the students' reading anxiety.

The people with whom primary school students interact most outside of school are their parents. Conscious parents with a high level of education better guide their children in correct reading, fluent and prosodic reading, and positively contribute to reducing their reading anxiety.

The results of the Mann-Whitney-U test show the significance of the difference between students' reading anxiety according to their mother's working status.

Table 11. Mann-Whitney U Test Results for Mother's Working Status

Dimension	Mother's Working Status	N	Mean	Std.Deviation	p
Reading Anxiety	Housewife	677	1.7335	.76437	0.038*
	Working	358	1.6194	.68324	

*p<0,05, $H_0: \mu_1 = \mu_2$

According to Table 11, the null hypothesis claiming that the difference between students' reading anxiety is statistically insignificant according to the mother's working status can be rejected with 95% confidence. Therefore, the working status of children's mothers creates a statistically significant impact on their reading anxiety in favor of those with a working mother. In other words, students whose mothers are working have lower reading anxiety.

Finally, Mann-Whitney U test results, showing the significance of the difference between students' reading anxiety according to their father's working status, are given below.

Table 12. Mann-Whitney U Test Results for Father's Working Status

Dimension	Father's Working Status	N	Mean	Std.Deviation	p
Reading Anxiety	Unemployed	69	1.8801	.87597	0.145
	Working	964	1.6771	.72133	

*p<0,05, $H_0: \mu_1 = \mu_2$

According to Table 12, the null hypothesis claiming that the difference between students' reading anxiety is statistically insignificant according to the father's working status cannot be rejected with 95% confidence. Therefore, the father's working status does not significantly affect students' reading anxiety.

Discussion and Interpretation

This study examined the reading anxiety of primary school 4th-grade students in terms of the school's district, gender, age, parent's education level, and working status using the descriptive survey model. The reading anxiety scale consisted of 29 items and was administered to 1049 students; its reliability coefficient was 0.957 (95.7%). As a result of the factor analysis based on Principal Component Analysis, the optimum model was obtained from the structure consisting of 1 factor. As the scale consisted of one dimension, the reliability in Table 2 was also valid for the Confirmatory Factor Analysis. The standardized factor loads were higher than 0.3, and there was an acceptable fit (Tabachnick et al, 2013).

This study, there was no significant difference between the students' reading anxiety according to the school district. Similarly, the study of İzci and Kaya (2021) also showed no significant difference between the reading anxiety of the students according to the settlement where the school is located. This study, no significant difference was observed in the reading anxiety of the students according to gender. The literature review showed similar results, reporting that there is no significant difference between reading anxiety according to gender (Altunkaya, 2017; Arslan, 2017; Ateş & Bahşi, 2019; Baki, 2019; Çevik et al., 2019; Kılınç & Yenen, 2016; Öy, 1990; Şahin, 2019; Taşdemir & Taşdemir, 2020; Yamaç & Sezgin, 2018; Yıldız & Ceyhan, 2016). However, some studies (Alisinanoğlu & Ulutaş, 2003; İzci & Kaya, 2021; Jafarigohar & Behrooznia, 2012; Park & French, 2013; Plotnik, 2009; Toros & Tataroğlu, 2002; Uçgun, 2016) reported a significant difference according to gender, in favor of male students. In other words, female students had higher

reading anxiety than males. This situation may vary according to the region where the school is located.

The students' age levels make a statistically significant difference in reading anxiety, which does not depend on whether the student is younger or older. Şahin (2019) and Tonka (2020) reported that there was no significant difference between students' reading anxiety according to their grades and age. On the other hand, Taşdemir and Taşdemir (2020) reported a significant difference between students' reading anxiety according to their grades, in favor of the high-grade students. In other words, secondary school 5th-grade students' reading anxiety is higher than 6th-grade and 7th-grade students.

A significant difference was found according to the parents' education levels of the students; this difference was in favor of students whose parents had a high level of education. Similar results were reported in some studies (İzci & Kaya, 2021; Taşdemir & Taşdemir, 2020; Uçgun, 2016). However, some other studies found no significant relationship between students' mother and father education levels and their reading anxiety (Çevik et al., 2019; Yamaç & Sezgin, 2018; Yıldız & Ceyhan, 2016). This study, Uçgun (2016) found a significant relationship between students' mother and father education levels and their reading anxiety against university graduate mothers and fathers. The review of the studies on reading anxiety and parent's education level showed that reading anxiety decreases as the parents' education level increases, which supports the results of this research (Alisinanoğlu & Ulutaş, 2003; Durkan & Özen, 2018; Katrancı & Kuşdemir, 2016; Özen & Durkan, 2016; Yenilmez & Özbey, 2006). The people with whom primary school students interact most outside of school are their parents. Conscious parents with a high level of education better guide their children in correct reading, fluent and prosodic reading, and positively contribute to reducing their reading anxiety.

Regarding the parents' working status, there was a significant difference in favor of students with working mothers. However, no significant difference was observed in the father's working status. This significant difference was in favor of students whose mothers were working. In other words, students whose mothers do not work have higher reading anxiety.

Conclusions and Recommendations
Conclusion
In this research, the following results were obtained.
In this study, it can be said that their school's district is not effective on their reading anxiety. In this process, it was not determined why there was a difference in terms of their genders on reading anxiety. In this study, it can be said with 95% confidence that age makes a statistically significant difference in reading anxiety. This difference is in favor of 10-year-old students.

Considering that the texts read by the students mainly belong to 4th-grade, 10-year-olds are more appropriate for 4th-graders regarding reading anxiety. Considering that only 0.05% of the students participating in the study were 12 years old, there is no linear relationship between the student's ages and reading anxiety.

It has been determined that students' mother's education level has an effect on reading anxiety. The people with whom primary school students interact most outside of school are their parents. Conscious parents with a high level of education better guide their children in correct reading, fluent and prosodic reading, and positively contribute to reducing their reading anxiety. A significant difference was revealed according to the parents' education levels of the students, in favor of those whose parents had higher education levels. In other words, the higher the parents' education level, the lower the students' reading anxiety.

Regarding the parents' working status, there was a significant difference according to the mother's working status in favor of students with working mothers. It was determined that the working status of the mothers of the students caused a significant difference between the reading anxiety levels, while the working status of the fathers did not cause a significant difference. It was determined that the significant difference in students' reading anxiety was in favor of working mothers. In other words, it can be said that the children of working mothers have lower reading anxiety levels. Therefore, the working status of children's mothers creates a statistically significant impact on their reading anxiety in favor of those with a working mother. In other words, students whose mothers are working have lower reading anxiety.

No significant difference was found between the reading anxiety levels of the students according to the district where the school is located, their gender and the working status of their fathers. It was determined that as the education level of the students' parents increased, the level of reading anxiety decreased. It was determined that the working status of the mothers of the students caused a significant difference between the reading anxiety levels, while the working status of the fathers did not cause a significant difference.

Suggestions

The following results were obtained in the research;

In the research, it was determined that there was no significant difference between the students' reading anxiety levels according to the district where the students attended school and their gender. It was determined that the age level of the students made a statistically significant difference on their reading anxiety levels, and this difference did not depend on whether the student was younger or older. A significant difference was found between the educational levels of the students' parents. This significant difference was

found to be in favor of students with higher levels of parental education. In other words, it was determined that the higher the level of education of the parents, the lower the reading anxiety of the students. When the students' reading anxiety was analyzed in terms of their parents' working status, a significant difference was found between the working status of the mothers, while no significant difference was found between the working status of the fathers. This significant difference was found to be in favor of students whose mothers were working. In other words, it was determined that students whose mothers do not work have higher reading anxiety.

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Examination of Prospective Science Teachers' Content Knowledge on Image in Plane Mirrors in Terms of Their Approaches to Error

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Abstract

This paper focuses on examining prospective science teachers' content knowledge about image formation in plane mirrors in terms of approach to error. In accordance with this purpose, 15 questions about the conceptual understanding of the image in plane mirrors and a data collection tool containing correct or incorrect information in the answers for each question were prepared and applied to the teacher candidates. The phenomenology, which is a qualitative research design, was used in this study. The sample consisted of 36 prospective teachers who continued their education in 3rd and 1st grades at a university in Turkey. The findings obtained in the research were analyzed with the descriptive analysis method. In the study, it was seen that the percentage of the candidates who were able to identify the questions that presented correct or incorrect answers about the image in plane mirrors was at a moderate level. Among the participants who detected incorrect answers in the questions presented to the candidates, it was determined that the explanations written by a small number of participants regarding the solution to the questions were correct. Most of the participants have misconceptions such as "the image is formed on the mirror surface in a plane mirror", "the image of objects in mirrors only occurs when the observer looks towards the mirror and does not occur when he does not", and "the size and location of an object's image in plane mirrors are affected by the movement of the observer". In the study, it was determined that some participants had the misconception of "seeing the mirror as a light source", which was not encountered in the literature. From the findings, it was stated that the participants in the research group were not in an acceptable position in terms of the image in plane mirrors, including their development in subject knowledge and student understanding. At the end of the study, some suggestions were made to researchers interested in the subject.

Keywords: Plane mirrors, approach to error, student understandings, misconceptions, physics education

Introduction

Today, states are in a great race in technology and science, as in every field. In order to survive in this race, states must train individuals in their own countries to be well literate in science. The most essential elements in this process are students, teachers, and teacher training institutions. Training teachers who will build the future of society must be well-planned and executed in these institutions. Teachers are expected to be strategists who can prevent the challenges they face in education in the 21st century global society (Spadora et al., 2017). In this context, the fact that prospective teachers know what they may encounter while performing their profession, and know how to find a solution to the problems they encounter is closely related to their teaching qualifications. Van Driel et al. (1998) defined teacher competencies as an integrated phenomenon that includes teachers' knowledge and beliefs about curriculum, subject, etc. Studies on this have revealed that the mentioned phenomenon determines what the teacher will teach and in what way (Uluçınar Sağır, 2018). Subject content knowledge (SCK) is one of the most critical pieces of information that teachers should have for an efficient education (Alev & Karal, 2013). In addition to SCK, teachers should also have features that will contribute to students' formal learning of concepts. These features constitute the main element of pedagogical content knowledge (PCK), which is defined as the teacher's ability to teach the subject depending on the education, training environment, and the individual differences of the learners (Alev & Karal, 2013). In the literature, different PCK models have been proposed in studies on teacher competencies. Among these studies, the study of Park (2005) has found an important place in science teaching. In her study, Park suggested the hexagon PCK model by first adding the pentagon model and then adding teacher competence to the pentagon model. In the hexagon model, one of the components of PCK is student understandings in science. According to Park (2005), teachers' misconceptions about students, learning difficulties, and development levels involve students understanding of science component. Student errors can also be considered in this component. Incorrect questions, answers, and misconceptions may be encountered in students' written or verbal expressions and sources. Therefore, teacher candidates and teachers should be able to identify the errors they encounter. This necessity was expressed in the literature by Uluçınar Sağır (2018), which states that "the teacher should sense students' verbal or non-verbal errors and misconceptions". According to Konyalıoğlu et al. (2010), the prospective teacher or teacher who can identify the error and explain the reasons correctly is able to interpret the related concept appropriately. Detection of information

such as misconceptions and student errors and the effective implementation of studies to eliminate them will contribute to the development of teacher candidates' PCK. According to Konyalıoğlu (2013), deep knowledge of the subject to be taught plays an essential role in shaping PCK. Konyalıoğlu further reported that, SCK with the desired quality increases students' success and education quality. In science subjects that students have difficulty in learning, the teacher's SCK is important. According to Konyalıoğlu et al. (2012), the ability to correctly identify and correctly explain the error can be used in determining the sufficiency of subject knowledge. In the same study, it was also emphasized that identifying the error correctly and expressing why it was wrong requires in-depth knowledge of the subject matter. Based on this information, it can be stated that the candidates, who can identify the wrong information about physics and reveal the reasons correctly, will be able to plan and implement the education process by knowing the reasons for the error when they are in the position of instructors in the future.

There are difficulties in teaching and learning concepts related to many subjects in physics because of its abstract nature. In order to overcome these difficulties, the choice of the teaching techniques, methods, and language to be used in teaching the concepts are also important. The scientific language and the language of daily life can sometimes differ. These differences appear as misconceptions in the education process. Daily life language, teachers, books, etc. are sources of misconceptions. As in most subjects in physics, the concepts related to the image in mirrors can be misused in daily life without realizing it. Some students may acquire university education with misconceptions and incomplete or incorrect information. For this reason, before the topics are given, what the students know and do not know should be determined. Planning the teaching process according to the results obtained will contribute to the efficiency and quality of education.

In the studies on the image in the mirrors (Anıl, 2010; Anıl & Küçüközer, 2010; Aydın et al., 2012; Ayvacı & Candaş, 2018; Blizak et al., 2009; Chen et al., 2002; Çökelez & Çiftçi Yaşar, 2015; Durukan & Paliç Şadoğlu, 2020; Feher & Rice, 1988; Fetherstonhaugh & Treagust, 1992; Galili & Hazan, 2000; Heywood, 2005; Kaltakçı Gürel et al., 2017; Kocakülah, 2006; Pompea et al., 2007; Şen, 2003; Taşlıdere & Eryılmaz, 2015; Wahyuni et al., 2019; Widiyatmoko & Shimizu, 2019). it has been determined that some of the primary, secondary and high school students, Computer and Instructional Technologies, Classroom Teaching, and Science and Physics teacher candidates have incomplete or incorrect information and misconceptions about the image in plane mirrors. Missing or incorrect information and misconceptions identified in the literature are listed below:

- The image of an object in a plane mirror is right in front of the observer.
- In a plane mirror, the image of the object is in front of/on the surface/inside/on the mirror.
- In a plane mirror, the image is inverted, big, small, and real.
- Real images are seen in the mirror, virtual images cannot be seen.
- The image size is always equal to the mirror size.
- If the dimensions of the plane mirror are increased, the image becomes larger.
- The distances of the object and its image from the plane mirror are at different values.
- Apple, black, and white pieces of paper can be seen in a dark environment.
- Light-colored objects can be seen in complete darkness as they emit light.
- Black-colored objects do not reflect light at all.
- If you want to use the mirror to see yourself in a dark room, the mirror should be illuminated with light rather than yourself.
- When the light hits the mirror, it stays on its surface.
- Expressing an image as a shadow in plane mirrors.
- If there is an obstacle in front of the rays coming out of the object, the image of a part or the whole of the object does not occur.
- For the image to be seen, the object must be directly in front of the mirror.
- If the object is in front of the mirror, its image is formed.
- A change in the observer's position affects whether the object is mirrored or not.
- Images that are not in the same region as the observer cannot be seen.
- When the observer moves, the image of the object moves in the opposite direction.
- The image in the mirror is directly opposite the point where the observer is.
- When the observer moves, the size and location of the image of the object in the plane mirror changes.
- The observer, who is in front of the plane mirror, sees more of himself when he moves away from the mirror.
- The image of the object moving away from the plane mirror becomes smaller.
- When we look in the mirror, an image is formed, otherwise there is no image in the mirror.
- As a person approaches or moves away from the plane mirror, they can see more of their own image in the mirror due to the increase in the field of view.

Importance of Research

In the literature, it is seen that there are misconceptions about the image in plane mirrors in every society and researches on this subject are still ongoing. Studies aim to detect incomplete or incorrect information and misconceptions and eliminate these misconceptions. The fact that there is no research covering the approach to error in the literature reveals the need to carry out this study. Considering that the study results will shed light on prospective science teachers who will give lectures on this subject in the future, thus the subject is worth investigating. Visual working memory serves as the foundation of cognitive processes (Amundsen et al., 2014). For these reasons, the knowledge of prospective teachers about images in plane mirrors and their approaches to solving questions with incorrect answers were examined in the study.

Purpose of the Research

The objective of this research was to examine prospective science teachers' image subject knowledge in plane mirrors according to their approach to error, and to determine the developmental status of subject knowledge and student understanding knowledge. Therefore, the research aimed to find answers to the following questions:

1. How are prospective science teachers continuing their education in 1st and 3rd grades to detect correct or incorrect information about the image in plane mirrors?
2. How do prospective science teachers approach the error in the image subject area in plane mirrors?

Method

This is a qualitative study. Data collection methods such as document analysis, interview, and observation are used in qualitative research. Qualitative research is a form of research that aims to identify events in their own environment realistically and inclusively (Yıldırım & Şimşek, 2021). According to Bülbül (2016), the qualitative research method is an approach that generally analyzes verbal data and aims to research and explore beyond generalization anxiety. In this context, the qualitative research approach was utilized to examine the knowledge of prospective science teachers about images in plane mirrors and students' understanding knowledge (misconceptions, proficiency levels, etc.).

This section gives explanations about the research model, data collection, study group, data analysis, validity and reliability.

Model of the Research

Based on the image in plane mirrors, this study aimed to determine the developmental status of students studying in 1st and 3rd grades of the Science Education program in the fall semester of 2021-2022 academic year. The study further aimed to identify the understanding of the students and their approaches to the errors related to the subject. In accordance with this purpose, the study was organized within the framework of the phenomenology pattern, which is one of the qualitative research methods. The phenomenology design is used in research to inquire deeply about participants thoughts based on their experiences with the subject or concepts, their perceptions, as well as the ways and methods of connecting concepts (Aydın Günbatar, 2019; Yıldırım & Şimşek, 2021). For this reason, the knowledge of the subject of images in plane mirrors was investigated with a phenomenological design in terms of the prospective teachers' approaches to error.

Study Group of the Research

The research group of the study, which was carried out with the qualitative research method, was determined with easily accessible sampling. This is one of the sampling methods suitable for the purpose. In the study group, 18 students from 3rd grade (F=16, M=2) and 18 students from 1st grade (F=12, M=6) were included in the Science Teaching Program of the Faculty of Education. Among the participants, 3rd grade students took the course related to the research topic in their 2nd grade. First grade students took the relevant course in high school. The study group was formed from 1st and 3rd grade students in order to examine the development of the knowledge of the image subject in plane mirrors of prospective teachers in 3rd grade. The demographic characteristics of the individuals in the research group were determined in this context, as seen in Table 1. The names of the participants were not included in the study, considering the ethical principles. As a result, each participant was given a code as $C1_1$, $C1_2$, - $C1_{18}$ for 1st grade students and $C3_1$, $C3_2$, - $C3_{18}$ for 3rd grade students.

Table 1. Demographic Characteristics of Participants

High School	1st Grade		3rd Grade		Total			
	Female	Male	Female	Male	Female		Male	
	N	n	n	N	n	%	n	%
Anatolian High School	9	6	11	2	20	55	8	22
Science High School	2	-	-	-	2	6	-	-
Imam Hatip High School	1	-	1	-	2	6	-	-
Vocational High School	-	-	3	-	3	8	-	-
Commerce High School	-	-	1	-	1	3	-	-
Total	12	6	16	2	28	78	8	22

According to Table 1, it was revealed that 77% of the participants graduated from Anatolian high schools. This group had the highest rate in terms of the schools graduated. As for the gender of the participants, 78% of the participants were female and 22% were male.

Data Collection Tool and Process

The researcher prepared a two-stage data collection tool for conceptual understanding. The data collection tool included 15 open-ended questions and correct and incorrect answers for these questions (Appendix 1. data collection tool). Teacher candidates were asked to examine the answers given to the questions about the conceptual understanding of the image in plane mirrors in the data collection tool. After the examination process was completed, the participants were first asked to write the letter T in parentheses (…..) if the answers were correct for them, and the letter F if they were incorrect. After that, participants were told to write their own answers for the explanations they deem wrong.

Analysis of Data

First, the numbers and percentages of the participants who distinguished the correct or wrong answers from the candidates' answers to the questions from the data obtained in the study were determined and tabulated. Second, the explanations of the candidates who could not and did not detect the erroneous explanations were grouped into the determined categories and codes. Data were analyzed with descriptive analysis. Descriptive analysis brings the data to a state that readers can comprehend and use whenever they want (Bayar & Zengin, 2020). After each question was analyzed, the findings were presented in tables. Samples selected from the answers given by the participants in the tables were given separately for all categories and codings. In Table 2, the categories and codes used in the analysis phase were given.

Table 2. Categories and Codes

Categories	Codes	Examining Codes*
No Response		
Inability to Detect the Wrong	No Description	
	Description Incorrect	
	Description Partially Correct	
	Description Correct	
Detecting the Wrong	No Description	
	Description Incorrect	
	Description Partially Correct	
	Description Correct	

*The review is defined below.

Categories
1. No response: No opinion is expressed.
2. Inability to Detect the Wrong: It is the situation in which the given answer is evaluated as correct.
3. Detecting the Wrong: It is the situation of detecting that the given answer is wrong.

Codes and Review

The explanations written by the participants as answers to the questions were handled under four different coding. These are the codes:
1. No Description: It is the coding without any explanation.
2. Description Incorrect: It is the coding where the explanation is seen as completely wrong.
3. Description Partially Correct: It is the situation where the explanation is not seen as completely correct. Incomplete explanations or explanations where some are correct and some are incorrect are evaluated under this coding. In addition, the answers written by the candidates are scientifically correct, but the explanations that are not fully related to the answer of the given question are included in this coding.
4. Description Correct: It is the coding in which the explanations are considered completely correct.

Validity Reliability

In order to ensure the reliability and validity of the study, the knowledge of a sufficient number of faculty members who are experts in the field of physics education has been consulted. Tables prepared separately for each question were given their final shape within the framework of expert opinions. To calculate the reliability of the study, the formula [Reliability = consensus / (disagreement + consensus) X 100], which was put forward by Miles and Huberman (1994), was used. Saban (2009) emphasized in his study that research reliability would be ensured when the consensus between the expert and the researcher was 90% or more. The study determined that the consensus between the experts and the researcher was 94% on average. The levels developed by the researcher were used to interpret the percentages of the candidates whose explanations were accepted/acceptable, (correct and partially correct) based on the error based on the research findings. Also, it was used to evaluate the development levels of the candidates in terms of subject knowledge. These levels include the following: very high (100 - 80%), high (80 - 60%), medium (60 - 40%), low (40 - 20%), and very low (20 - 0%).

Ethical Procedures

This research was carried out with the "Ethics Committee Permission" dated 13/10/2021 and numbered E-30640013-108.01-37445 of the Social Sciences Ethics Committee and the Amasya University Science Ethics Committee.

Findings

In this section, the findings related to the sub-problems of the research obtained from the data collection tools are given. The answers to questions 4, 6, 9, 12, and 14 presented to the prospective teachers in the data collection tool in Appendix 1 were correctly constructed, and the answers to the other questions were arranged with incorrect definitions or citing misconceptions in the literature.

1. How are prospective science teachers continuing their education in 1st and 3rd grades to distinguish between true and false information about the image in plane mirrors?

The number (n) and percentages of the participants who identified the questions with correct answers regarding the image subject area in plane mirrors, and the number (n) and percentages of the participants who identified the questions with incorrect answers were shown in Table 3.

Table 3. Number and Percentages of Participants Who Determined that the Answers were Correct or Wrong

Number and Percentages of Prospective Teachers Identifying the Correct Answers				
Question	1st Grade		3rd Grade	
	n	%	N	%
4	9	50	2	11
6	3	17	3	17
9	11	61	13	72
12	13	72	12	67
14	12	67	17	94
Number and Percentages of Prospective Teachers Identifying Wrong Answers				
Question	1st Grade		3rd Grade	
	n	%	N	%
1	9	50	15	83
2	18	100	16	89
3	9	50	11	61
5	4	22	1	6
7	16	89	16	89
8	9	50	10	56
10	4	22	3	17
11	2	11	2	11
13	5	28	7	39
15	8	44	7	39

According to Table 3, the number and percentage of the first-grade teacher candidates who determined that the answers to the questions given to the participants were correct were the highest (72%), and the answer for the twelfth question indicates that "the image of an object in a plane mirror is flat compared to the object". The answer with the highest number and percentage of the participants in 3rd grade was 94%. However, the answer for the 14th question denotes that "When the observer approaches the plane mirror with the speed v, his image approaches the mirror with the speed v, and when the observer moves away from the plane mirror with the speed v, the image also has the speed v and moves away from the mirror". The answer given for the 6th question, where the number and percentage of the 1st grade participants who identified the correct explanations was the smallest (17%), denotes that "As the student moves away from the plane mirror, the size of the self-image that the student sees in the mirror does not change". The smallest number and percentage of prospective teachers in 3rd grade (11%) is the answer given for the 4th question, which states that "When the object is brought from point A to point B, which is closer to the plane mirror, the image of the object approaches the mirror, and the size of the image of the object in the mirror does not change". The 2nd question, however, identified the number and percentage of the first-grade candidates who found that the solutions of the questions presented to them about the image in plane mirrors were wrong (100%). Conversely, the number and percentage of the 3rd grade candidates were the highest (89%). The answer given for the 11th question showed that the number and percentage of the 1st grade prospective teachers who detected erroneous explanations were the smallest (11%). The frequency and percentages of the 3rd grade candidates are the smallest (6%), based on the 5th question.

2. How do prospective science teachers approach the error in the image subject area in plane mirrors?

The findings in Table 4 were obtained by examining the statement and answers given by the students to the 1st question. Nonethelesss, the solution was incorrect about the image in plane mirrors.

Table 4. Categories, Codes, Participants, and Sample Answers for Question 1

Categories	Codes	Participants		Sample answers
		1st Grade	**3rd Grade**	
No Response				
	No Description*	$C1_{12}$, $C1_{15}$		
Inability to Detect the Wrong	Description Incorrect	$C1_2$, $C1_4$, $C1_5$, $C1_8$, $C1_{11}$, $C1_{16}$, $C1_{18}$	$C3_3$, $C3_6$	*"A little image is formed by the light of the mirror."* $C1_{16}$, *"In the dark, a white object brings light to our eyes, and thus we see the image"* .$C3_3$
	Description Partially Correct**			
	Description Correct*		$C3_4$	
	No Description**			
Detecting the Wrong	Description Incorrect	$C1_3$, $C1_{13}$, $C1_{14}$	$C3_{11}$	*"Because black does not reflect any color, so white is seen as black."* $C1_3$, *"Because the color white is exploited by the color black."* $C3_{11}$
	Description Partially Correct	$C1_1$, $C1_{17}$	$C3_2$, $C3_{12}$, $C3_{13}$, $C3_{16}$, $C3_{18}$	*"Since there is no light, light cannot reflect on the object and no image is formed."* $C1_1$, *"Nothing is visible in a dark environment."* $C3_{13}$
	Description Correct	$C1_6$, $C1_7$, $C1_9$, $C1_{10}$	$C3_1$, $C3_5$, $C3_7$, $C3_8$, $C3_9$, $C3_{10}$, $C3_{14}$, $C3_{15}$, $C3_{17}$	*"An image does not form. There must be an illuminated environment for it to occur."* $C1_9$,*" No image is formed because there is no light."* $C3_{15}$

**: There are no participants in both grades for this coding group, *: For this coding group, there are participant(s) in one grade but not in the other grade.

As seen in Table 4, the number of participants who determined that the answer to the 1st question was wrong and their explanations were correct was 9 (nine) in 3rd grade and 4 in 1st grade. The number of participants whose explanations were partially correct was 5 in 3rd grade and 2 in 1st grade. Subsequently, the percentages of the participants whose explanations were acceptable were 33% (thirty-three percent) for 1st grade and 78% for 3rd grade.

The findings in Table 5 were obtained by examining the explanations and answers given by the students to the second question. However, the solution was incorrect about the image in plane mirrors.

Table 5. Categories, Codes, Participants, and Sample Answers for Question 2

Categories	Codes	Participants		Sample answers
		1st Grade	**3rd Grade**	
No Response				
Inability to Detect the Wrong	No Description**			
	Description Incorrect*		$C3_3$	*"When the reflected ray comes into the eye, we see the light and form the image."* $C3_3$
	Description Partially Correct**			
	Description Correct*		$C3_2$	"*The observer must look at the object to see it, but if she/he does not have to see, the object will still appear in the mirror."* $C3_2$
Detecting the Wrong	No Description*	$C1_{12}$, $C1_{14}$		
	Description Incorrect	$C1_2$, $C1_4$, $C1_{11}$, $C1_{13}$,		*"It occurs in the refraction of a black object in a bright environment."* $C1_4$
	Description Partially Correct	$C1_7$, $C1_8$, $C1_9$, $C1_{16}$, $C1_{17}$, $C1_{18}$	$C3_{10}$, $C3_{13}$, $C3_{14}$, $C3_{15}$, $C3_{16}$, $C3_{17}$, $C3_{18}$	*"In a bright environment, the object is seen even if it is black."* $C1_{18}$, *"The image is formed. Because of the light in the environment, it is reflected on the mirror."* $C3_{17}$
	Description Correct	$C1_1$, $C1_3$, $C1_5$, $C1_6$, $C1_{10}$, $C1_{15}$,	$C3_1$, $C3_4$, $C5_5$, $C3_6$, $C3_7$, $C3_8$, $C3_9$, $C3_{11}$, $C3_{12}$	*"In a bright environment, the color does not affect the formation of the image."* $C1_{15}$, *"Since the environment is bright, the image of the black object in the plane mirror is formed."* $C3_{12}$

**: There are no participants in both grades for this coding group, *: For this coding group, there are participant(s) in one grade but not in the other grade.

According to Table 5, the number of participants who determined that the answer to the 2nd question was wrong and their explanations were correct was 9 (nine) in 3rd grade and 6 in 1st grade. Subsequently, the number of participants whose explanations were partially correct was 7 (seven) in 3rd grade and 6 in 1st grade. The percentages of prospective teachers who made an acceptable statement were 67% (sixty-seven percent) for 1st grade and 89% for 3rd grade.

The findings in Table 6 were obtained by examining the explanations and answers given by the students to the 3rd question. Nevertheless, the solution was incorrect about the image in plane mirrors.

Table 6. Categories, Codes, Participants, and Sample Answers for Question 3

Categories	Codes	Participants 1st Grade	3rd Grade	Sample answers
No Response				
	No Description*	$C1_8$, $C1_{15}$		
Inability to Detect the Wrong	Description Incorrect	$C1_3$, $C1_7$, $C1_{10}$, $C1_{12}$, $C1_{14}$	$C3_1$, $C3_9$, $C3_{12}$	*"The point of view and the position of the observer are important."* $C1_{12}$, *"It comes to our eyes with the refraction of light by looking in the mirror."* $C3_9$
	Description Partially Correct	$C1_9$, $C1_{18}$	$C3_3$, $C3_{13}$, $C3_{16}$	*"If she/he doesn't look in the mirror she/he can't see if an image will form."* $C1_9$, *"If she/he does not use other material (camera, mirror ...) to observe whether the image is formed, she/he cannot see whether it is reflected or not."* $C3_{16}$
	Description Correct* No Description**		$C3_2$	*"The observer has to look at the object to see it, but still the object is seen in the mirror."* $C3_2$
Detecting the Wrong	Description Incorrect	$C1_4$, $C1_{17}$		*"The mirror must see the image."* $C1_{17}$
	Description Partially Correct	$C1_{11}$, $C1_{13}$	$C3_7$	*"She/he doesn't need to look. Because the light is refracted, all sorts of images will appear."* $C1_{13}$, *"An image of your own body is also formed."* $C3_7$
	Description Correct	$C1_1$, $C1_2$, $C1_5$, $C1_6$, $C1_{16}$	$C3_4$, $C5_5$, $C3_6$, $C3_8$, $C3_{10}$, $C3_{11}$, $C3_{14}$, $C3_{15}$, $C3_{17}$, $C3_{18}$	*"It is enough for the ray reflected from the object to fall on the mirror to form the image."* $C1_1$, *"The image is formed even if we don't see it."* $C3_6$

**: There are no participants in both grades for this coding group, *: For this coding group, there are participant(s) in one grade but not in the other grade.

As seen in Table 6, the number of participants who determined that the answer to the 3rd question was wrong and their explanations were correct was 10 (ten) in 3rd grade and 5 in 1st grade. Also, the number of participants whose explanations are partially correct is 1 (one) in 3rd grade and 2 in 1st grade. The percentages of prospective teachers who made an acceptable statement were 39% (thirty-nine percent) for 1st grade and 61% for 3rd grade.

The findings in Table 7 were obtained by examining the explanations and answers given by the students to the 5th question. Nonetheless, the solution was incorrect about the image in plane mirrors.

Table 7. Categories, Codes, Participants, and Sample Answers for Question 5

Categories	Codes	Participants 1st Grade	3rd Grade	Sample answers
No Response		$C1_8$		
	No Description*	$C1_{15}$		
Inability to Detect the Wrong	Description Incorrect	$C1_1$, $C1_3$, $C1_5$, $C1_6$, $C1_7$, $C1_{10}$, $C1_{11}$, $C1_{12}$, $C1_{13}$, $C1_{14}$, $C1_{17}$, $C1_{18}$	$C3_1$, $C3_2$, $C3_3$, $C3_4$, $C5_5$, $C3_6$, $C3_7$, $C3_8$, $C3_{10}$, $C3_{11}$, $C3_{12}$, $C3_{13}$, $C3_{14}$, $C3_{15}$, $C3_{16}$, $C3_{17}$, $C3_{18}$	*"There is no image where there is an obstacle."* $C1_{12}$, *"The obstacle forms an obstacle to the reflected part of the object and closes some of it."* $C3_8$
	Description Partially Correct**			
	Description Correct**			
	No Description**			
Detecting the Wrong	Description Incorrect*	$C1_2$, $C1_4$, $C1_9$, $C1_{16}$,		*"Depends on where the observer is. If it's on the right side of the object, it's fully visible."* $C1_2$
	Description Partially Correct*		$C3_9$	*"Opaque objects are opaque. Therefore, the image is not formed."* $C3_9$
	Description Correct**			

**: There are no participants in both grades for this coding group, *: For this coding group, there are participant(s) in one grade but not in the other grade.

According to Table 7, the participant who determined that the answer to the 5th question was wrong and whose explanations were correct could not be determined. The number of participants whose explanations were partially correct was zero in 1st grade and 1 in 3rd grade. Also, the percentages of prospective teachers who made an acceptable statement were 0% (zero percent) for 1st grade and 6% for 3rd grade.

The findings in Table 8 were obtained by examining the explanations and answers given by the students to the 7th question. However, the solution was incorrect about the image in plane mirrors.

Table 8. Categories, Codes, Participants, and Sample Answers for Question 7

Categories	Codes	Participants		Sample answers
		1st Grade	**3rd Grade**	
No Response		$C1_8$		
	No Description**			
	Description Incorrect	$C1_{10}$	$C5_5, C3_{11}$	*"As the mirror gets bigger, the focal point changes. Therefore, the size of the image also increases."* $C1_{10}$, *"The larger the mirror, the larger the pupil."* $C3_{11}$
Inability to Detect the Wrong	Description Partially Correct**			
	Description Correct**			
	No Description**			
	Description Incorrect	$C1_1$, $C1_{14}$, $C1_{17}$	$C3_1$, $C3_2$, $C3_6$, $C3_7$, $C3_9$, $C3_{14}$, $C3_{17}$	*"It shrinks."* $C1_{14}$, *"Since the student's place does not change, there is no change in her/his image."* $C3_{17}$
Detecting the Wrong	Description Partially Correct	$C1_2$, $C1_3$, $C1_5$, $C1_6$, $C1_7$, $C1_{12}$ $C1_{15}, C1_{16}$	$C3_4$	*"It does not change. Because the distance of the mirror is effective, not the size."* $C1_3$, *"The size of the mirror does not affect the image. The distance of the pupil affects the image size."* $C3_4$
	Description Correct	$C1_4$, $C1_9$, $C1_{11}$, $C1_{13}$, $C1_{18}$	$C3_3$, $C3_8$, $C3_{10}, C3_{12}$, $C3_{13}, C3_{15}$, $C3_{16}, C3_{18}$	*"Increasing the size of the plane mirror does not affect the size of the image."* $C1_{18}$, *"The size of the plane mirror image of the pupil does not change."* $C3_{15}$

**: There are no participants in both grades for this coding group.

As seen from Table 8, the number of participants who determined that the answer to the 7th question was wrong and whose explanations were accepted as correct was 8 (eight) in 3rd grade and 5 in 1st grade. Subsequently, the number of participants whose explanations were partially correct was 1 (one) in 3rd grade and 8 in 1st grade. The percentages of prospective teachers who made an acceptable statement were 72% (seventy-two percent) for 1st grade and 50% for 3rd grade.

Findings in Table 9 were obtained by examining the explanations and answers given by the students to the 8th question. However, the solution is incorrect about the image in plane mirrors.

Table 9. Categories, Codes, Participants, and Sample Answers for Question 8

Categories	Codes	Participants		Sample answers
		1st Grade	**3rd Grade**	
No Response				
	No Description**			
Inability to Detect the Wrong	Description Incorrect	$C1_1$, $C1_3$, $C1_4$, $C1_6$, $C1_8$, $C1_{10}$, $C1_{12}$, $C1_{14}$, $C1_{17}$	$C3_2$, $C3_3$, $C3_4$, $C3_8$, $C3_{13}$, $C3_{14}$, $C3_{18}$	*"As objects A and C do not look into the mirror, their images do not form."* $C1_8$, *"Plane mirrors do not see objects."* $C3_{18}$
	Description Partially Correct*		$C3_9$	*"If we are directly opposite the plane mirror, we only see the image of B. A and C are not in line with the mirror."* $C3_9$
	Description Correct**			
	No Description**			
Detecting the Wrong	Description Incorrect	$C1_7$, $C1_{13}$, $C1_{16}$	$C3_6$, $C3_{12}$, $C3_{17}$	*"Depends on how you look in the mirror."* $C1_{13}$, *"The plane changes depending on where you're looking at the mirror."* $C3_{12}$
	Description Partially Correct	$C1_2$, $C1_{15}$	$C3_5$	*"All of them are viewed from different angles."* $C1_{15}$, *"They all form images. But depending on the eye that sees."* $C3_5$
	Description Correct	$C1_5$, $C1_9$, $C1_{11}$, $C1_{18}$	$C3_1$, $C3_7$, $C3_{10}$, $C3_{11}$, $C3_{15}$, $C3_{16}$	*"The image of all is formed."* $C1_{11}$ *"The objects are not visible when viewed from the angle of the B object. However, if we look from the points where A and C are located, we see the image of the objects"* $C3_{16}$

**: There are no participants in both grades for this coding group, *: For this coding group, there are participant(s) in one grade but not in the other grade.

As seen in Table 9, the number of participants who identified the erroneous explanation given in the answer to the 8th question and whose explanations were correct was 6 (six) in 3rd grade and 4 in 1st grade. Subsequently, the number of participants whose explanations are partially correct is 1 (one) in 3rd grade and 2 in 1st grade. The percentages of prospective teachers who made an acceptable statement were 33% (thirty-three percent) for 1st grade and 39% for 3rd grade.

Findings in Table 10 were obtained by examining the explanations and answers given by the students to the 10th question. Nevertheless, the solution is incorrect about the image in plane mirrors.

Table 10. Categories, Codes, Participants, and Sample Answers for Question 10

Categories	Codes	Participants		Sample answers
		1st Grade	**3rd Grade**	
No Response		$C1_7$, $C1_8$		
	No Description	$C1_2$, $C1_5$, $C1_{14}$	$C3_7$, $C3_{10}$, $C3_{12}$, $C3_{14}$	
Inability to Detect the Wrong	Description Incorrect	$C1_3$, $C1_4$, $C1_6$, $C1_{10}$, $C1_{11}$, $C1_{13}$, $C1_{16}$, $C1_{17}$	$C3_2$, $C3_3$, $C3_4$, $C5_5$, $C3_6$, $C3_8$, $C3_{13}$, $C3_{15}$, $C3_{17}$, $C3_{18}$	*"The image of an object in a plane mirror is upside down and on the surface of the mirror."* $C1_{11}$, *"Since the object is visible to the naked eye, the image is formed on the surface of the mirror."* $C3_{15}$
	Description Partially Correct	$C1_{12}$	$C3_9$	*"On the surface of the mirror, a flat image is formed."* $C1_{12}$, *"It appears in the mirror."* $C3_9$
	Description Correct** No Description** Description Incorrect**			
Detecting the Wrong	Description Partially Correct	$C1_9$	$C3_{11}$, $C3_{16}$	*"The image of the object in the plane mirror depends on the distance of the object from the mirror."* $C1_9$, *"For example, if the object is 5 steps ahead, its reflection in the plane mirror will be 5 steps away."* $C3_{16}$
	Description Correct	$C1_1$, $C1_{15}$, $C1_{18}$	$C3_1$	*"It occurs behind the mirror."* $C1_{15}$, *"In a plane mirror, the image of the object occurs behind the mirror."* $C3_1$

**: There are no participants in both grades for this coding group.

As seen in Table 10, the number of participants who identified the erroneous explanation given in answer to the 10th question and whose explanations were correct was 1 (one) in 3rd grade and 3 in 1st grade. Subsequently, the number of participants whose explanations are partially correct is 2 (two) in 3rd grade and 1 in 1st grade. The percentages of prospective teachers who made an acceptable statement were 22% (twenty-two percent) for 1st grade and 17% for 3rd grade.

Findings in Table 11 were obtained by examining the explanations and answers given by the students to the 11th question. However, the solution is incorrect about the image in plane mirrors.

Table 11. Categories, Codes, Participants, and Sample Answers for Question 11

Categories	Codes	Participants		Sample answers
		1st Grade	**3rd Grade**	
No Response		$C1_8$		
	No Description	$C1_{12}$, $C1_{14}$, $C1_{15}$,	$C5_5$, $C3_7$, $C3_{10}$, $C3_{14}$	
	Description Incorrect	$C1_2$, $C1_3$, $C1_5$, $C1_6$, $C1_7$, $C1_9$, $C1_{10}$, $C1_{11}$, $C1_{13}$, $C1_{16}$, $C1_{17}$	$C3_1$, $C3_2$, $C3_3$, $C3_4$, $C3_6$, $C3_9$, $C3_{11}$, $C3_{13}$, $C3_{15}$, $C3_{16}$, $C3_{17}$	*"The observer increases as long as she/he looks from a certain point."* $C1_2$, *"Like the real observer, the mirror reflects what it sees."* $C3_4$
Inability to Detect the Wrong	Description Partially Correct	$C1_4$	$C3_8$	*"As the object gets closer to the mirror, the angle of impact of the rays reflected from the object to the mirror changes."* $C1_4$, *"When we get closer to the mirror, we see our face closer, clearer, more distinct, but as we move away, it becomes blurred."* $C3_8$
Detecting the Wrong	Description Correct** No Description** Description Incorrect** Description Partially Correct**			
	Description Correct	$C1_1$, $C1_{18}$	$C3_{12}$, $C3_{18}$	*"The size of the image does not depend on the distance of the object from the mirror. The image size does not change".* $C1_1$, *"The size of the image formed in a plane mirror is the same as the size of the object "* $C3_{12}$

**: There are no participants in both grades for this coding group.

As seen in Table 11, the number of participants who knew that the answer to question 11 was incorrect and whose explanations were correct was 2 in 1st and 3rd grades. Also, the percentage of prospective teachers who made acceptable statements is 11% in 1st and 3rd grades.

Findings in Table 12 were obtained by examining the explanations and answers given by the students to the 13th question. Nonetheless, the solution is incorrect about the image in plane mirrors.

Table 12. Categories, Codes, Participants, and Sample Answers for Question 13

Categories	Codes	Participants		Sample answers
		1st Grade	**3rd Grade**	
No Response		$C1_8$		
Inability to Detect the Wrong	No Description**			
	Description Incorrect	$C1_1$, $C1_4$, $C1_6$, $C1_9$, $C1_{10}$, $C1_{11}$, $C1_{13}$, $C1_{16}$, $C1_{18}$	$C3_1$, $C3_6$, $C3_9$, $C3_{10}$, $C3_{12}$, $C3_{13}$, $C3_{14}$, $C3_{16}$, $C3_{17}$	*"It changes because the observer's perspective changes."* $C1_4$, *"When we look at the pen, it is on the right side of the pen."* $C3_{14}$
	Description Partially Correct	$C1_7$, $C1_{12}$, $C1_{15}$	$C3_{11}$	*"The image size does not change. As there is a change of location, the location of the image changes."* $C1_7$, *"The pen and its image are on the right with respect to the observer at position A, while it is on the left with respect to the observer at position B."* $C3_{11}$
	Description Correct*		$C3_4$	*"The location and image of the pen is fixed. When the observer moves, his own image moves too."* $C3_4$
Detecting the Wrong	No Description**			
	Description Incorrect*	$C1_2$, $C1_3$, $C1_{14}$		*"The image is independent because the distance of the male does not change."* $C1_3$
	Description Partially Correct	$C1_5$	$C3_5$, $C3_7$, $C3_{18}$	*"The plane mirror image does not change. It changes depending on where the observer is looking."* $C1_5$, *"Her/his image does not move. The position where the observer sees the pen changes."* $C3_7$
	Description Correct	$C1_{17}$	$C3_2$, $C3_3$, $C3_8$, $C3_{15}$	*"The image of the object in the mirror does not change. The observer's point of view may change."* $C1_{17}$, *"The image does not move because the position of the mirror and pen does not change."* $C3_{15}$

**: There are no participants in both grades for this coding group, *: For this coding group, there are participant(s) in one grade but not in the other grade.

According to Table 12, the number of participants who identified the erroneous explanation given in answer to the 13th question and whose explanations were correct was 4 (four) in 3rd grade and 1 in 1st grade. Subsequently, the number of participants whose explanations were partially correct was 3 (three) in 3rd grade and 1 in 1st grade. The percentages of prospective teachers who made an acceptable statement were 11% (eleven percent) for 1st grade and 39% for 3rd grade.

Findings in Table 13 were obtained by examining the explanations and answers given by the students to the 15th question. However, the solution is incorrect about the image in plane mirrors.

Table 13. Categories, Codes, Participants, and Sample Answers for Question 15

Categories	Codes	Participants		Sample answers
		1st Grade	3rd Grade	
No Response		$C1_8$		
	No Description	$C1_{15}$	$C3_{14}$	
Inability to Detect the Wrong	Description Incorrect	$C1_5$, $C1_{10}$, $C1_{11}$, $C1_{12}$, $C1_{14}$, $C1_{16}$, $C1_{17}$	$C3_4$, $C3_7$, $C3_8$, $C3_{10}$, $C3_{11}$, $C3_{13}$, $C3_{15}$ $C3_{18}$	*"The greater the distance, the smaller the image."* $C1_{10}$, *"As you move away from the mirror, the size of your pen in the mirror also changes."* $C3_{13}$
	Description Partially Correct	$C1_9$	$C3_9$	*"As the observer gets farther away, the pen seems to shrink in size. Because of the eye focus."* $C1_9$, *"As she/he gets further away, the distance increases, and she/he sees smaller."* $C3_9$
	Description Correct** No Description**			
Detecting the Wrong	Description Incorrect	$C1_2$, $C1_4$, $C1_6$,	$C3_2$, $C3_3$, $C3_{16}$, $C3_{17}$	*"The location of the object does not change."* $C1_4$, *"The farther you get from the light source, the larger the object becomes in the mirror."* $C3_{16}$
	Description Partially Correct	$C1_3$, $C1_7$	$C5_5$	*"The pen doesn't change in size. The pen gets bigger if it gets closer, it gets smaller if it gets farther away. It's not dependent on the observer."* $C1_3$, *"The observer is getting farther away, the distance is increasing, so the pen looks small."* $C5_5$
	Description Correct	$C1_1$, $C1_{13}$, $C1_{18}$	$C3_1$, $C3_6$, $C3_{12}$	*"It doesn't change. The image the observer sees shrinks."* $C1_1$, *"The size of the image does not change, the observer sees smaller."* $C3_6$

**: There are no participants in both grades for this coding group.

As seen in Table 13, the number of participants who identified the erroneous explanation given in answer to the 15th question and whose explanations were correct was 3 in 3rd and 1st grades. The number of participants whose explanations were partially correct was 1 (one) in the 3rd grade and 2 in the 1st grade. The percentages of prospective teachers who made an acceptable statement were 22% (twenty-two percent) for 3rd grade and 28% for 1st grade.

Discussion and Conclusion

Under this heading, in light of the findings given in Table 3 by the researcher, the prospective teachers' ability to distinguish between true and false information was evaluated for each grade. Subsequently, the findings obtained from the explanations given by the prospective teachers to the questions with incorrect answers (Table 4-14) were interpreted separately for each question solution, and the misconceptions, wrong or missing information of the candidates were revealed and compared with the literature results. In addition, the opinions of prospective teachers on the subject of images in plane mirrors and the need to improve in terms of understanding the student were also included.

Although the percentage of the candidates who determined that the explanations given with correct answers to the questions varied depending on the question (Table 3, p.6) on average, it was 53% for 1st grade students who took this course in 2nd grade at the university. On the other hand, those studied in 3rd grade was 52%. Looking at these values, the candidates in both grades have a moderate level of distinguishing the correct information about the image in the plane mirrors presented to them. Candidates' ability to distinguish erroneous explanations given to them also varies depending on the question. The percentage of students in 1st grade that detected false information is 47% on average and 49% in 3rd grade. The percentage of prospective teachers that are able to distinguish false information is moderate for both grades. In general, prospective teachers' ability to distinguish false information is slightly lower than their ability to distinguish correct information. The level of distinguishing between correct and incorrect information as a percentage of prospective teachers in 3rd grade is almost at the same level as the students in 1st grade. Based on this result, the information obtained by 3rd grade students through distance education does not increase their knowledge in distinguishing between true and false information. However, the number of candidates who detected the erroneous explanation given to them and also gave a correct or partially correct explanation for the 1st, 2nd, 3rd, 8th, and 13th questions was higher in 3rd grade than in 1st grade. This is an indicator of the development of the candidates in 3rd grade for these questions, even if their subject knowledge is at an average level.

Furthermore, it was determined that the participants who thought the answer to the 1st question was correct (Table 4, p.7), and whose explanation was wrong, had the misconception that "objects in front of a mirror in unlit environments have a mirror image". It can be stated that some candidates in this category also have misconceptions such as "thinking of the mirror as a light source", "an image occurs in the mirror with or without light in the environment", and "using the concepts of image and shadow interchangeably". These misconceptions of prospective teachers are similar to the misconceptions found in the relevant literature (Ayvacı & Candaş, 2018; Chen et al., 2002; Feher & Rice, 1988; Fetherstonhaugh & Treagust, 1992; Şen, 2003; Taşlıdere & Eryılmaz, 2015). Therefore, it was concluded that the participants who detected the error in answer to this question, but whose explanation was wrong, had the unacceptable wrong information about the subject. In addition to the wrong information, it can be said that some candidates in this coding have the misconception that "black objects do not reflect light". This misconception was also emphasized in the studies of Pompea et al. (2007). According to the findings in Table 4, the percentages of the participants' acceptable explanations for the question that was answered incorrectly were 33% (thirty-three percent) for 1st grade and 78% for 3rd grade. In the light of these findings, the percentage of 1st grade prospective teachers who learned that an object cannot be seen in a dark environment and that an image cannot be formed in the mirror without light is low, while the percentage of 3rd grade teacher candidates is high.

The candidates whose explanations were wrong by determining that the answer to the second question was wrong (Table 5, p. 8) confuse the concepts of reflection and refraction. Candidates whose explanations were partially correct were able to identify that the answer to this question was incorrect. Thus, it has been understood that they know that light is necessary for an object to be seen, but they do not fully understand the formation of the image, and they have incomplete information on this subject. According to the findings in Table 5, the percentage of prospective teachers' acceptable explanations for solving erroneous questions was 67% (sixty-seven percent) for 1st grade and 89% for 3rd grade. In the light of these findings, the percentage of 1st grade students who learned that a black object would appear in the mirror in a bright environment and that black objects do not absorb all of the light falling on them, but reflect a small part of it, was at a high level, while the percentage of prospective teachers in 3rd grade was very high.

Based on the findings obtained in Table 6 (p. 9), the following conclusions were drawn. Candidates who cannot detect that the answer to question 3 is wrong and whose explanations are wrong have the misconception that "the image of an object in a bright environment only occurs when the observer looks into the mirror but does not form when he does not". This

misconception was also revealed in the studies of Anıl and Küçüközer (2010), Çökelez and Çiftçi Yaşar (2015), and Galili and Hazan (2000). In addition, it can be emphasized that the participants in this category and coding confuse vision with image formation. Candidates in this category whose explanations are partially correct may suggest that they do not fully understand the question and lack information. An opinion can be put forward that the candidates who discover that the answer given for this question is wrong, but whose explanations are wrong, confuse the concepts and cannot fully understand what is being asked. According to the findings in Table 6, the percentage of the participants' acceptable explanations for the solution of the question whose answers were given incorrectly was 39% for 1st grade and 61% for 3rd grade. Hence, the percentage of 1st grade students, who internalized that when the rays reflected from an object illuminated by light fall on a mirror surface, an image will be formed in that mirror, is low while the percentage of 3rd grade teacher candidates is high.

Candidates who cannot determine that the answer to question 5 is incorrect and whose explanations are wrong have the misconception that "when an obstacle is placed between the mirror and an object, part or all of the object's image is not formed". This misconception is compatible with the results of the literature (Anıl & Küçüközer, 2010; Galili & Hazan, 2000; Kaltakçı Gürel et al., 2017). Furthermore, the candidates who determined that the answer to the question was wrong (Table 7, p.10), but whose explanations were wrong, confused the image's formation with the image's appearance. These candidates have the misconception that "the image of objects is formed when looking in the mirror, otherwise the image does not form". According to the findings in Table 6, the percentage of participants' acceptable explanations for incorrect question solving is 0% (zero percent) for 1st grade and 6% for 3rd grade. The percentage of teacher candidates in the study group is very low. Based on findings in Table 8 (p.10), the candidates who cannot detect that the answer to question 7 is wrong and whose explanations are wrong do not know that the focal point of the plane mirror is infinite. The candidates in this coding group have the misconception that "when the dimensions of the plane mirror change, the size of the image also changes". These candidates also confuse plane mirrors with spherical mirrors. The mentioned misconception is also similar to the misconceptions given in the literature (Anıl & Küçüközer, 2010; Kaltakçı Gürel et al., 2017). It was determined that the candidates who detected the error in the solution of this problem and whose explanations were wrong had the misconception of "when the size of the plane mirror is increased, the size of the image decreases", which is not encountered in the literature. According to the findings obtained from Table 8, the percentage of acceptable explanations for erroneous question solving by prospective teachers is 72% (seventy-two percent) for 1st grade and 50% for 3rd grade.

Also, the percentage of acceptable explanations for erroneous question solving by prospective teachers is 72% (seventy-two percent) for 1st grade and 50% for 3rd grade.

Accordingly, it can be emphasized that candidates who cannot detect that the answer to question 8 is incorrect (Table 9, p.11), and whose explanations are wrong at the same time, have the misconception that "the image of an object that is not directly in front of the mirror does not form". This misconception is also present in the literature (Blizak et al., 2009; Chen et al., 2002). Thus, it can be stated that the candidates who detect the error given as an answer to this question and whose explanations are wrong have wrong information. According to the findings obtained from Table 9, the percentage of acceptable explanations for erroneous question solving by prospective teachers is 33% (thirty-three percent) for 1st grade and 39% for 3rd grade. In the light of these findings, the percentage of first-grade prospective teachers, who learned that the image of an object not directly in front of the mirror will be formed, is low while the percentage of third-grade prospective teachers is medium.

Considering the findings outlined in Table 10 (p.12), the candidates who could not determine that the explanation given as the solution to the 10th question were incorrect, and whose explanations were wrong, had the misconception of "in a plane mirror, the image is on the mirror's surface". This misconception has been reported in the literature in different ways (Blizak et al., 2009; Chen et al., 2002; Durukan & Paliç Şadoğlu, 2020; Heywood, 2005; Kocakülah, 2006; Pompea et al., 2007; Şen, 2003). Therefore, it can be stated that some of the candidates in this coding group have misconceptions that the image is inverted and real. Candidates in this category with partially correct explanations have the above-mentioned alternative concepts about the image location in a plane mirror. The percentage of acceptable explanations for erroneous question solving by prospective teachers is 22% (twenty-two percent) for 1st grade and 17% for 3rd grade. Thus, the percentage of the participants in 1st grade who know the information that "the image of an object is behind the mirror in the plane mirror" is low, and the percentage of the participants in 3rd grade is deficient. Anıl and Küçüközer (2010) opined that the misconceptions of the candidates regarding this question can be corrected with an activity involving a glass plate and two identical candles.

Based on the findings in Table 11 (p.13), participants who could not identify the wrong explanation given for the solution of the 11th question, and whose explanations were also wrong, had the misconception that "the size of an object's image in a plane mirror varies depending on the object's distance from the mirror". This misconception was also revealed in the studies of Blizak et al. (2009). The percentage of acceptable explanations for erroneous question solving by prospective teachers is 11% for 1st and 3rd grades. As a

result, the percentage of 1st and 3rd grade candidates who comprehend the information that "the size of the image in a plane mirror is independent of the distance of the object from the mirror and the size of the image is equal to the size of the object no matter how far the object is" is very low. However, the reason for the misconception in solving this problem of many candidates is because they confuse the actual size of the image with the image size perceived by the observer. This misconception can be eliminated by sharing the knowledge that no matter how far an object moves away from us, the actual size of the object does not change even though the perceived/apparent size of the object decreases.

From the findings presented in Table 12 (p.13), it was concluded that the candidates who could not determine that the answer to the 13th question was wrong, and whose explanations were wrong, had the misconception that "the image location of the object in the plane mirror changes according to the position of the observer". This misconception has also been revealed in the literature (Anıl & Küçüközer, 2010; Blizak et al., 2009; Chen et al., 2002; Heywood, 2005). The percentage of acceptable explanations for erroneous question solving by prospective teachers is 11% (eleven percent) for 1st grade and 39% for 3rd grade. Subsequently, the percentage of the participants in 1st grade who learned the information that "The position of the image of the object in the plane mirror does not depend on the location and point of view of the observer" is deficient, while the percentage of the participants in 3rd grade is at a low level.

Based on the findings in Table 13 (p.14), the participants who could not detect the wrong explanation given in the answer to question 15, and whose explanations were also wrong, thought that "the farther away an object is from us, the smaller we perceive the object". In addition, the candidates substitute the perceived/apparent size of the image for the actual size of the image. In line with this idea, the misconception which states that "if the observer moves away from the mirror, the dimensions of the image of the object get smaller" occurs amongst the participants in this category and coding. This misconception is consistent with the results of the literature (Anıl, 2010; Aydın et al., 2012; Chen et al., 2002; Heywood, 2005; Kaltakçı Gürel et al., 2017; Taşlıdere & Eryılmaz, 2015). A lack of information was detected amongst the candidates who determined that the answer to this question was wrong, but whose explanations were wrong. Thus, it can be said that these candidates do not fully understand the question or do not know the answer to the subject. The percentage of acceptable explanations for erroneous question solving by prospective teachers is 28% (twenty-eight percent) for 1st grade and 22% for 3rd grade. Hence, the percentage of 1st and 3rd grade candidates who learned the conceptual knowledge that "the size of an object's image in a plane mirror is not affected by the observer's looking at the mirror from a near or far point"

is low. According to Anıl and Küçüközer (2010), the misconceptions experienced by the candidates here can be corrected with an activity involving a glass plate and two identical candles. Subsequently, prospective science teachers have alternative concepts, wrong or incomplete information about the image in plane mirrors seen in the literature. It can be stated that the participants are not in an acceptable situation regarding their development in the field knowledge of the image in plane mirrors and their understanding of the students. Therefore, candidates should re-examine their subject knowledge. It is possible for the candidates to turn their own learning mistakes into profit when they become teachers or when they consider the mistakes they make due to wrong learning and lack of knowledge. According to Konyalıoğlu et al. (2010), using activities related to students' mistakes in the education of teacher candidates can help the latter to see the reasons for mistakes and to plan lessons while taking these into account. Candidates must be aware of students' mistakes and misunderstandings in the process of becoming teachers. Teachers should take precautions to ensure that students can distinguish between right and wrong. Being able to detect errors and reveal the causes of errors is related to learning. Individuals should be able to recognize mistakes with learned knowledge. It is further emphasized by Konyalıoğlu et al. (2010) that when something is right or wrong, it is essential to determine the cause of the error.

When teachers' PCK develops, it will be easier for students to learn concepts at a meta cognitive level. This depends on the adequacy of the teacher's SCK, which cannot be separated from her/his PCK. Nevertheless, giving wrong information or correct information while teaching the subjects allow the student to think about their experiences (Akpınar & Akdoğan, 2010). For this reason, error-based activities can be carried out to eliminate students' misconceptions about the image subject knowledge in plane mirrors at all levels of education. The activities' contribution to the students' learning can be examined. Similar studies can be done for different subjects related to physics. The effects of this can be investigated by including error-based activities in teaching. Research can be conducted regarding the approaches of students or teacher candidates who use concrete tools related to the subject and the changes in their knowledge levels. Prospective teachers' learning difficulties, motivations, and interests can be revealed through bilateral meetings with prospective teachers. Along with error-based activities, research can be conducted to determine which teaching strategies and methods can be used by prospective teachers to eliminate students' errors. The contribution of error-based activities to prospective teachers' assessment and evaluation can also be examined.

Limitations of the Study

This study is limited to 36 science teacher candidates continuing their education at a state university and their answers to these questions. It is also limited to 15 questions prepared by the researcher based on the professional knowledge and experience of the image in plane mirrors and the conceptual understanding from the relevant literature. In this context, similar results can be found in studies with sample groups in different environments, and different results can be obtained according to the perspectives and interpretation of the researchers.

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Appendix 1. Data Collection Tool

In the data collection tool, there are 15 open-ended questions, as well as correct and incorrect answers for these questions. Teacher candidates were asked to examine the answers given to the questions about the conceptual understanding of the image in plane mirrors in the data collection tool.

After the examination process was completed, the participants were first asked to write the letter T in parentheses (…..) if the answers were correct for them, and the letter F if they were incorrect. After that, the participants were told to write their own answers for the explanations they deem wrong.

(*Answer key*: 1 F, 2 F, 3 F, 4 T, 5 F, 6 T, 7 F, 8 F, 9 T, 10 F, 11 F, 12 T, 13 F, 14 T, 15 F)

<u>**Questions and Answers**</u>

1. In a dark room, there is a white object in front of the plane mirror. What can be said about whether this object will appear in a plane mirror or not?
Answer: In a dark environment, a plane mirror image of a white object is formed. (.....)
Description:

2. There is a black object in front of the plane mirror in a bright (illuminated) environment. What can be said about whether this object will appear in a plane mirror or not?
Answer: In a bright environment, the image of the black object in the plane mirror does not occur. (.....)
Description:

3. What can be said about whether it is necessary for the observer to look towards the plane mirror in order for an object in front of the plane mirror to form an image in the plane mirror in a bright environment? (Cited image: Demirci & Ahçı, 2016, p.174)

Answer: In order for an object to appear, the observer must look towards the plane mirror. Because the image of the object in the plane mirror is formed only when the rays reflected from the plane mirror come to the eye of the observer. (.....)
Description:

4. When an object in a bright environment is brought from point A to point B, which is closer to the plane mirror, what can be said about the location and size of the newly formed image of the object in the plane mirror?
Answer: When the object is brought from point A to point B, the image of the object in the plane mirror approaches the mirror, and the size of the object's image in the plane mirror does not change. (.....)
Description:
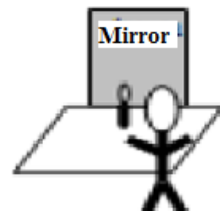
5. There is an obstacle between the object in a bright environment and the plane mirror as seen in the figure. What can be said about the mirror image of the object when it is placed (an opaque object)? (Excerpt image: Anıl & Küçüközer, 2010, p.109)
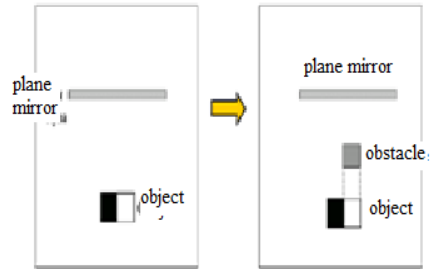
Answer: When an obstacle is placed between the object and the plane mirror, some part of the object is imaged, while the other part does not. (.....)

Description:

6. How does the size of the self-image seen by a student standing in front of a plane mirror change as the student moves away from the mirror?

Answer: As the student moves away from the plane mirror, the size of the student's own image in the mirror does not change. (.....)

Description:

7. How does the size of the image formed in the mirror of a student standing in front of the plane mirror change when the size of the plane mirror is increased? (Excerpt image: Anıl & Küçüközer, 2010, p.116)
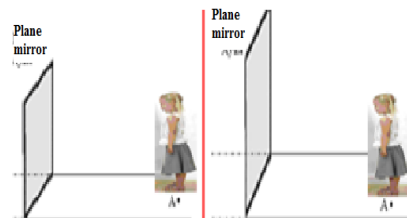
Answer: The size of the student's image formed in the plane mirror increases when the size of the mirror increases. (.....)

Description:

8. Which of the objects A, B, and C in the figure form a plane mirror image?

Answer: The image of B object is formed in the plane mirror, the images of A and C objects are not formed. (.....)
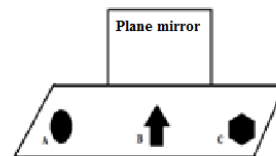
Description:

9. What can be said about the virtual or real image of an object formed in a plane mirror?

Answer: The image of the object in the plane mirror is virtual. (.....)

Description:

10. What can be said about the location of an object's image formed in in a plane mirror?

Answer: The image of the object in the plane mirror is formed on the surface of the mirror. (.....)
Description:

11. What can be said when the size of the image formed in the plane mirror of an object is compared with the size of the object?

Answer: The size of the image formed in the plane mirror of the object varies depending on the distance of the object from the mirror. As the object gets closer to the plane mirror, the size of the image increases, and as the object moves away from the mirror, the size of the image decreases. (.....)
Description:

12. What can be said about the inverted or flat image of an object formed in a plane mirror?

Answer: The image of the object formed in the plane mirror is flat with respect to the object. (.....)
Description:

13. What can be said for the observer about the location of the pencil's image in the plane mirror when the observer moves from position A to position B? (Excerpt image: Aydın & Öztekin, 2018, p.162)

Answer: When the observer changes position, the image of the object in the plane mirror also changes place. (.....)
Description:
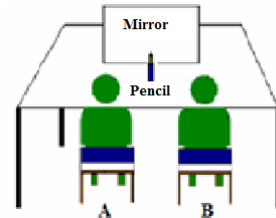
14. What can be said about the speed of the observer's image on the plane mirror when the observer moves with speed v in a direction perpendicular to the plane mirror?

Answer: When the observer approaches the plane mirror with speed v, the image of the observer in the plane mirror also approaches the mirror with speed v. If the observer moves away from the plane mirror with the speed v, his/her image also moves away from the plane mirror with the speed v. (.....)
Description:

15. In a bright environment, an observer looks at the image of the pen formed in the plane mirror, as seen in the figure. What can be said about the size of the image of the pen in the plane mirror when the observer moves away from the mirror? (Image quoted from Chen et al., 2002, p.119)
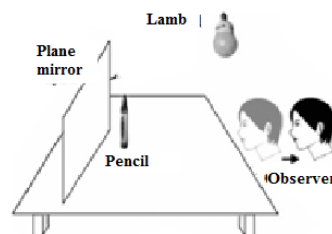
Answer: When the observer moves away from the plane mirror, the size of the pen's image on the plane mirror decreases. (.....)
Description

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.Ethical procedures. This research was carried out with the "Ethics Committee Permission" dated 13/10/2021 and numbered E-30640013-108.01-37445 of the Social Sciences Ethics Committee of Amasya University Science Ethics Committee.

This article does not contain any studies with animals performed by any of the authors.

The data was not taken from any electronic medium. The data has not been shared in any environment. The data is not available online.

There is no conflict of interest with any author, institution, or organizati

Learning Amidst COVID-19: Pre-service Teachers' Perceptions, Experiences, and Challenges with Online Teaching and Learning in Ghanaian University

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Abstract

Considering the rapid spread of the COVID-19 pandemic, most universities migrated to online mode of teaching and learning in a spontaneous manner without adequate preparation and guidance for the key stakeholders in the institutions. The change in mode of teaching has implications for pre-service teachers because of the unique nature of teacher education that includes both theory and practicum. The purpose of this study was to examine pre-service teachers' perceptions, experiences, and challenges with online teaching and learning. To achieve this purpose, a quantitative descriptive survey design was employed whereby 311 pre-service teachers were sampled and surveyed through questionnaire. The results of the data analysis indicated that the online mode had a positive impact on pre-service teachers' academic performance and assisted them to set their own learning schedules. The results also revealed that the online mode was more convenient, boosted confidence, and suited the learning styles of pre-service teachers. The findings revealed that pre-service teachers got immediate feedback from online assessments. Despite these findings, pre-service teachers indicated that the online mode was more expensive and limited their interaction with instructors. Further, pre-service teachers indicated their intentions to use the online mode of teaching and learning in the future, and it is recommended that the online mode be formalized in the university in the post-COVID-19 era.

Keywords: Online teaching and learning; online assessment; pre-service teachers; feedback; COVID-19; Ghana

Background

COVID-19's unparalleled health crisis has impacted practically every element of life. For instance, the education sector has been hit by a lot of

setbacks because of the sudden occurrence of COVID-19: brief school closure in over 180 nations since March 2020, exposing the vulnerability of education institutions around the world. This disturbance in schooling, along with the predicted slowing down of growth globally because of the economic slump, has a major impact on the most vulnerable kids who come from low-income families (UNESCO, 2020).

In reaction to the virus's spread, Ghana's government imposed a lockdown on March 15, 2020, that closed all schools, colleges, and universities, as well as all other educational institutions. This forced the education institutions especially at the tertiary level to adopt other means of completing the academic year. With the boost in online teaching and learning, the education system was thus changed significantly because of the unavoidable shutdown of schools and colleges for an extended length duration (Dawadi et al., 2020). As a result of unavoidable shutdowns due to COVID-19, many universities and colleges around the world including the University of Ghana have shifted to online learning.

Virtual learning increasingly plays a fundamental role in the educational system and learning is no longer constrained to traditional classrooms. With its introduction in institutions throughout the world in recent years, universities have found that making a successful transition between the traditional method of teaching and learning and online learning has now become an increasingly important difficult feat following the COVID-19 pandemic. Several colleges have implemented a "blended learning" technique that combines traditional face-to-face teaching and learning with online teaching and learning technologies to provide students with adequate learning experience. This transition has evolved to be a popular method since it gives students better versatility and access to a variety of teaching resources to help them learn (Wong & Fong, 2014). Thus, the pandemic has made remote learning obligatory, prompting schools and colleges to quickly embrace unprecedented tactics in their efforts to make online learning practicable, and learner-friendly.

The struggle to migrate fast to online learning environments has had an impact on universities, professors, and students at all levels. With the push to grant additional online learning options to students growing, it is critical to evaluate learners' views and experiences with this change from traditional face-to-face delivery to online delivery. Gaining insight into the motivation and attitudes of learners toward adopting technology may manipulate their level of participation during online learning (Ong & Lai, 2006). Basioudis et al. (2012) stated that students' views of the Learning Management System and its online resources can affect their degree of involvement. The attitudes of learners toward online learning and distance education are one of the variables influencing this transformation. Understanding their views and inclination can

aid universities and academic institutions in creating and implementing suitable online learning models and formats to meet the students' needs. Many scholars (Peytcheva-Forsyth et al., 2018; Rhema & Miliszewska, 2014) have emphasized the need for educational institutions to analyze and document students' attitudes and experiences towards online learning. The learners' attitudes and perceptions about online learning, according to Dhiman et al. (2014) are a major influence on students' learning outcomes. Students' positive views toward online learning are crucial to their preparedness and integration in online learning (Peytcheva-Forsyth et al., 2018). However, very little attention has been paid to Ghana's pre-service teachers' attitudes and experiences towards online learning and assessment. For instance, Warschauer (2007) advocated for more research into students' experiences and attitudes regarding the practice of online teaching and learning, since this will aid stakeholders in education in adjusting the educational system to improve student's participation and achievement in online teaching and learning. Considering this, the purpose of the study is to examine pre-service teachers' perception, experiences and challenges with online teaching, learning, and assessment. Specifically, this study addressed the research question: what are the experiences of pre-service teachers towards online teaching, learning, and assessment?

Literature review
Perception and experiences of students on online learning
According to a study conducted by Daniel (2020), both students and teachers have different perspectives on the usage of technology devices as a learning tool. With the different interactions and problems posed by technological innovation in educational settings, Kalyanasundaram and Madhavi (2019) stated that understanding how learners perceive e-learning has become a requirement for society. This perspective could be based on the fact that they have never interacted with these modern subjects due to a lack of accessibility or availability (Almaiah et al., 2020). The significance, difficulties, and perspectives of e-learning on distance education were discussed by Ajadi et al. (2008), who came to the conclusion that the survival of tertiary education in the twenty-first century will be dependent on the deployment and implementation of various technological tools. Also, Ngampornchai and Adams (2016) investigated North Eastern Thailand's students' experience with technology by using the Unified Theory of Acceptance and Use of Technology (UTAUT) model. Despite the fact that most students had a basic understanding of mobile devices as a result of their active social media usage, they had minimal understanding of e-learning technical tools

With an emphasis on developing nations like Vietnam, Pham et al. (2019) investigated the relationships between e-learning attributes: services, quality, contentment, and trustworthiness of students. The finding was that the quality of an e-learning service has a direct impact on students' conviction in their ability to learn online. Keller and Cernerud (2020) used multiple regression analysis to assess the perspectives of e-learners in a 2020 survey. Students' computer skills, attitudes toward new technology learning techniques, and the benefits and drawbacks of e-learning were all assessed. The approach and style of implementing e-learning technologies in schools were considered to be critical. Almarabeh (2020) used the technology recognition model to assess students' perceptions of e-learning. The findings suggest that students are not only qualified, but also willing to accept the e-learning method. According to Kalyanasundaram and Madhavi's (2019), students who are interested in online learning are also confident with online learning, teaching, and assessments.. Further, according to El-Seoud et al. (2014), the usage of e-learning interactive tools aids in the maintenance and motivation of students' learning processes.

Challenges of Online Teaching and Learning

Owing to the COVID-19 pandemic, majority of educational institutions all over the continent temporarily restricted their operational techniques. This was to prevent the virus from spreading any further (Kim, 2020). The term "online education" refers to the process of learning via the internet. It has both advantages and disadvantages. Online lessons save money on travel and other expenses. As a result, teachers and students have been abreast with the needed technical competencies necessary to participate in the electronic classes and the use of computers (Kim, 2020). Due to the spreading character of COVID-19, personal interactions between teachers and students have been severely affected. It has enhanced the role of information and communication technology (ICT), creating new obstacles and challenges for students such as amiable isolation, network hitches, and other environmental factors. During the pandemic, the pre-service teachers viewed online learning as a means of disseminating more freedom to contact with lecturers and interact with their educational texts and notes at their leisure and in an adjustable phase and space, as stated by (Khan et al., 2020).

Teacher-students relationships were thus changed as a result of online education, as teachers were unable to provide additional attention and care to learners who require it or who are physically exhausted. Additionally, the students considered that online classes were insufficient for them. The requirement for professors to provide recordings, power point presentations, and electronic notes for the students has increased their workload in online teaching. To work, teachers will need more than just mobile data; they will

also need enough bandwidth with strong connection. Teachers and students in online programs were physically exhausted and missed the classroom experience (Hindocha, 2020). Students who come from remote communities had limited or no connectivity access, making it tough for them to show up for their online classes. In some cases, they may not be able to join classes for the required time because of these connectivity issues. Spending long periods of time in front of a screen or on a mobile phone was equally stressful for students. The lack of real classroom conversation and detachment from the university library are the two most significant disadvantages of online lectures (Farooqui, 2020). Both teachers and students have witnessed a huge shock as an aftereffect of online education, which has had a repercussion on the teacher's productivity and student's education. Teachers' largest problem was quickly changing the educational texts to an automated form, since some were not skilled in this area and it was difficult to let the learners stay away from other socialization applications during online classes. The socioeconomic backgrounds of the students varied in diverse ways, making the ability to access the internet and other technologies unequal for them. Some had adequate access while others were not so privileged (Blog, 2020). Students desired online learning to keep their educational pursuit amidst the pandemic, according to a poll on online learning performed by students (Shetty, 2020). They also faced other hurdles, such as a lack of socialization, technology limitations, and vision problems, to name a few. When the classes resumed, 79 percent of students were no longer interested in online education classes because of the technical hitches they encountered while learning; the masses of students looked forward to a mixed paradigm approach to learning in attendance to the COVID-19 epidemic (Shetty, 2020).

An additional study enforced interpretative phenomenological analysis (IPA) to further understand the issues that university lecturers encounter when lecturing online and reaching students at home. They divided barriers into four categories:

1. Barriers in the home and other social environments, such as a lack of essential amenities, family disruption when teaching is ongoing and when assessments are being conducted.
2. Institutional help rubs, such as a lack of training, a lack of precision and navigation, and an inadequate allocation of funds for acquiring advanced gadgets and technologies
3. Technical issues encountered by teachers, such as a lack of technical setups, a lack of concern, and insufficient budget for purchasing advanced technologies.
4. Teachers' peculiar issues, such as bad behaviors, a lack of enthusiasm for teaching, and a deficit of technological competence, create hindrances to online learning and evaluation (Joshi & Vinay, 2020).

When compared to traditional teaching methods, the students believe that online courses are discomposed.

Educators do not accept that online classes may possibly be a substitute for traditional (face-to-face classes). As said by Kulal and Nayak (2020), it has been difficult for teachers especially those who teach practical lessons to teach due to inadequate facilities and the absence of interpersonal link with the students. Isolation procedures have resulted in children and teachers being confined to their homes as a result of the pandemic. Due of the pandemic, it is tedious for teachers and students deliver and study in an isolated atmosphere. Male students were highly displeased with the present online learning, while female students were deeply displeased with their immediate household setting, which harmed their education (Chandra, 2020).

Experiences and benefits of online learning and teaching
Pre-service teachers experience in the digital evolution forms an integral part of the worldwide efforts in migrating to the digital space for teaching and learning. Students' exposure to the technological use for teaching and learning is critical for preparing preservice teachers to embrace the digital transition or integration for teaching and learning. The covid-19 pandemic has widely affected most of the activities which involve human contact especially teaching and learning in areas where e-learning has not been fully integrated into the education system, which led to the closure of schools (Dhawan, 2020). Thus, a number of universities and schools have had to rapidly adapt to online teaching to create learning environments and prepare future teachers (Flores & Gago, 2020). This abrupt transition requires both teacher educators and pre-service teachers to adapt to new models of teaching environments, and this process also results in several perceptions, challenges, and constraints that need to be overcome (Carrillo & Flores, 2020).

A number of studies have looked into the impact of e-learning, the factors that affect preservice teacher's professional growth, the inexperience of preservice teachers, the challenges associated with poor online teaching and learning, the inadequate or lack of resources and technical support, perceptions, and anxieties towards preparing preservice teachers for online teaching and learning (Judd et al., 2020; Huber & Helm, 2020; Zhang et al., 2020). Hill (2021) and Khurana (2016) claimed that the swift transition towards the deployment of online teaching and learning created chances for preservice teachers to get interacted with facilitators due to its ease in terms of time, place, the pace of learning, and cost. Garrison (2000) was of the conviction that preparation of preservice teachers towards online learning necessitates the preservice teachers to be adaptable and flexible to a range of instructional designs, as well as to improve preparation and delivery of

diversified teaching and learning methods. Ordinarily, preservice teachers are familiar with theories, pedagogies, and practical strategies by taking courses with instructors (Jin, 2022) liaised with the use of teaching and learning technologies to support the perennial deployment of the online teaching and learning approaches (Aparicio et al., 2016).

E-learning, whether asynchronous or synchronous, offers a pre-service teacher several benefits professionally: for example, it does not depend on being in the same physical location and can thus increase participation rates. In addition, it can be cost-effective because online learning reduces travel and other costs required to attend in-person classes and also may provide learning opportunities for adult students while also engaged in full-time or part-time jobs (Fedynich, 2014; Yilmaz, 2019). Online teaching and learning allow for effective interactions between students and faculty members with students getting to electronically interact with lecturers remotely for formative feedback to improve teaching and learning (Debrah et al., 2021; Danchikov et al., 2021; Bdair, 2021). Baskan et al. (2020) study revealed that online learning offers the opportunity of increasing preservice teachers' teaching competence or pedagogical skills and preparing them for effective online teaching and learning.

Anxiety in using online learning and teaching

Teaching anxiety is a considerable affective state that may have some adverse effects on the learning and teaching processes (Aydın, 2021). Anxiety in the online teaching environment among pre-service teachers is one of the factors that may negatively affect online teaching effectiveness and professional growth (Dolighan & Owen, 2021). Anxiety in using online teaching and learning in this sense refers to the dread and the apprehensions that come as a result of the skills and difficulties involved in handling online teaching and learning. it can be seen as a normal human emotion, it may cause failure, a decline in academic performance, inability to concentrate on lessons, avoidance of personal relationships and social surroundings, and being introverted (Kunt & Tüm, 2010). It is very important to prepare future teachers to handle online learning without denying them the prior experience and knowledge on how to engage and support all students in learning, designing the media, and maintaining an effective situation for students. According to the Kennedy and Archambault (2012), the digital space for teaching and learning increases pre-service teachers' knowledge of evolving online classroom management and new technologies to reach their students in interactive and engaging ways, as well as an appreciation of the ever-changing existence of technology and its effect on the education system as a whole. The feeling of dread towards the use and management of online teaching and learning comes as a result of inadequate technological support in training

colleges, lack of teaching experience, pre-service teachers and faculty members attitude towards technology integration for online teaching and learning, perceived ease of use, fear of making mistakes, inadequate preparation, unmet expectations and time management among others are among the contributing factors towards preservice teachers' anxiety (Gyamfi, 2017; Woldab, 2014; Almaiah et al., 2020; Safira, 2021). Safira (2021) thematic analysis disclosed that factors that contribute to preservice teachers' anxiety are both administrative and personal factors.

Pre-service teachers' future intentions on online teaching and learning

Pre-service teachers' willingness to pursue online teaching, learning, and assessment heavily depends on their perception, attitude, commitment, and experience. A good attitude and effective experience in the use of online teaching and learning, and assessment will promote acceptance among pre-service teachers. Today's pre-service teachers commonly use technological and educational applications routinely in their daily lives, the use of such applications for online teaching and learning purposes is more problematic (Sailer et al., 2021; Valtonen et al., 2011) which requires specialized software and skills to be accomplished. OECD (2015) maintained that the impetus of current policies to promote pre-service teachers use of the digital platform for online teaching and learning is grounded in (a) promoting online teaching and learning processes through digital media and (b) allowing students to explore fully in the 21st-century knowledge and experience by advancing their digital literacy and professional growth.

The desire of pre-service teachers to embrace and apply educational technology for online teaching and learning is defined as the amount to which they will be willing to accept and use educational technology for teaching and learning in the future (Joo et al., 2018) It is also thought that the desire to utilize digital teaching and learning is directly tied to the individual's acceptance of technology. In recent years, experts have proposed and tested a number of models to explain and predict the acceptance and implementation of technology integration among teachers (Wong, 2016). The Technology Acceptance Model (TAM), for instance, explains the elements that influence instructors' acceptance and implementation of technology (Scherer & Teo, 2019; Wong, 2016).

A recent scoping review of over 40 research using the Technology Acceptance Model as a conceptual framework found that instructors' intention to utilize Technology for teaching improves when educational technology is both simple to use and helpful (Scherer & Teo, 2019). Moreover, a larger degree of technology integration was linked to higher levels of behavioral intentions, according to the study conducted (Scherer & Teo, 2019).

Methods and materials

Research Design

A research design according to (Kothari & Crag, 2014; Creswell, 2013) can be defined as a plan, structure, and strategy for conducting research in order to identify the tools needed to address an issue and reduce variance. Its aim is to make sure that the evidence gathered guarantees that the questions are answered as clearly as practicable. Similarly, research design makes it easier to complete numerous research procedures, making research more efficient and yielding more knowledge with less work, time, and money spent (Kothari & Crag, 2014). This study adopted the quantitative research design because, it is an approach in which the investigator develops knowledge primarily via the use of positivist statements (Creswell, 2013), and the positivist paradigm encourages researchers to take a scientific and methodical approach to their work. Thus, the quantitative design was employed in this study since it allowed the researchers to conduct an objective analysis and acquire actual knowledge through measurement. Specifically, the researchers employed a survey design to collect data at a specific point in time with the goal of detailing the nature of online teaching, learning, and assessment. According to Glasow, 2005, the survey design is an effective means to collect data from a wide range of people and educational settings in a methodical manner.

Population and Sample

The study's population was undergraduate students of one of the teacher education universities in Ghana. Students (pre-service teachers) who had taken online courses mainly during the emergence of the pandemic formed the study's target population. This study adopted a multi-stage sampling procedure in arriving at a sample of 311 pre-service teachers for the study. In the first phase, the teacher education department was randomly selected from the list of departments in the University. In the second phase, the questionnaire was sent to all the students in the department, out of which a convenience sample of 311 students responded to the questionnaire.

Research Instrument

The data for this study was collected using structured questionnaires. A questionnaire, according to Siniscalco and Auriat (2005), is a survey tool used to collect data about individuals or a social unit such as a household or a school from individuals. The questionnaire was in two parts: the background or demographic section, and the section on students' experiences with online teaching, learning, and assessment. The questionnaire was created on the google forms and distributed via the mail and WhatsApp platforms of the sampled participants. The questionnaire was on a five-point Likert Scale-

based statements ranging from "Strongly Disagree" to "Strongly Agree". Prior to the administration of questionnaire, they were piloted on students from department other than the teacher education department.

Ethical Consideration

The goal of research ethics is to determine some standards and norms of conduct the researchers should adhere to (Connolly, 2003). The researcher followed the laid down ethical criteria when conducting this study in order to protect the subjects as well as themselves. Before the questionnaires were given out, all respondents were told that the information they provided would be kept private. Participants were also volunteered to participate willingly, and could withdraw from the study at anytime.

Results

Demographic Profile of Respondents

The objective of the demographic profile was to find out more about the respondents which would enable their responses to be put in the right perspective. Therefore, the results on the demographic profile covered their sex, age group, and level. The results are displaced in Table 1.

Table 1. Demographic Information of Sampled Respondents (N=311)

Variables	Categories	Frequency	Percentage %
Sex	Male	146	46.9
	Female	165	53.1
	Under 18	35	11.3
	18-22	161	51.8
Age Group	23-27	92	29.6
	28-32	18	5.8
	33 and above	5	1.6
	100	100	32.2
Level	200	48	15.4
	300	59	19
	400	104	33.4

Source: Field Survey, 2021

It was discovered from the results that majority of the respondents (53.1%) were females, and aged (51.8%) between 18 – 22 years. In terms of the level of education, 33 and 32 percent were in levels 400 and 100 respectively.

Pre-services teachers' experiences with Online Teaching, learning and Assessment

The study investigates the experiences of students that included the benefits of online teaching and assessment during the COVID-19 lockdown,

challenges with the online teaching and learning experiences, and intentions of using online learning and teaching in the future. The results for this section of the study are presented in Table 2.

Table 2. Pre-service teachers' experiences with online teaching, learning, and assessment

Benefits of Using Online Teaching and Assessment	SA%	A%	N%	D%	SD%	Mean	SD
Items							
Online teaching and learning help me to set my own schedule	26.4	42.1	19.6	10.0	1.9	3.80	0.99
Online teaching and learning is more affordable than the traditional method of teaching and learning	26.4	26.7	21.2	17.0	8.7	3.44	1.27
Online learning is more convenient than the traditional method	32.5	29.9	20.6	12.9	4.2	3.73	1.16
I acquired new technical skills through the use of online teaching and learning	32.8	40.5	18.3	5.1	3.2	3.94	1.00
Online learning platforms provided were easily accessible	24.1	40.8	24.1	9.3	1.7	3.76	0.97
Online teaching and learning suits my learning style	26.7	35.7	23.2	10.0	4.4	3.70	1.10
Learning online had a positive impact on my academic performance	27.3	41.2	20.9	7.1	3.5	3.81	1.02
Taking online classes boosted my confidence to participate	28.3	33.8	24.4	10.3	3.2	3.72	1.08
I felt that the quality of class discussion via online teaching and learning was high compared to face to face	28.3	29.9	22.8	8.4	10.6	3.58	1.23
Perceptions of students towards Online Assessment							
Online assessment created an effective platform to rate student's academic performance	34.7	38.9	17	7.1	2.3	3.96	1.00
Online assessment is more reliable than face-to-face assessment	30.5	30.9	22.5	10.9	5.1	3.71	1.16
Online assessment is flexible	28.0	48.9	16.1	5.5	1.6	3.96	0.89
I got immediate feedback from online assessment	35.7	53.4	8.7	2.3	0.0	4.11	0.94
I am less anxious during online assessment as compared to face-to-face assessment	32.8	45.3	14.5	4.5	2.9	4.00	0.95
Online assessment boosted my academic performance	33.8	39.5	19.0	5.1	2.6	3.96	0.98
Future Intentions of Students on Online Teaching and Assessment							
If I had the opportunity to take another course online, I would gladly do so	29.3	36.7	22.8	7.7	3.5	3.80	1.05
I would prefer if all future assessments would be done online	35.4	32.8	22.2	5.5	4.2	3.89	1.07
Future assessment should be a blend of online and face-to-face	40.8	35.0	17.7	4.5	1.9	4.07	0.97

Challenges Student Face when Using Online Teaching and Assessment							
I easily get distracted learning online as compared to face- to- face classes.	33.1	37.6	18.6	6.8	3.9	2.10	1.06
Online teaching and learning reduced my rate of interaction with the instructor.	31.5	39.2	21.5	5.8	1.9	2.07	0.96
The time allocated for online assessment is relatively short.	32.5	44.7	17.4	4.5	1.0	0.87	1.96

Source: Field Survey, 2021

Table 2 reveals that the acquisition of new technical skills through the use of online teaching and assessment; positive impact of online learning on academic performance; and online teaching and learning assist students to set their own schedule had high appraisals. Similarly, the appraisal of accessibility of online learning platforms, "online learning is more convenient than the traditional method", "online classes boosted my confidence to participate", and online teaching and learning suits my learning style" were both scored highly and evenly. On the contrary, 27 percent of the respondents indicated that online teaching and learning is not more affordable than the traditional method of teaching and learning. This item had the lowest mean score in that category which is 3.44., with a standard deviation of 1.27.

In terms of respondents' experiences with online assessments, majority of the respondents indicated positive experiences as revealed by their responses to most of the items. For instance, about 74 % of the respondents indicated that "Online assessment created an effective platform to rate student's academic performance". Similarly, about 89% of the respondents revealed that they "got immediate feedback from online assessment". Further, 78% of the respondents stated that they are "less anxious during online assessment as compared to face-to-face assessment".

For future intentions of students towards online teaching and assessment, greater percentage of the respondents expressed positive attitude. For instance, the item "future assessment should be a blend of online and face to face", had the highest mean value of 4.07 with 0.97 standard deviation. It is an indication that students have good intentions towards future prospective on online teaching and assessment.

With respect to challenges with online teaching, learning, and assessment, it was found that 71 % of the respondents believed that they were easily distracted during online learning as compared to face to face. Similarly, majority of the respondents (71%) agreed that "online teaching and learning reduced their rate of interaction with their instructors". Majority of the respondents also complained by the time allocated for online teaching and learning. Specifically, 78 percent of the respondets indicated that "the time allocated for online assessment is relatively short".

Furthermore, respondents were asked to identify the technical challenges they faced during online teaching and learning and assessment and the results from their responses are shown Figure 1.

Figure 1. Technical Challenges during Online Teaching and Learning
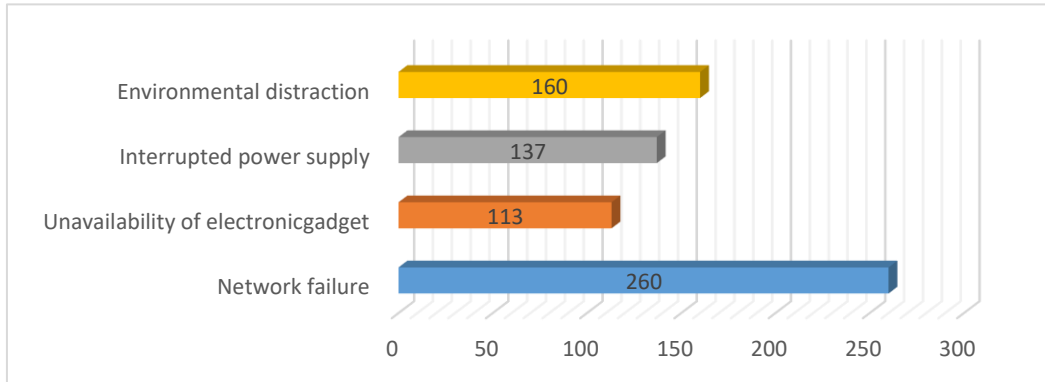
It came to light that students encountered varied level of technical challenges with regards to online teaching and learning. These challenges range from environmental distraction, interrupted power supply, unavailability of electronic gadget and network failure. Out of the total number of 311 respondents, 260 indicated that network failure was their major challenge during online teaching and learning. The second-highest challenge was environmental distraction with 160 respondents indicating that.

Again, 137 respondents identified interrupted power supply as a technical challenge. Because students were taking online classes through electronic means, 113 of them indicated that unavailability of electronic gadget was also a challenge.

In line with the challenges, respondents were also asked to identify the challenges with regards to online assessment and their responses are display in Figure 2.

Figure 2. Challenges during Online Assessment
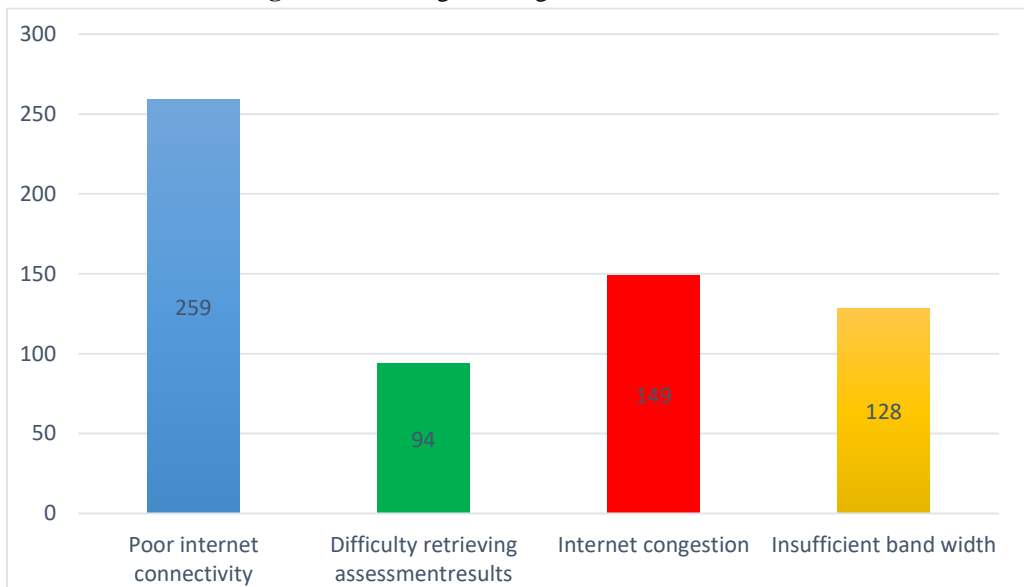
From Figure 2, 259 respondents indicated poor internet connectivity as a major challenge during online assessment. This was followed by internet congestion, insufficient bandwidth, and difficulty retrieving assessments results.

Discussion, conclusions, and recommendations

The present study analyses students' attitude and experience with online teaching and assessment during Covid-19 lockdown period. According to the findings, online studying technology enhances knowledge/ understanding access, resulting in students developing a good attitude about it. This end is primarily based totally on the utility, self-efficacy, comfort of use, and student conduct in terms of online learning and assessment. This study affirmed the results of online learning, such as the ability to learn from any location, which is not available with traditional face-to-face learning. Furthermore, the study shows that students consider online learning and assessment to be equivalent to face-to-face learning, illustrating the similar experience of being educated as done through physical classroom teaching.

Unlike previous studies, however, this study found that online learning has grown in popularity in recent years, with students preferring to use online learning tools to engage with one another and with instructors. For instance, in previous studies (Totaro et al., 2005), teachers believed that e-learning takes time, can cause student monitoring issues, and can cause them to pay less attention in traditional instruction. These distinct insights could be linked to participants' inexperience with the e-learning medium, as well as their varying

technological knowledge and skills, highlighting the necessity for formal training and workshops on various technology approaches and platforms to boost e-learning activities

This study revealed that majority of students indicated that they benefited from receiving rapid feedback that inspired them and helped them perform well on the exam. These features are the most significant advantages of computer-based assessments over paper-based tests. The most significant physical distinctions between computer and paper test administration are perceived interactivity and display area size.

In the current study, it was discovered that a larger proportion of respondents agreed that online learning and assessment was useful for enhancing and developing the coaching and studying process, indicating that students accept that online tutoring is beneficial in upgrading and developing the instructing and studying procedure. On the contrary, previous findings by Poon et al. (2004) found that students from universities had difficulties with the online learning as a teaching device, citing a variety of reasons including problems with technology and technology tools, difficulty in interconnecting and debating with learners, insufficiency of requisite internet comparability, and individual learning preferences.

Several studies (Qureshi et al., 2012; Khan & Nawaz, 2013; Mohammadyari & Singh, 2015) found that learners' acquisition and approval of online learning was swayed by a variety of individual (e.g. keenness to implement internet learning), social (e.g. personal and coach effect), and organizational (e.g. scientific provisions, monetary, and framework) elements within an e-learning environment. In line with these findings, Nguyen et al. (2020) found that the most significant barriers to online learning are grounded on different shareholders' viewpoints on framework, machinery, administration, implementation, and instructive factors.

Further research found that in order to acquire users' confidence and ameliorate their approval of internet learning, e-learning solutions must match their needs (Rehman et al., 2021). Communication between the teacher and the student is critical for successful learning outcomes. Another major drawback of online education is students' inability to communicate adequately with instructors face-to-face. Teachers are unable to check in with pupils on their grasp of lessons in a tangible way. As a result, they are unable to alter their teaching activities and online discussions because they do not know what their pupils require. Learners can use online exams to help them achieve their concluding scores and learning purposes (Collings et al., 2018). Due to a lack of familiarity with the new procedures, online assessments during the epidemic era proved to be another problem. Students were unable to participate in real-time problem-solving activities or obtain teacher feedback.

Formative and summative assessments, on the other hand, are conducted in both synchronous and asynchronous modes.

Sufficient and up-to-date resources play an important role in students' online learning (Azevedo & Marques, 2017), and their effective propagation is critical for success (Akram & Yang, 2021).

Restricted internet connectivity, on the other hand, has arisen as a serious barrier that stops students from learning effectively. Other research has looked into the similar issues that instructors encounter, such as insufficient financing (Nagashima, 2014), poor ICT integration (Tosuntaş et al., 2019), time constraints and cyberspace connectedness. Tertiary institutions need to be provided with the necessary cutting-edge technology infrastructure to help students study faster (Wang et al., 2018). Also, lack of abilities and a lack of utility for practical examination (Liebenberg & Pieterse, 2018) was cited as barrier to online teaching and learning.

Conclusion

In the past, online learning and evaluation were underutilized, particularly in underdeveloped nations such as Ghana. The present COVID-19 pandemic, however, has compelled the whole world to move from the traditional face-to-face mode of teaching and learning to the online mode. This research provides a realistic understanding of online teaching and assessment methods and obstacles encountered by students from one of the teacher education universities in Ghana, especially during the COVID-19 outbreak. It can be concluded from this study that, students had positive experiences with the online teaching, learning, and assessment, and are likely or willing to use the online mode of teaching and learning in the future although there were challenges with the internet connectivity and infrastructure.

Recommendations

According to the findings, learners' happiness with online learning is influenced by learning course flexibility. As a result, course coordinators should create flexible online learning programs or approaches that address a wide range of student needs. Learners should be given the option of choosing from a variety of online learning courses or methods for them to select the one that best suits their learning style and needs.

For effective online learning, the quality of online learning courses is equally critical. The technology that is utilized to conduct courses is closely related to this. As a result, both the curriculum and the technology should be designed to be simple for students to understand. The perceived ease, with which students can use technology, as well as the overall quality of the course, will have an impact on their satisfaction and performance.

According to the findings, instructors should use interactive communication-based tools and activities to enhance student interest and engagement in order to foster online learning.

In addition, the university should establish an ultra-modern IT support unit for instructors and students to give technical assistance and also train them and also give them higher education commission should develop a approach to make internet access for educational motives more accessible and reliable.

Human Studies: All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

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Examination of the Abstraction Process of Parallelogram by Sixth-Grade Students According to RBC+C Model: A Teaching Experiment

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Abstract

This study used the RBC+C model to reveal the abstractions of the 6th-grade students in the process of transition to the parallelogram area formula. Also, constructing parallelogram area information was employed as a teaching experiment based on the basic interpretive approach, one of the qualitative research methods. The study participants comprised 9 volunteer sixth-grade students with high, medium and low mathematics success levels in a public school in Istanbul in the 2021-2022 academic year. Four activities prepared by the researcher on triangular, rectangular and parallelograms were used as data collection tools. In the study, activities were recorded on video and then transcribed. As a result of the research, it is seen that students with a high and medium success level in the recognizing and building phases did not have difficulty finding the quadrilateral and triangular areas and guided the students with a low success level. Moreover, it was found that students constructed parallelogram area information. Still, when asked about the area formula, they had difficulty expressing their operations even though they correctly found the area. This is because students process by rote and cannot explain mathematical information logically. In line with these results, it is considered necessary and recommended to organize teaching activities that will allow students to learn meaningfully.

Keywords: Mathematics teaching, parallelogram area, abstraction level, constructivist approach

Introduction

Abstraction means an individual structuring a situation or the information he/she has learned due to mental processes. According to the Turkish Language Society(2022), abstraction " refers to the mental process, dealing with any feature of an object or the relationships between its features alone, and separating the inseparable in reality in thought". Mathematical abstraction is the activity of rearranging mathematical information or problem as a result of mental processes in the individual's learning environment and constructing a new mathematical structure (Hershkowitz, Schwarz & Dreyfus, 2001).

Since concepts are produced at the end of the abstraction process, and mathematical thought and abstraction are inseparable, mathematics is a science of abstraction (Yıldırım, 1988). Abstraction is the process of change that enables the existing situation constructed in memory to be combined with new situations resulting from experiences (Skemp, 1986).

The fact that mathematics is an abstract science and mathematical concepts are obtained due to abstraction (Altun, 2014) reveals the importance of abstraction in examining the formation of mathematical concepts. The inability to observe abstraction has led to much research and the emergence of the Recognizing-Building With-Constructing (RBC) abstraction model, in which observable actions that provide information about the abstraction process are defined by Hershkowitz, Schwarz and Dreyfus (2001). The abstraction process has been defined as recognizing, building with and constructing, and the RBC model name is an acronym (Altun & YILMAZ, 2010). For the abstracted information to become permanent (Memnun, 2011), the model became RBC+C as a result of the addition of the epistemic action of consolidation (consolidation +C) by Dreyfus (2007).

RBC+C works on observable cognitive actions, and the mental processes of the participants are defined based on the actions. It also facilitates the observation of the structures formed in the process (Dreyfus, 2007; Dreyfus & Tsamir, 2004; Tsamir & Dreyfus, 2002). The observable cognitive actions put forward in this model enable the examination of the process of recognizing, building with, constructing and consolidating abstraction.

Recognition from observable cognitive actions refers to using a recognized structure in new situations (Dreyfus, 2007; Hassan & Mitchelmore, 2006; Hershkowitz, Schwarz & Dreyfus, 2001). The act of *building with* is the ability of the individual to associate the mathematical expressions he/she constructed beforehand to reach a solution and achieve the goal by using them (Dreyfus, Hershkowitz & Schwarz, 2001; Tsamir & Dreyfus, 2002). The act of *constructing,* expressed as the process of reorganization and restructuring, can be defined as the construction of new information due to the restructuring of existing information by undergoing

partial changes (Bikner-Ahsbahs, 2004). Recognizing, building with, and constructing actions are integrated actions. First is the recognizing action, then the building with and constructing, respectively (Dreyfus, 2007; Dreyfus, Hershkowitz, & Schwarz, 2001). Every newly acquired concept needs to be consolidated. In mathematical concepts, a permanent new structure can only be constructed by consolidation. The act of consolidation can be realized with mental activities as a result of using the information to construct new information by associating it (Dreyfus, 2007; Dreyfus & Tsamir, 2004).

In the literature review, according to the examinations of students' information-constructing processes with the RBC+C model (KALAYCI & Akkaya, 2019; Yeşildere & Türnüklü, 2008; Atıf Karataş, 2021; GÜLER &ARSLAN, 2018; Memnun & Altun, 2012a; Memnun & Altun, 2012b; Türnüklü & Özcan, 2014; Çubukluöz, ADIGÜZEL, Özdemir & Akkaya, 2018; KOBAK-DEMIR & Hülya, 2019; Akkaya, 2010; Çelebioğlu, 2014; Altun & Durmaz, 2013; KAPLAN & Elif, 2015; Schwarz, Hershkowitz & Azmon, 2006), no study was found on how secondary school students constructed parallelogram area information. This study is a unique study that will contribute to the field.

Purpose and Significance of the Study

This study aims to examine the processes of constructing parallelogram area information for sixth-grade students in the context of the cognitive actions of recognizing, building with, constructing and consolidating the RBC+C abstraction model.

In Turkey, much qualitative research is conducted using descriptive analysis, content analysis, etc., to construct new teaching designs and examine existing teaching styles. The abstraction process is to be carried out more actively with these researches about the abstraction of information, examining in depth the sample information abstraction processes. Also, the researchers gain information and experience about the abstraction process and support the students to identify and overcome the points they have difficulty with. This situation shows the need for abstraction studies and reveals its importance. In addition, the 2018 Primary Education Mathematics Curriculum (Ministry of National Education, Board of Education and Discipline, 2018) aims to develop a positive attitude towards mathematics with the students' experiences and develop the ability to construct and build with information.

This study evaluated the construction of the parallelogram area information in the mathematics learning process using the RBC+C abstraction model. The RBC+C abstraction model allows the analysis of students' information learning processes thanks to the recognizing, building with, constructing and consolidation processes, which are observable cognitive actions and facilitates the analysis. Analysis of students' information-

constructing processes through the RBC+C model shows the validity and effectiveness of the analysis. In addition, it reveals a need for research examining student achievements, especially in this abstraction, due to the lack of research conducted in Turkey on abstraction in the mathematics literature.

As a result, this study aimed to evaluate the nature of information formation, namely, abstraction during learning parallelogram area information in appropriate learning environments. The research results are also crucial in determining the paths that educators will follow for students' construction of information in parallelogram area learning, and the research is essential in this respect.

Method
Research Model

This study used the process of constructing parallelogram area information as one of the qualitative research methods and the teaching experiment method based on the basic interpretive approach. In the teaching experiment, qualitative data and instructional notes were obtained from video recordings taken in the learning environment for observation and information construction (Knuth & Elliot, 1997).

Participants of the Study

The research was conducted with 9 sixth-grade students studying in a public school in Istanbul. Participants had not yet learned the concept of parallelogram area or done any studies on this subject. Participants were selected among voluntary students who were considered to have high, medium and low mathematics levels. The students' mathematics achievement scores of the two written mathematics exams held during the semester were also influential in determining the students. Their success levels have been presented in detail in Table 1 by giving code names instead of their real names. Codes were used as S_1(Student1), S_2, S_3, S_4, S_5, S_6, S_7, S_8 and S_9 for the participants in the study.

Table 1. Participants' Codes and Success Levels

	Participant Codes	Mathematics Written Average	Success Levels
Group 1	S_1	97	High
	S_2	73	Medium
	S_3	50	Low
Group 2	S_4	93	High
	S_5	74	Medium
	S_6	50	Low
Group 3	S_7	95	High
	S_8	75	Medium
	S_9	48	Low

In constructing information, the members of the groups were selected heterogeneously according to their different levels of success to provide peer interaction, allow feedback corrections and prevent false learning during the construction of information. The application process was carried out as group work and 2 lessons of 40 minutes each to enable students to think multifacetedly with peer interaction and voice their thoughts. In this way, it was aimed to examine the process of constructing information more clearly and comprehensibly by passing through the students' steps of the RBC+C abstraction process.

Data Collection and Analysis

The research was conducted in a public school in Istanbul in the spring semester of the 2021-2022 academic year. Before the study, the students were told the study's purpose and informed about the subject of the study. The study was conducted as a group of 9 students with high, medium and low success levels.

Four activities prepared by the researcher were used as data collection tools. Activity applications were performed by taking approximately 40 minutes of video recording in the library allocated by the school administration. Students' interactions were observed in constructing the information, and field notes were created. Thus, it was to analyze the study process most accurately and effectively.

Results

In this section, the processes of reaching the parallelogram area information of 3 student groups of 3 students were determined according to the steps of recognizing, building with, constructing, consolidation and action. According to the findings, codes were created with the initial letter of students' names and the X code for the researcher.

Recognizing

In Activity 2, students were given triangular and quadrangular plots of different sizes and asked to explain how they solved by calculating the area separately. Below is the dialogue among the students and the activity carried out in Figure 1.
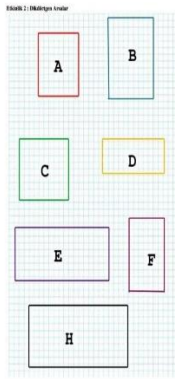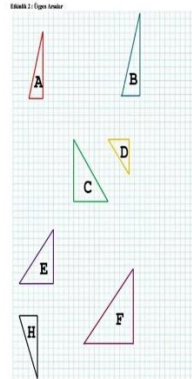
Figure 1.a   Figure 1.b   Figure 1.c   Figure 1.d

Figure 1. *Activities in which Recognizing Action takes place (Figure1.a, Figure1.b, Figure1.c, Figure1.d)*

X: Would you read the Activity 1 sheet aloud, S$_4$.

S$_4$: Welcome to the world of metaverses! Choose your avatar, name it, and start building your city immediately. You will create your city by buying land and building spaces on the land you buy. However, there is only one way to buy land in Metaverse: to accurately estimate the areas of the lands you choose by using the land modules we will give you. Tip: You can use the area formulas of the shapes you know, the plots drawn on the unit square paper, and the pencil and scissors to accurately and more easily calculate the areas.

S$_9$: Teacher, now we will calculate the area to buy the land.

X: Yes

S$_5$: If we do not calculate the areas correctly, we cannot buy the lands. Then we must calculate the areas of all the lands correctly. (laughing)

X: This is our only condition. I hope you will buy all the pieces of land. Well, activity 2 paper has triangular and quadrilateral lands. Calculate the plot areas.

S$_2$: Teacher, we can do it by counting the boxes.

S$_3$: I think so too.

S$_1$: Teacher, I will use the area formulas. Should we use cm or unit while finding the edge lengths?

X: Take the edge lengths as units, guys.

S$_8$: Will everyone find their areas, teacher?

X: Create your answers first. Then, as a result of the group evaluations, tell me the land areas you found.

Building with

Below is the dialogue among the students and the activity carried out in Figure 2.
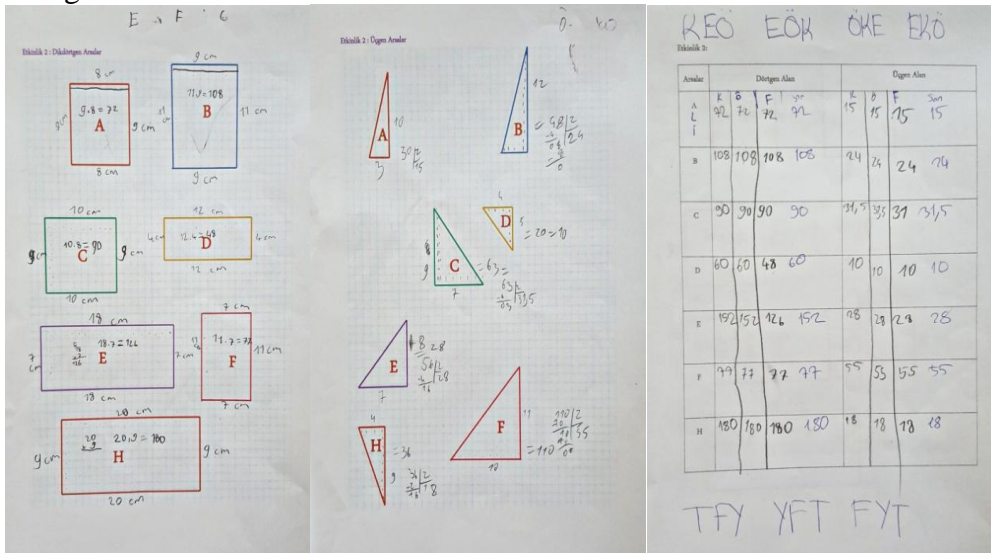
| *Figure 2.a* | *Figure 2.b* | *Figure 2.c* |

Figure 2.*Activities in which the Building with Action takes place (Figure2.a, Figure2.b, Figure2.c)*

Group 1

S_1*: I'm done.*

S_2*: Mine is almost done, too.*

S_3*: I couldn't calculate some areas.*

S_2*: Count boxes in rectangular areas.*

S_3*: What do we do with the triangle? Some of the boxes in the triangle aren't full.*

S_1*: Friends, let's not bother counting the boxes in the triangle. Just multiply the height of the edge by the edge and divide by 2.*

S_2*: Let's write the areas as a group.*

Group 2

S_4*: I found them all.*

S_5*: I'm on the last question about triangles. What about you, S_6?*

S_6*: I have more.*

S_4*: Are your quadrilateral plots finished?*

S_6*: Yes. I have trouble with the triangles.*

S_5*: Look, complete the shape. Do you see that it is rectangular?*

S_4*: Two triangles made a rectangle.*

S_5*: Just calculate the area of the rectangle and divide it by two.*

S_4*: Let's write our areas as a group.*

Group 3

S₈: If everyone has found an area, let's look at our areas.

S₇: I found them all with area formulas.

S₉: I could not finish it all. You finished it quickly...

S₈: There is nothing when calculating the area; counting boxes is sufficient.

S₉: What do we do about the triangle?

S₇: Multiply those two sides and take half.

When examining the dialogues, it was observed that the students with a high success level completed their information with the feedback of those with a low success level and progressed in the activities this way. It was also seen that the students in the groups generally tried to count the unit boxes while calculating the areas of the quadrilateral plots and the triangular area with the guidance of the students with high success.

X: Okay, guys, we will start with the quadrilateral plot areas. How did you calculate the areas?

S₁: Teacher, we can reach the area by counting boxes in the rectangle.

S₈: Or we could multiply the short and the long side.

X: It could be both. Did you do the same thing in the triangular?

S₉: Teacher, I had a hard time calculating the triangular plots, but I succeeded when

S₇ said that multiplying the horizontal and vertical sides in the triangle and taking half of them can calculate the area.

S₅: When we completed the rectangle in triangles, I saw that two identical triangles made a rectangle and divided it by two.

X: Good idea. If we do not think of a formula, let's produce such a formula ourselves. As far as I understand, all groups have calculated their areas. Let's see who gets which lands...

Constructing

To construct the parallelogram area information, the students were given the Metacrociand Activity 3 paper containing three questions. The following is the dialogue between the students and the activity carried out in Figure 3.

Figure 3.a *Figure 3.b* *Figure 3.c*

Figure 3. *Activities in which the Constructing Action takes place*
(Figure 3.a, Figure 3.b, Figure 3.c)

X: In this lesson, we will buy new land. I will distribute your sketches. See the lands you can buy.

S_9: Teacher, this is a different shape.

X: Yes, S_9. Last year, we learned about this shape and its features.

S_2: It looks like a rectangle.

S_1: It is not rectangular, but it is a parallelogram.

X: You are right, S_1. This shape is called a parallelogram.

S_4: Teacher, we have never calculated the area of such a shape.

X: Do you remember the activity paper you read to the class? It said, "You can use the area formulas of the shapes you know, the plots drawn on the unit square paper, and the pencil and scissors to calculate the areas accurately and more easily."So try to see which groups can buy which lands.

Students first calculated the areas using the trial and error method while finding the area of parallelogram lands.

Group 1

S_1: Let's count the boxes again.

S_2: I say we do that.

S_3: Let's calculate the areas.

Group 2

S_4: We do not know the parallelogram area calculation.

S_5: We will count boxes, then there is no other way.

S_6: Let's find it and write it down.

Group 3

 S_8: Let's count the boxes.

 S_7: We have to be careful about the corners.

 S_9: Look at how many units we're going to get! That's a tough one.

 When examining the dialogues among the students in the groups, it was noteworthy that the students with a high success level completed their information with the feedback they gave and thus progressed in the activities.

 X: Can everyone calculate the areas?

 S_1: Can we count the boxes, teacher?

 X: How will you count the boxes that are not full in the corners? Won't it be difficult?

 S_4: Teacher, this is how we found the areas we calculated last time.

 S_8: Yes, teacher. We do not know how to calculate the area.

 X: Calculate your results and see which group will buy which lands with this method.

 It was observed that the students tried to use the method of counting the unit boxes they used in Activity 2 to calculate the parallelogram area and had difficulty counting the unit boxes.

 S_8:We finished as a group.

 S_2: So we calculated it.

 S_5: We're done, too.

 X: Bring the paper on which you wrote the land areas. Which groups were able to buy which lands in Metaverse?

 The Activity 3 paper was collected, and the answers given by all groups for the parallelogram areas were examined.

 X: Children, all fields were found to be incorrect. Unfortunately, nobody can buy land at the moment. Let's discuss it together. How can you calculate the field that the box-counting method did not work for you?

 S_3: Teacher, the corners caused problems.

 S_4: What else can we do?

 S_8: If you say that corner boxes make 1/2 or 1/3 units of boxes, we can calculate it.

 X: Try different methods. I reminded you at the beginning of the activity. You can use the fields of pencils, scissors or shapes you know while calculating the area.

 S_2: Teacher, I found it. This shape is the side of the rectangle, so we multiply the horizontal and vertical sides to find the area. The area of the land is 72 square units.

 X: That shape is not a rectangle, S_2. However, we can say that they are rectangular. Look, they are not perpendicular to their corners. However, you calculated the area of land A correctly.

 S_5: Will we multiply the short and long sides like the rectangle?

X: No, honey. We do not multiply two sides. S_2 thought the shape changed form and made the edges vertical. However, we cannot do this.

S_1: What are we going to do then, teacher?

X: A little tip for you. S_2 is right about one thing. We can obtain a rectangle in this way. But how?

S_4: I found it; we can complete it like this.

X: You can add an extra triangular area to your parallelogram.

S_2: If we draw height from the lower corners, it makes a rectangle.

X: When you do not count a triangle area at that time, you add the triangle area you produce. If the area of these two triangles is equal, it happens. If you want, try cutting.

S_1: I found it, teacher. Look, I cut the triangular part. If we add it to this side, it becomes rectangular; we calculate its area.

X: The 1st group took all the parallelogram plots, children. Group 1 said that if we create a perpendicular from the lower corners, cut the triangle inside the parallelogram, and add it upside down from the other lower corner, we will get a rectangle and calculate the area, so show this in the figures you have.

S_8: How did Group 1 do it?

X: S_1 and S_2, show your friends how you did it.

At the end of the erroneous results of all groups, the teacher gave a clue to guide the students correctly. With the clue given by the teacher, the students constructed the information correctly using the trial and error method; that is, they realized the constructing stage. At this stage, high and medium-successful students noticed the field relationship faster than low-successful students.

Consolidation

To consolidate the parallelogram area information, the students were given the Metacrociand Activity 4 paper containing three questions. The following is the dialogue among the students and the activity carried out in Figure 4.
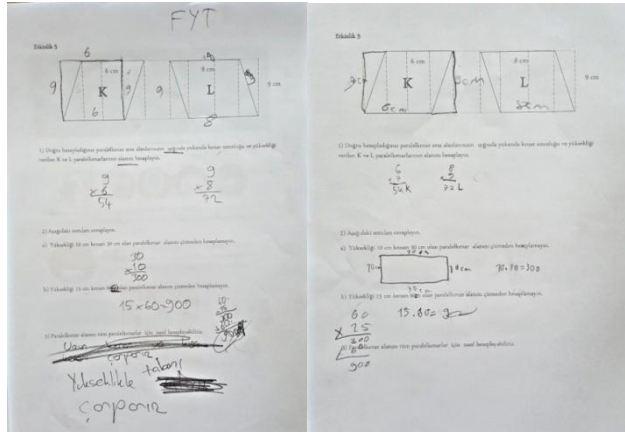
Figure 4.a   Figure 4.b

Figure 4. *Activities in which the Consolidation Action takes place (Figure 4.a, Figure 4.b)*

X: S₂, what did you say the parallelogram looks like?

S₂: Rectangle, teacher.

S₁: In fact, we said quadrilateral.

X: What are the similarities between the parallelogram and the rectangle, S₂?

S₂: The opposite sides are parallel and equal in length.

X: Right, that's how I explained it when we were learning the features of the quadrangles. You guys now have an idea of the parallelogram area. Let's do the Activity 4 paper as a group.

Students were allowed to review the similarities between the parallelogram and the rectangle and then started the activity. All student groups quickly answered the first two questions in Activity 4 with the guidance of students with high and medium levels of success.

X: Everyone can calculate the areas of the parallelograms whose height and edge are given, but the areas and drawings aren't given. So tell me, what is your field formula for all parallelograms?

S₁: We multiply the horizontal and vertical edges.

X: No, we don't multiply two sides. You produce the vertical length. It has a name.

S₃: We multiply the perpendicular by the length.

X: What else can we say if we don't call it perpendicular?

S₁: Right, right angle.

X: It was even derived from English.

S₁: High, I mean height!

X: Yes. Then which ones are you multiplying?

S₁: We multiply the length of the side by the height.

X: A random edge?

S₁: No, a certain edge.

X: What is it?

S₂: Horizontal edge?

X: No.

S₂: Short side?

X: No.

S₄: We multiply the long side.

X: No. Which side do you multiply by height each time?

S₈: Vertical edge.

X: No

S₂: We multiply the height by its bottom side.

S₅: Yes, you're right.

S₂: We multiply the height and the horizontal side.

X: In the triangle area, we also asked what we multiply by height?

S₁: Area of the triangle= $\frac{h.a}{2}$ and h is the height.

X: Yes, h is the height. Well, what about a?

S₅: Base! It is the base, namely the side which intersects the height. We multiply the base and height.

X: Yes, S₅, we multiply them. We multiply the height and base, and instead of the base, we can even say the edge is ere the height intersects.

All students answered the question "How can the area of all parallelograms be calculated?" in a shorter time in the Activity 4 paper. At the end of the activity, all students constructed and consolidated their parallelogram area information.

Conclusion

In this study, the processes of constructing parallelogram area information of sixth-grade students were examined within the framework of the cognitive actions of the RBC+C abstraction model. As a group, students were enabled to realize their learning processes, exchange information with each other and realize the process by performing peer learning.

As a result of the research, it is seen that students with a high and medium success level in the recognizing and building phases did not have difficulty finding the quadrilateral and triangular areas and guided the students with a low success level. It is an indication of the students' action of recognizing and using erroneous calculations of the quadrilateral and triangular land areas in Activity 2. During the constructing phase, it was observed that students with high and medium success levels constructed parallelogram area information by applying the trial and error method and provided peer education to students with low success levels. Calculating the area by converting the parallelogram to a rectangle indicates that the

construction actions have occurred. The duration of the constructing action varied according to each group, and it was observed that the process of students with a high level of success in the groups was better internalized. It is thought that the later formation of the parallelogram area formula by those at the other level may be due to the lack of necessary preliminary information. When asked about the parallelogram area formula during the application, the students had difficulty expressing their operations even though they found the area correct. The reason for their difficulty is that the students performed the operations by rote without knowing why they were performed and had difficulty explaining and sharing mathematical information logically (TOYGAN, GÖK & CANCAN, 2019). The first steps of the RBC+C model, that is, the recognizing, building with and constructing processes, are essential for the consolidation step. In the consolidation, the newly constructed information was expected to be consolidated. In Activity 4, the students reached the parallelogram area formula by consolidating the information with the questions.

In the RBC+C model, recognizing, building with, constructing and consolidation processes are integrated, not consecutively. Many studies have shown that the abstraction process is integrated, and the recognizing process is the basis of abstraction (ÖZGÜL & Kaplan, 2016; Hershkowitz, Hadas, Dreyfus & Schwarz, 2007; Yeşildere, 2006).

As a result, it can be stated that the RBC+C abstraction process is effective in constructing information. In addition, the findings obtained from the four unstructured activity observations showed that since the process of constructing information was carried out in the case of group work, there was peer learning among the students, and thus, equivalent learning was obtained. An in-depth examination of the process of constructing information of the students during the activities with the RBC+C model allowed them to understand in which process or action the students had problems structuring the information and constructing parallelogram area information. It is thought that identifying the problems experienced by the students will help overcome the problems by drawing attention to these problems. RBC+C abstraction model can be a theoretical framework for research on detecting and explaining the observable cognitive actions of the student in the conceptual learning process of acquisition (Baki, 2018). This theoretical framework can also enable researchers and mathematics teachers to gain information and experience in the field of sixth-grade parallelograms and contribute to more meaningful and effective learning and teaching of mathematics subjects.

Recommendations
- In line with these results, it is considered necessary and recommended to organize teaching activities that will allow students to learn meaningfully.
- The fact that the students with a low achievement level make explanations in an unambiguous and self-confident manner using mathematical language is a positive reflection of their work in groups during the implementation process. Based on this situation, it would be beneficial for students with medium and low levels to conduct group studies with students with different success levels.
- Similar studies can be used to create a theoretical framework for abstraction.

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APPENDIX 1
Activity 1: Metaverse Lands

Welcome to the world of metaverses!

Choose your avatar, name it, and start building your own city right away.

ςyou buy. However, there is only one way to buy land in Metaverse, and it
ιis to accurately estimate the areas of the selected lands by using the land
αmodules we will give you.

Tip : You can use the area formulas of the shapes you
know, the plots drawn on the unit square paper, and the
pencil and scissors to calculate the areas accurately and
more easily.

Activity 2: Rectangular Lands
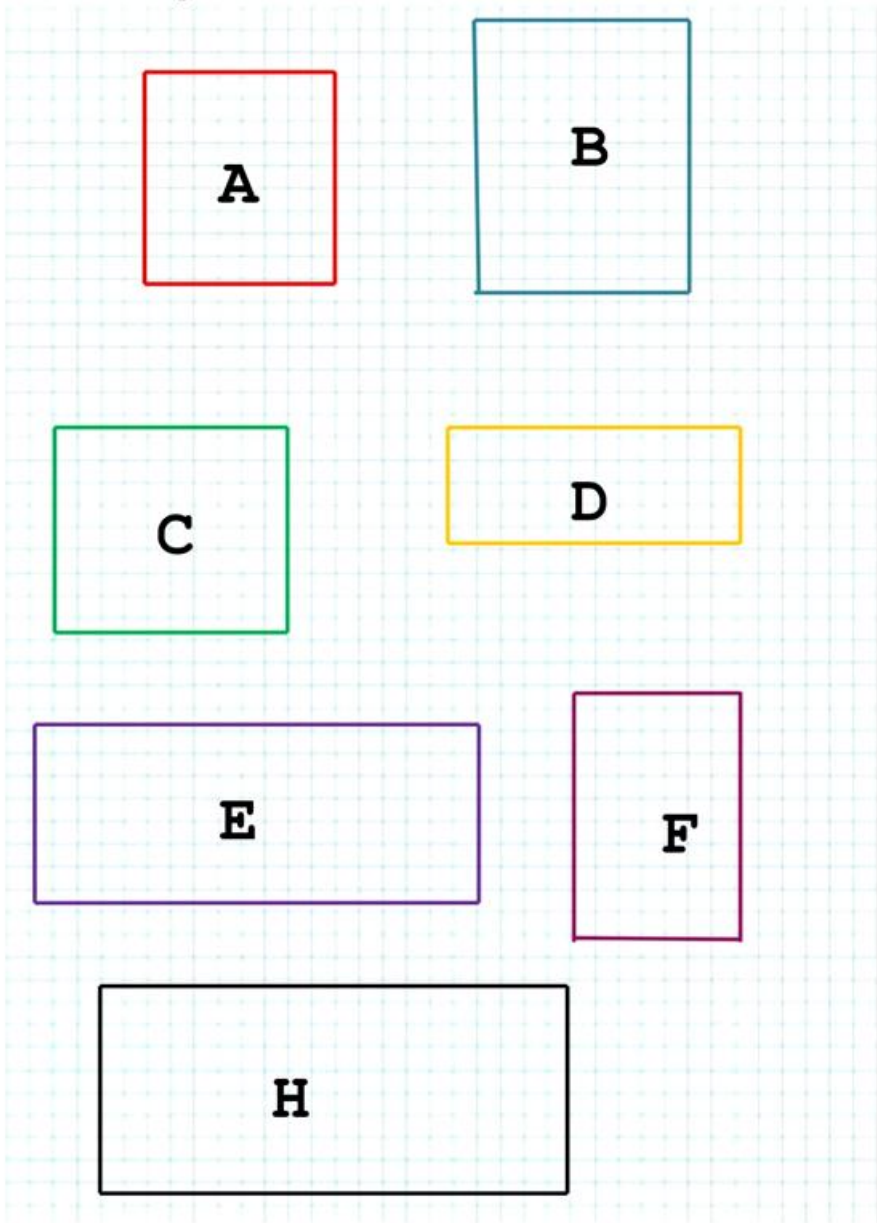
Activity 2: Triangle Lands
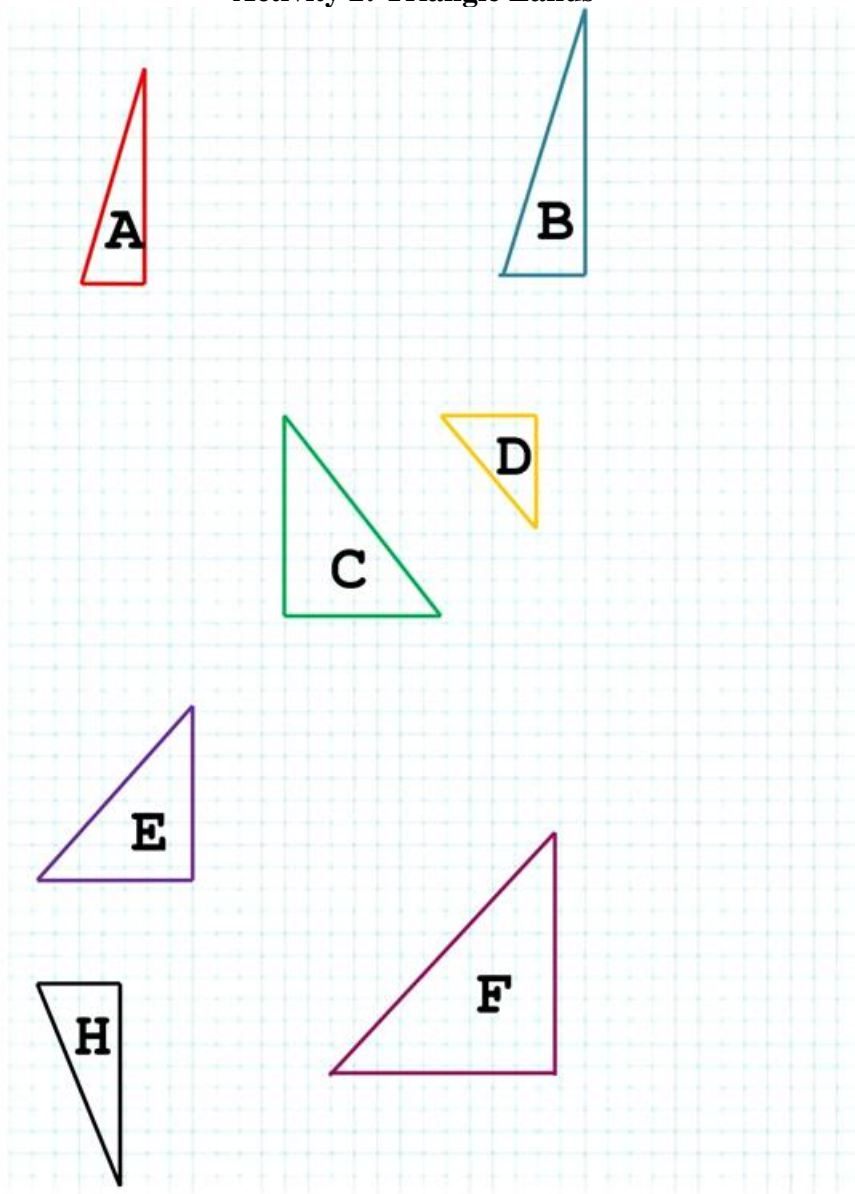
Activity 2: Measuring areas of triangle and rectangular

Answer the questions in the table below.

Lands	Rectangular area	Triangular area
A		
B		
C		
D		
E		
F		
H		

Activity 3: Parallelogram Lands
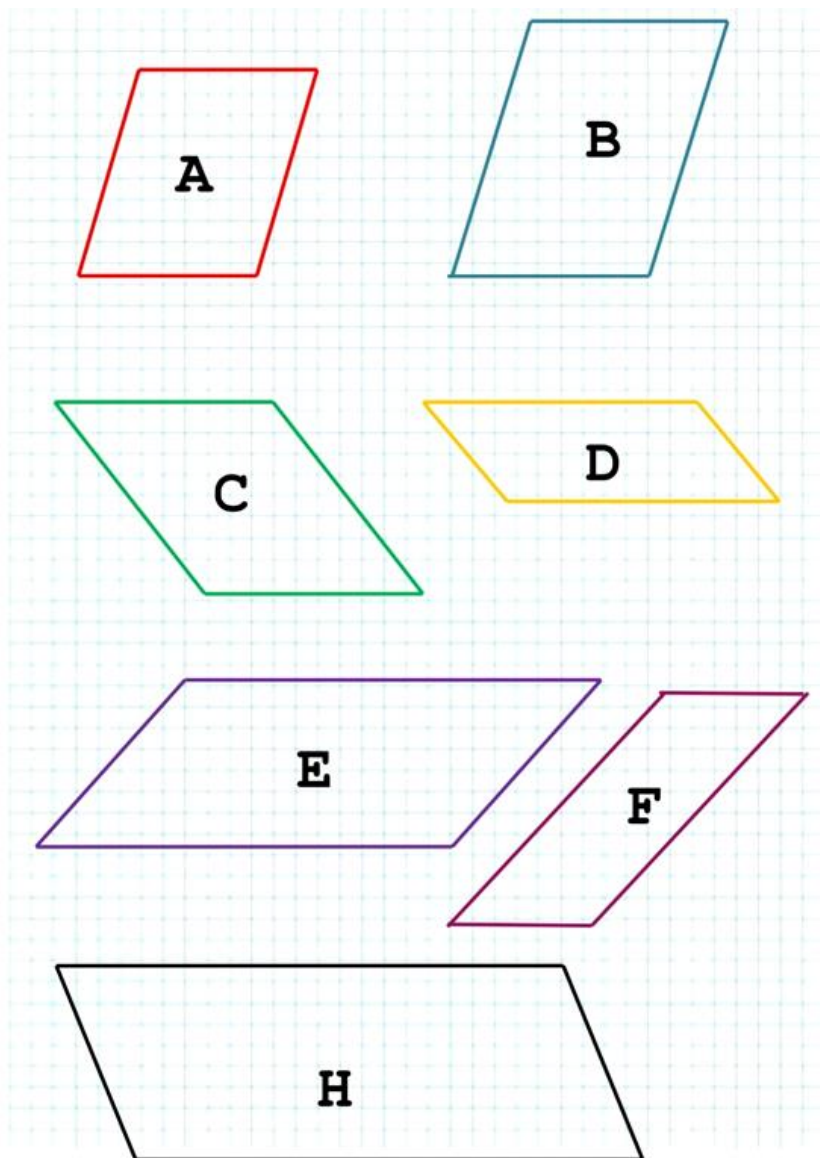
Activity 3: Measuring the area of a parallelogram
Answer the questions in the table below.

Lands	Parallelogram area	What path did you take when calculating the area? (Write in detail.)
A		
B		
C		
D		
E		
F		
H		

Activity 4: Problems about the parallelogram area
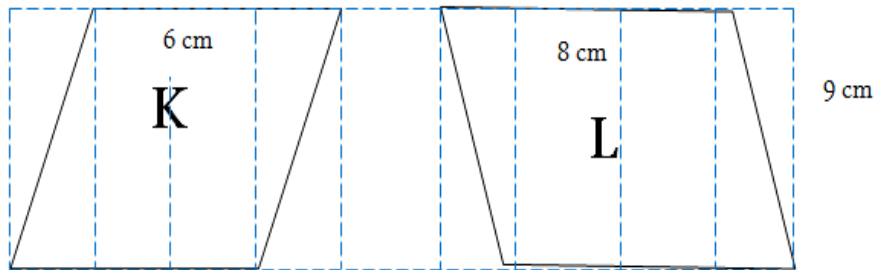
1) Calculate the area of the K and L parallelograms given above in the light of your correctly calculated parallelogram land areas.

2) Answer the following questions.
a) Do not calculate the parallelogram area with a height of 10 cm and an edge of 30 cm without drawing it.

b) Do not calculate the parallelogram area with a height of 15 cm and an edge of 60 cm without drawing it.

3) How can we calculate the area of the parallelogram?

Analysis of Primary School Teachers' Distance Education Practices during the Covid-19 Pandemic in the Context of Classroom Management

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Abstract

This research employed a phenomenological design of qualitative research models to examine the views of primary school teachers about distance education during the pandemic in the context of classroom management. Fifteen teachers voluntarily participated in this research, conducted in Antakya, one of the central districts of Hatay province. The interview data collected during the fall semester of the 2020-2021 academic year were analyzed using a content analysis technique. As a result of the research, it was determined that the teachers frequently benefited from digital content and educational websites during the pre-class process and the class. It has been determined that visual materials are used frequently to motivate and attract students' attention to the lesson. The lessons are generally taught through teacher-centered methods. Teachers did not think the environments where students attended online courses were suitable for teaching-learning processes. Teachers mostly determined the classroom rules related to the physical environment and technical subjects (keeping the microphone off, the camera on etc.). Planning and preparing before the lesson, using other lessons' time to fulfill the course objectives, and assigning some activities as homework are the ways followed to manage and use class time effectively. The result showed that during the distance education process the communications with students were established through video calling and messaging after the class. The research showed that turning on the microphone, turning off the camera, being indifferent to the lesson, and interrupting the flow of the lesson are common problems in distance education. In addition, teachers experienced many problems during distance education due to technical/infrastructure issues, not having computers or cell phones for all students, simultaneous connection of more than one sibling to

the lesson, parents' not creating suitable class environments for the children, and incomplete/wrong learning. Teachers, who had constant communication with parents and continued dealing with students through WhatsApp groups after the lesson to cope with these problems, stated that their professional skills improved, but they were exhausted physically and emotionally.

Keywords: Classroom management, distance education, primary school teacher

Introduction

Education is an important part of human life. In addition to managing to survive, human beings, who are in pursuit of discovering the world, have been obliged to use their minds since their existence and needed to educate themselves. The living conditions of humanity have influenced all areas towards which education is heading, and education, which is described as the primary tool of social change based on individuals, has existed in forms and types appropriate to the conditions of the time's context from primitive ages to the present (Akyüz, 2013; Durkheim, 2016; Görgen, 2014; Russell, 2014). Also, distance education is a type of education in which students and teachers in different settings communicate using educational technologies under a specific curriculum (İşman, 2011). Dating back to the 1700s, distance education used to be carried out through written and visual means such as letters, radios, and television broadcasts in the past (Devran & Elitaş, 2016; Kırık, 2014), while today teachers and students can also communicate verbally with the support of Internet and information technology tools and cameras (İşman, 2011; Moore & Kearsley, 2012). Put differently, while students and teachers were away from physical interaction in earlier distance education activities (Başaran, 2020; Eygü & Karaman, 2013), the lessons have started to be conducted interactively in synchronous or asynchronous ways, owing to the rapidly developing technology since the 2000s. Thus, along with the changing conditions, distance education has also played a great role in supporting face-to-face education (Kır & Bozkurt, 2020; Ramiszowski, 2004; Midkiff & DaSilva, 2000).

According to Devran and Elitaş (2016), distance education is a technologically feasible and affordable education in terms of its applicability. Providing an individual and independent learning environment, ensuring flexibility in learning, providing adults with opportunities to continue their education without leaving their job, particularly those working in public organizations or institutions, enriching educational activities using various digital materials, and also reaching out to large masses are highlighted as strong aspects of distance education (Elitaş, 2017, p.94; Eygü & Karaman, 2013, p.42; Galusha, 1998; Uçar, 2016, p.14). The widespread use of

computers, mobile phones, and the Internet at younger ages makes it easier to recognize distance education applications (Fauzi & Khusuma, 2020; Marshall & Wolanskyj-Spinner, 2020). Although distance education is preferred by individuals in need of learning for different reasons, it has become a necessity throughout the world under the health measures taken against the Covid-19 virus. As such, in Turkey, the Ministry of National Education (MoNE) had to temporarily switch to home education practices in all levels of education (primary, secondary, and high school) from 16 March 2020 onward throughout the country. Although the education switched to face-to-face education for a short while during the fall semester of the same year, distance education continued for a long time. Regardless of the gradual transition to formal education, it is still continuing in different types and levels of education. This obligation caused students lacking access to computers and the internet to be deprived of education, and students and teachers having insufficient knowledge and skills concerning distance education experienced different problems in terms of the quality of education (Akdeniz & Uzun, 2022; Mailizar, Almanthari, Maulina, & Bruce, 2020). Inadequate understanding of digital content/teaching materials and course content, students with learning difficulties needing different supports, short course durations, lack of materials, motivation and attention problems, and problematic behaviors observed in students during the lesson were among the problems reported (Rasmitaila et al., 2020; Karadağ & Yücel, 2020). All these issues reveal the necessity of following a planned curriculum, establishing a healthy student-teacher relationship, and managing the process effectively when using technology as the primary tool in distance education practices (Desmond, 2006, as cited in Devran & Elitaş, 2016).

Classroom management involves creating and applying methods that support students' emotional, social, and academic development, making teaching-learning activities effective (Humphreys, 2003). Preparing for the lesson, applying different methods, techniques, and activities in practice, creating a positive learning environment and classroom culture in the classroom, and effective use of time and behavior management are the basis of classroom management (Çalık, 2012), which is a precursor for smooth course delivery and academic achievement. In order to create an effective learning environment that supports effective learning, determining the behavioral norms that guide student behaviors is of great significance. Supportive and reassuring communication between teachers and students plays a critical role in students' emotional and social development and the social relations established with students in behavior management (Emmer & Evertson, 2013). Several studies show that teachers working at different levels experience many problems while managing their classrooms (Akın, Yıldırım, & Goodwin, 2016; Arı, Kızılaslan Tunçer, & Demir, 2016; Erol, Özaydın, &

Koç, 2010; Sadık & Akbulut, 2015; Segalo & Rambuda, 2018; Sieberer-Nagler, 2016; Sullivan, Johnson, Owens, & Conway, 2014). Considering the course delivery through computer screens in distance education and the developmental characteristics of primary school students, teaching-learning processes will become more susceptible to classroom management problems. It is difficult for primary school students who are in the period of concrete operations to sit before the screen and follow the lesson for a long time in a virtual environment (Senemoğlu, 2018). When the lack of social interaction with teachers and classmates is added to these issues, the likelihood of facing different emotional and social problems is high. In terms of increasing educational efficiency, knowing what happened in distance education practices during the pandemic period and how the process was managed is of great importance. When the domestic studies on distance education are examined, they are generally conducted at university (Keskin & Özer Kaya, 2020; Yıldız, 2020; Yılmaz, 2020) and secondary education levels (Başaran, Doğan, Karaoğlu & Şahin, 2020; Yılmaz, Güner, Mutlu & Arın Yılmaz, 2020), and suggestions are provided by focusing on the problems experienced. However, the number of studies directly examining distance education in the context of classroom management is limited (Akdeniz & Uzun, 2022; Göktaş & Sırakaya, 2021; Şeker, Kankanat, & Elmalı, 2022). When studies on classroom management in distance education conducted abroad were searched, they were carried out before and in connection with the pandemic (Balkin, Buckner, Swartz, & Rao, 2005; Graziadei, Gallagher, Brown, & Sasiadek, 1997; Lohmann, Randolph, & Oh, 2021; Stamatis, 2021). In line with these explanations and reasons, there was a need for conducting a study to analyze the distance education practices of classroom teachers during the pandemic in the context of classroom management (teaching process, learning environment, classroom rules, time management, relationships with students, and managing problem behaviors) and examine the general problems they experienced in this process. The findings obtained could be important in terms of not re-experiencing the existing problems in education during Covid-19 or similar disaster events, learning lessons from this process in terms of pedagogy, and ensuring the stable progress of education in emergencies.

Method
Research Model
        A phenomenological qualitative research design was employed in this study to examine the views of classroom teachers on distance education conducted during the pandemic. Phenomenological studies aim at obtaining detailed, in-depth, and truth-reflecting information based on the shared experiences of individuals about the phenomenon under investigation

(Creswell, 2018, p.81; Meriam, 2018, p.25). As such, the phenomenon addressed in this study is classroom management.

Participants

This study was conducted with fifteen classroom teachers who volunteered to participate in the study from seven randomly-selected schools of different socioeconomic levels in Antakya, one of the central districts of Hatay Province. Of purposive sampling methods, a maximum variation sampling method was followed when forming the study group, paying maximum attention that teachers are different in terms of gender, age, length of service, marital status, the socioeconomic status (SES) of the vicinity where the school they worked located, and the grade levels they taught. Table 1 includes the demographic information of participants.

Table 1. *Demographic characteristics of participants*

Characteristics		N	Characteristics		N
Gender	Female	11	Marital status	Single	1
	Male	4		Married	14
Age	20-30	2	SES of school vicinity	Low	3
	31-40	10		Middle	10
	41 and above	3		High	2
Length of service	0-5 years	1	Grade level taught	First grade	5
	6-10 years	1		Second grade	4
	11-15 years	8		Third grade	4
	15 years and above	5		Fourth grade	2

Data Collection Tools and Collecting the Data

An interview method was used to collect data in the study, and a semi-structured interview form developed by the researchers was employed during the interviews. In order to ensure the validity of the questions prepared by examining the relevant literature, the opinions of faculty members working in this field at the Education Faculty of Çukurova University were obtained. After receiving feedback from the experts, the wording of three questions was changed and two questions were combined. The finalized interview form consisted of 15 questions. Of these questions, eleven were about the classroom management dimensions (instructional management, classroom rules, learning environment, relationship with students, time management, problem behaviors, and management of students), and four were about distance education. Before the actual application, pilot interviews were conducted with three classroom teachers, not included in the study group, and the form was considered applicable since there was no problem. The research data were collected during the fall semester of the 2020-2021 school year. Since face-to-face meetings would be risky due to the pandemic, the interviews were

conducted online through the Zoom program or through video calls via WhatsApp. Before the interviews, the dates and times feasible for teachers to attend the interviews were determined. They were also informed that the interviews would be recorded. The interviews lasted about 19–41 minutes.

Data Analysis

A content analysis technique was used to analyze the collected data after obtaining the raw textual data by transferring the voice recordings into the Word document. The raw textual data were coded independently at different times by the researchers and the inter-coder consistency was calculated as 86% by using Miles and Huberman's (1994, p.64) formula (Reliability = consensus/consensus + disagreement x 100). In cases where there were different opinions, the two researchers discussed and made a joint decision together. Two researchers decided on the final version of the themes and codes together. When presenting the findings, the themes and the codes beneath them were visualized in tables. During the explanation of the themes and codes, quotations from the views of teachers were often provided, and the real identities of teachers were concealed using codes (T1, T2) to identify them. The numbers used in the coding indicate the order in which teachers were interviewed.

Findings

The findings obtained in this study, which examined distance education in the context of classroom management, were presented according to the order of research questions.

Findings Regarding the Instructional Management

In order to learn how teachers, manage the teaching-learning process in online lessons, they were primarily asked about how they prepared before class, and the themes and codes derived from the explanations are summarized in Table 2.

Table 2. *Preparation before lessons*

Theme	Code	Teacher	Total
Mental preparation	Examining the learning outcomes, topics to be covered, and activities in the annual plan	T3,7,10,11,13	5
	Thinking about sounds, syllables, and duration of activities	T7, 12, 15	3
	Exchanging views with group teachers through social media groups like Telegram and Facebook	T6, 14	2
		T13	1
	Examining the EBA broadcast streaming		

Preparing digital content	Downloading questions from educational websites (e.g., Eğitimhane, Okulistik, Morpakampüs, EBA, Sadık Uygun, and Ufuk Hoca)	T1,2,4,5,6,7,8,9,10,11,12,13,14	14
	Downloading/recording video lectures (YouTube)	T1,2,3,4,5,7,9,10,11,12,13,15	12
	Saving all contents (e.g., e-books, activities, videos, and slides) on desktop	T1,3,4,5,11	5
	Preparing slides	T3,8,9,15	4
Preparing activities and materials	Preparing activities from reference/supporting books	T3,4,5,7,8,11,13,15	8
	Preparing visual materials (e.g., geometric object models, drama materials, puppet-origami materials, animal models with sounds-syllables-sentences printed on, and posters)	T3,4,6,8,10,11,13	7
	Preparing worksheets/tests on relevant subjects	T3,4,5,13,15	5
	Determining activities in the textbook	T1,7,8,11,13	5
	Determining/preparing questions to use in the class	T1,3,8,13,15	5
	Preparing game questions and square texts	T1,2,14	3

As seen in Table 2, teachers' pre-class preparations gathered under three themes: mental preparation, preparing digital content, and preparing activities and materials. Teachers mostly described their mental preparation as examining annual plans (f:5) and EBA broadcast streaming (f:5), followed by thinking about activities and exchanging ideas with colleagues. For instance, T3 had the following opinions in this regard: *"First of all, I look at my annual plan and examine the EBA TV broadcast streaming. But my priority is my own annual plan."* However, T7 expressed the following opinions: "*I decide which units to be covered that week, and what learning outcomes and activities will be covered in which subjects.*" Regarding digital content, nearly all participants stated that they visited educational websites (f: 14), benefited from video lectures (f: 12), and prepared slides (f: 12), and five teachers stated that they saved all these contents on the desktop. Some excerpts from the teachers' remarks are as follows:

"I usually try to prepare for distance education by downloading online videos. I usually try to prepare a presentation in a Word document, prepare a presentation in PowerPoint, or I try to download presentations from educational websites through the internet. I usually use educational

websites. I follow Okulistik and benefit a lot from Eğitimhane. Particularly, EBA has educational links. For example, there are Ufuk Hoca (www.ufukkoca.com.tr) and Morpa." (T9)

"Generally, I prepare slides as preliminary preparations for the subjects. I prepare using scanned books. There are many resources on the internet. I get and organize them by myself and provide them in that way. There are some programs. For example, I use Morpa." (T15)

"Of course, I examine the subject first. There could be visual materials and videos for children in line with the subject matters I cover, especially during the distance education process. I should prepare in advance. Otherwise, it is not possible during the lesson." (T11)

However, under the theme of preparing activities and materials, teachers often benefited from reference books (f:8), prepared 3D materials such as visual and geometric object models, puppets-origamis, and animal models (f:7), and prepared printed materials like subject-related tests and worksheets (f:7). In addition, participants underlined cases such as determining activities in textbooks and preparing questions, square texts, and games. For example, T3 described the preparation process as follows: *"…I have digital resources and my reference books. I look at them. Then, I explore my resources… I do my weekly preparation, do my material preparation."* Other teachers expressed their views as follows:

"For example, there were geometric objects today. I prepared rectangular prism, triangular prism, etc. before class. The resources must be definitely ready before class." (T11)

"We made a dinosaur in D sound from egg packages. I prepared planes in P sound, made clouds from straws and cardboard, and attached those straws to them." (T14)

"If there is an activity in the book, if there is an activity that we can do in line with it, I do. Sometimes, we become clowns. Sometimes, we played a student as Mehmet Akif Ersoy." (T1)

The responses teachers provided to the second question about which strategies, methods, and techniques they followed in the lessons and which materials they used/can use are summarized in Table 3.

Table 3.Methods, materials, and activities used in lessons

Theme	Code	Teacher	Total
Teacher-centered methods and techniques	Question and answer	All	15
	Lecture	T2,4,5,7,8,9,10,12,13,14	10
Student-centered strategies, methods, and techniques	Discovery learning	T2,3,6,9	4
	Discussion	T4,9,13	3
	Experiment	T9,11	2
	Drama	T1,3	2
	Demonstration	T4,14	2
	Brainstorming	T4,13	2
	Project	T2	1
	Fishbone	T3	1
	Six thinking hats technique	T13	1
	Research	T11	1
Materials used and activities conducted	Book (e-book, textbook, workbook, and reference book)	T1,4,8,10,12	5
	Roleplay activities with pictures	T6,8,10,14,15	5
	Video lectures	T2,5,9,11	4
	Text reading	T8,12,15	3
	Game questions	T2,13	2
	Worksheets	T3,12	2
	Poster	T8	1
	Origami	T14	1

Table 3 shows that the question-and-answer method (f:15) is used by all teachers and the lecture method is used by most of them (f:10). A limited number of teachers stated that they use strategies and methods such as discovery learning (f:4), discussion (f:3), experiment (2), and drama (f:2). However, fishbone, six thinking hats technique, and research were implemented by one teacher each. The study revealed that teachers generally use books (f:5) and videos (f:5) in their lessons. Some views in this regard are as follows:

"Actually, lecture takes place more. This becomes somewhat traditional and one-sided like that. This is how the question-answer and lecture work because the time is too limited."

"We do more questions and answers. I ask [questions] and ensure they find [the answers]. Considering the visuals, I try to ask [questions] by having them make comments and finding [the answers]." (T6)

"We employ the question and answer, discovery learning, and lecture, of course. I have them watch videos often. I often give homework with game programs." (T2)

"I give research assignments. Actually, children have already mastered computers." (T11)

"First of all, I use the lecture method. After that, I use the question-and-answer technique and discussion method. Sometimes, there will be brainstorming where I get the views of kids." (T4)

"Since it is grade 1, there is no need for more materials or experiments. Usually, [I teach] using pictures in these reading-writing processes. By preparing images on cardboard, for example, the B sound, I drew a bee using colored cardboard and showed it on the screen." (T15)

Another question directed to teachers regarding the management of teaching-learning processes was about how they drew students' attention to the lesson and motivated them throughout the lesson. Teachers' explanations about drawing student attention to the lesson are summarized under three themes in Table 4.

Table 4. *Strategies of teachers for drawing students' attention to the lesson*

Theme	Code	Teacher	Total
Auditory stimuli	Singing	T1,3,6,11,14,15	6
	Asking intriguing questions	T1,2,5,7	4
	Having a talk	T3,4,6	3
	Telling jokes	T4,15	2
	Talking about news and current topics	T4,5	2
	Making jokes	T1,7	2
	Asking questions through tales	T5,11	2
	Giving examples from the daily life	T9	1
Audiovisual stimuli	Using pictures related to the topic	T1,6,8,10,11,15	6
	Showing videos	T5,6,9,11	4
	Playing musical instrument	T14	1
	Showing animations	T15	1
	Playing puppets	T4	1
Emotional stimuli	Running contests	T1	1
	Playing games	T1	1
	Asking riddles	T4	1
Encouragement	Giving a plus or minus	T4,8	2
	Buying a chocolate	T12	1
	Taking a nature walk	T15	1
Monitoring student work	Allowing different persons to have a say	T2,3	2
	Using guiding phrases (Did you write down? Are you done?)	T6	1

As seen in Table 4, teachers follow the strategies of drawing attention to the lesson by using auditory, audiovisual, and emotional stimuli and encouraging and monitoring student work. Singing (f:5) and asking intriguing questions (f:4) were prominent in auditory stimuli, followed by talking with students, telling jokes, and talking about news/current issues. Generally, they

used subject-related visuals as audiovisual stimuli (f: 6) and showed videos (f: 4). Some remarks of teachers are quoted below.

"Asking the kids questions considering the image I share at that time, I handle it using activities they can do by themselves." (T10)

"I show them videos before starting the day's lesson. In the morning class, we listen to the song 'Good Morning, Good Morning Kids' and we sing it together. In the afternoon, I play our school music, the school bell [song], or songs about balanced nutrition." (T6)

"I open a thread from the news they watched on TV. If I have prepared an activity, I show it. For example, I made a puppet and had it talk to the kids like a teacher." (T4)

"A little more like encouraging students by giving a plus or minus. I take note of these. These make students happy." (T8)

"In the form of mutual competitions. For example, suppose we are doing synonyms and antonyms. Suppose I choose two kids. I would say, come on, you are going to ask each other." (T1)

Table 5 shows the themes and codes obtained from the responses of teachers to the last question about how they motivated students.

Table 5. *Teachers' strategies to motivate students*

Theme	Code	Teacher	Total
Establishing positive communication with students	Having a talk	T6,7,9,13,15	5
	Making jokes	T5,7,12	3
	Encouraging (you can do it, I trust you, etc.)	T3,10	2
	Using nice words (my dears, my flowers, etc.)	T6,8	2
	Telling jokes	T15	1
Establishing a connection with experiences	Talking about current topics	T9,13	2
	Asking questions	T9,13	2
	Giving examples from daily life	T13	1
Making activities meaningful and motivating	Singing	T2,6,10,11,13,14,15	7
	Playing games	T1,2,11,13,14	5
	Making students active	T1,11,13	3
	Running competitions	T1	1
	Asking riddles	T11	1
	Asking tongue twisters	T11	1
	Playing puppets	T14	1
	Showing cartoons	T12	1
	Making origamis	T14	1
	Doing sports	T11	1
Generating expectations	Sending video lectures	T3,4,6,10,12	5
	Arousing curiosity	T5,7,9,14	4
	Reminding what was learned in the previous lesson	T2,3,4	3
	Using phrases such as we will learn a very good topic	T11	1

Making the lesson interesting	Using materials found at home	T2,11	2
	Making a video call to the student whose losing motivation at that moment	T2	1
	Bringing students staying in the background to the forefront by giving them a teacher's role	T1	1
Rewarding	Using phrases like bravo, very nice, etc.	T3,6	2
	Applauding	T3	1
	Giving a plus or minus	T4	1
	Buying a chocolate	T1	1

As seen in Table 5, teachers followed strategies like establishing positive communication (f:13), establishing a connection with experiences (f:5), making activities meaningful and motivating (f:22), generating expectations (f:13), making the lesson interesting to motivate students, (f:4) and rewarding (f:5). Under the theme of establishing positive communication with students, teachers stated that they usually have a talk with students and make jokes. Of these teachers, T9 expressed their rationale with the following words, *"I definitely talk about that lesson. Our topics are usually about social life in the third grade. When I speak, I change my tone of voice. I bounce back by saying, my tone of voice has changed here, for example."* Singing and playing games under the theme of making the activities meaningful were the ways many teachers went for. For example, T11 explained this as follows: *"Kids get bored naturally. We sing, play games, [and use] songs, riddle, tongue twisters as in the classroom setting, but more frequently of course."* While teachers generally follow ways like arousing curiosity and sending children videos about the lesson before the class to generate expectations, some teachers made video calls students getting bored during the lesson, gave the students a teacher's role, and used the materials available at home during the class to make the lesson interesting. A limited number of teachers who went for rewarding provided examples of using verbal expressions, applauding, giving +/-, and buying chocolates. Below are some sample remarks from teachers.

"What shall we do in the next lesson? Which notebook are we going to get out? I say this for them to wait curiously." (T5)

"I send lectures from YouTube channels beforehand. I send videos to parents. I let some students have a say by asking, what did we do in the last lesson?" (T4)

"I give rewards. For example, I say, those who solve this question… I went to them on Monday. Actually, our students live in this neighborhood. They came down in front of their apartments. I went [there] and gave them chocolates one by one."

"For example, I have students who read very slowly and do not want to do questions. I encourage them by saying: No, you can do it. I give a round

of applause if necessary. No applause is heard, but their applause is seen. This encourages them." (T3)

Findings Regarding the Learning Environment

Regarding this issue, the participants were asked about the environments where students attended online classes and how these environments reflected on lessons. The majority of the participants had negative views about the learning environments of students. However, T7, 711, and T13 stated that students who had their own rooms and a family environment that provided academic support (T7) did not experience any problems in their lessons and the lessons were productive even for themselves. Table 6 summarizes teachers' views about the learning environments and their reflections on lessons.

Table 6._Students' environments and their reflection on lessons_

Theme		Code	Teacher	Total
Environment	Inside the home	Living room/lounges	All	15
		Bedroom	T2,9,	4
		Stove-heated room	T4,5,8,10,12	5
		Kitchen	T2,6,15	3
		Their own room	T7, 11, 13	3
	Outside the home	Workplace	T1	1
		In the car during the trip	T2	1
		Farm/garden	T8	1
		In houses where they visit as a guest	T2	1
		Park	T1,8	2
Reflections on lessons	Challenges in managing the process	Noise (indoor sounds, sounds of conversation and discussion, sounds of TV, etc.)	All	15
		Distraction	T1,3,4,6,7,8,10,11,13	9
		Wasting time	T1, 13	2
	Interfering with the teacher	Individuals in the environment complain about other students	T14	1
		Question not letting their kids speak	T2	1
		Back their own children	T14	1
	Interfering with the student	Individuals in the environment enter and leave the room	T1,7,9,11,14	5
			T3,7	2
			T7	1
		Warn the kid not to make mistakes		
		People in the environment tell the kid the answers		

As seen in Table 6, the majority of teachers stated that students attended the lessons from living rooms or lounges followed by bedrooms, stove-heated rooms, and kitchens. A teacher describing this by exemplifying crowded families where kids have no room of their own explained, *"Since the population of families in the region where we work is crowded and since they have many children, and it is winter, they attend the [lessons] from a crowded stove-heated room. There is noise and distraction (T8)."* As such, T12 stated, *"There was only one stove-heated room. Either the kid stayed in the cold room, or when staying in the stove-heated room, the sound of the TV, the mother's voice, or other noises. It was very difficult for me and affected me negatively."* Examples from the opinions of other teachers are given below:

"It definitely affects a lot. Yesterday, a kid was listening to me from the car when he was coming home from the village. The situation is the same for all of them. They listen in the car and listen in places they go as guests." (T2)

"For example, their parents are working, and the kids attend from the workplace. The workplace they attend from is not suitable. It's a room for ten people. Even I have my eyes on it. Noises come from there. There is a lesson there. There is a seriousness issue. Their time runs out." (T1)

"Affects a lot, both positively and negatively. Positively, if the kids are in their own room and have direct contact with me. After all, it is like a classroom environment. You are one-to-one with the kid. You feel freer. The kid feels freer, too." (T7)

"They experience difficulties, especially in large families. A constant stimulant. The mom comes, the sibling comes. We do not have such problems in families having one or two children. They have their individual rooms… They are never distracted. They completely focus on the lesson." (T11)

"We even experience this, for example, there are one or two students who tolerate all kinds of jokes, and you stick with them. When you stick with them, this time other parents say, you didn't do anything to my child, you didn't give my child the right to speak." (T2)

"Their parents are in the background, their siblings come to them, and their elder brothers come, and hit them on the head when they cannot answer the question." (T3)

"The main disturbing issue is that parents interfere a lot. They are always by your side. It happened in the early days of school. A mother from there says, 'sir, it is time to tell you that Burak has intruded on Elif at school.' I was shocked. I didn't know how to intervene at that moment." (T14)

Findings regarding the classroom rules

The findings obtained from teachers' explanations about the classroom rules they set during the distance education process are given in Table 7.

Table 7. *Specified classroom rules*

Theme	Code	Teacher	Total
Technical rules	Keeping the microphone off during class	T1,3,4,5,7,8,9,11,12,14,15	11
	Keeping the camera on	T1,2,4,5,8,9,11,15	8
	Not using the chat section	T7,9,13	3
	Not typing on the screen	T7,9,14	3
Rules for the course environment	Preparing the course materials in advance	T1,3,5,6,9,10,12	7
	Being alone in the room during class	T6,7,8,10,11,14	6
	Creating a special environment for the class (sitting at a table, in a specific corner)	T1,6,7,8,9	5
Rules for attending the class	Asking for permission before speaking	T1,2,4,6,8,9,15	7
	Not interrupting/speaking all the time	T6,8,9	3
	Satisfying their needs during the breaks (toilet, water, food, etc.)	T6,10	2
	Sitting upright in front of the screen	T1,9	2
	Not leaving the screen during class	T1	1
Rules regarding the time	Attending the class on time	T1,13,14	3
	Those attending the class late should not disturb the course of the lesson	T13	1
	Sending the homework within the hours specified by the teacher	T15	1

According to Table 7, most teachers set technical rules (f:25) followed by rules for the course environment (f:16), attending the class (f:15), and time (f:5). Among the technical rules, keeping the microphone off (f:11) and keeping the camera on during the class were more prevalent, and teachers described their requirement for mutual interaction as follows: *"For example, I tell them that your microphones will be always turned off. Raise your hand when you want to talk and turn on your microphone when I let you have your words" (T1); "The biggest of our rules is about turning the sound and camera on and off. Of course, the camera is not mandatory. If they are convenient, I ask them to turn it on so I can see them for mutual interaction"* (T3). The rules determined for the course environment were about preparing the course materials before the class (f:7), being alone in the room during the class (f:6), and creating a special environment for the class (f:5), and some relevant remarks are quoted below along with rationales:

"Before the lessons, I write to the WhatsApp group about which lesson I will teach from which book, and how many pages I will cover. I want the kids to be ready before each class. Otherwise, it will be a waste of time." (T5) "I had to talk to the parents during the class so the kid would not be disturbed during the class. Since it was a village environment, both his brothers and late

friends constantly interfered. Regarding this, we decided that there should be no stranger next to the child during the class." (T10)

"They should attend the class at tables and on chairs just like in the classroom. Before attending the class, the necessary books, pens, and tools should be ready." (T6)

Asking for permission to speak when taking part in the lesson (f:7) and attending the lesson on time from time-related rules (f: 3) were emphasized. For instance, regarding the rule of asking for permission before speaking, T4 had the following remarks: *"Everyone turns on their sounds in distance education. I tell them, turn off your sounds kids. Because there will be so much chaos. Second, raising hands. Raise your hands just like in the classroom, I say. Because this time they do things like: Can I say? I already see those who are raising their hands on camera."* As such, T13 described the rule, coming to the class on time, using the following phrases: *"One of our rules is to come to class on time and not disrupt the class. Coming to the class on time applies to distance education, too. Even if they say "Sorry teacher, I'm late" the class will break off at that moment."*

Findings regarding the time management

Another question directed to teachers during the interviews was about time management. While one teacher (T12) stated that they were unable to manage the time well because of discipline issues, other teachers stated that they made effective use of time. The explanations of 14 teachers, who stated that they managed time effectively, are given in Table 8 under two themes of strategies they followed before and during the class.

Table 8.*Strategies followed in time management*

Theme	Code	Teacher	Total
Before the class	Preparing the course materials (material, texts, books, etc.)	T1,3,6,7,13,14	6
	Preparing the activities	T3,7,9	3
	Lesson planning (introduction - development - conclusion)	T4,7,9	3
	Sending a video about the relevant topics/activities the day before the class	T2,12	2
	Asking students to prepare their materials before the class	T1,6	2
	Rehearsing the lesson	T15	1
	Controlling the learning outcomes/annual plan	T3	1
	Choosing between topics/activities	T5	1
	Paying attention to the appropriateness of the activities student level	T8	1
During the class	Extending the course duration by taking from the duration of the other course	T1,6,13,14,15	5
	Giving some activities as homework	T2,8,9	3

No conducting some lessons/subjects (Physical Education and Play, Visual Arts, Music)	T2,5,8	3
Asking students to do time-consuming activities during the breaks	T1	1
Teachers doing difficult activities	T12	1
Giving students the right to choose what they can do by offering different activities	T11	1
Attending the class on time	T8	1

As shown in Table 8, the pre-class preparations involved preparing materials (f:6), activities (f:3), and lesson plans. During the class, teachers went for extending the course duration (f:5), giving some activities as homework (f:3), or not conducting some lessons/subjects (f:3) to complete teaching the topics or activities they were doing. Below are some example quotes from the remarks that teachers had in this regard:

"We come to the class prepared. Which topic we will cover and which activity we will do are clear. We explained the lesson. Let's do an activity. This time Google the activities, search for videos, and so on. The minutes pass like this. That's why we come prepared for them in advance. At least, we prevent wasting three or five minutes during the class." (T7)

"First, I look for course materials, books, and arrange them. When they are ready, we save time from there." (T1)

"First, I prepare a lesson plan. Say, I provide these things at the introduction stag and use these methods and techniques. If I have materials, the introductory, development, and conclusion phases of the lesson become very good." (T4)

"Sometimes, disruptions happen. The flow is such that the kids want to talk about the subject matter, and the discussion prolongs. I tell them, what we are going to explain has not finished, should we take a break or use our break time? Most of them do not want to leave." (T13)

"For example, when there are five examples, we solve two of them in the lesson and give three to students as activities." (T8)

Findings regarding the relationships with students

Teachers' explanations about their efforts to keep/maintain their relationships healthy with students during the distance education process are given in Table 9 under two categories: beyond the class and during the class.

Table 9. *Strategies of teachers for establishing/maintaining healthy relationships with students*

Theme	Code	Teacher	Total
Beyond the class	Calling, video calling (about academic issues)	T1,3,4,5,6,7,8,9,10, 13	10
	Messaging	T1,2,4,5,7,11,12,13, 14	9
	Meeting with parents (talking and giving advice about students)	T4,6,8,9	4
	Communicating through the classroom WhatsApp group	T1,2,7	3
	Taking a nature walk/face-to-face meeting with students on days designated with parents	T2,15	2
	Calling on special occasions (funeral, illness, birthday)	T4	1
During the class	Talking (about academic and current issues)	T2,5,7,9,10,12,15	7
	Conducting various activities (related to specific days and weeks, intelligence games, keeping rhythm)	T2,4,8,14	4
	Making jokes	T3,5	2
	Playing games	T14	1
	Talking to students about their behaviors after class	T9	1
	Keeping eye contact	T4	1
	Addressing by their names	T4	1
	Using verbal reinforcements (bravo, very good, my flowers, etc.)	T6	1

As shown in Table 9, the majority of teachers stated that they made video calls to their students beyond the class (f:10), sent messages (f:9), and created a classroom WhatsApp group (f:3). Two teachers stated that they took students for a nature walk and meet them face-to-face. T8, who told the kids that they could ask about the issues they find difficult beyond the class at any time, had the following remarks in this regard: *"I try to answer their questions as much as possible. When they send the assignments through WhatsApp, I review them and correct their mistakes."* Stating that they made video calls to their students, T2 said, *"I usually make a video call to my students on the weekends. I talk with their mothers and then with the kids."* Of teachers who stated that they took a nature walk, T15 realized this approach as follows: "*We were already seeing each other in distance education classes. However, the kids always used to say, teacher, we miss you, we want to see you, and so on. So, I said I would choose five students each week to reward those who were the most organized, attended the class most regularly, and had fine handwriting. I used to take them out for a nature walk to reward them."* As shown in the table, during the class, teachers attempted to entertain students by talking with them (f:7), involving them in the process by conducting various activities (f:4), making jokes (f:2), and playing games. Below are some examples from the remarks of teachers:

"I take the kids to the waiting room during the lesson, accepting them one by one. So, it doesn't happen all at once. It happens two minutes later. I definitely talk with them one by one during this process." (T9)
"I try to entertain them in some way, albeit from afar. They received rhythm training as part of the project. Those things also made me have a lot of fun." (T14)

"A conversation during the class. We talk about current issues. I listen to what they have to say, things they are interested in." (T10)
"I keep eye contact very well during the class. I address my students by name. I think it becomes more effective." (T4)

"Apart from the course topics, for example, we organized a Domestic Goods Week this week. In addition, we organize activities related to Specific Days and Weeks. We organize activities for our kids on topics such as love of homeland, freedoms, fundamental rights, and respect for differences." (T8)
Findings regarding the problem behaviors exhibited by students during the class and their management

Teachers' explanations about students' problem behaviors during class and how they manage these behaviors are given in Table 10.

Table 10.*Problem behaviors of students and teachers' disciplining methods*

	Theme	Code	Teacher	Total
Problem behaviors	Failing to comply with technical rules	Turning on the microphone during class	T2,6,11,15	4
			T1,2,5,14	4
		Turning off the camera during class	T1,2,9	3
		Not turning off the microphone during class		
		Scribbling on the screen	T7,11	2
	Being indifferent to the lesson	Doing things unrelated to the lesson (talking, discussing, playing games, surfing the internet, etc.)	T1,4,6,7,9,10, 11,12	8
		Leaving the screen	T10,15	2
		Whining (when will the class end)	T4	1
	Disrupting the class	Talking about issues unrelated to the lesson	T2,6,7,8	4
		Speaking without asking for permission	T12,14,15	3
		Asking unnecessary questions (asking the time, page number, etc.)	T4,11	2
			T6	1
		Interrupting their classmates		
		Playing jokes	T5	1
		Speaking for someone else	T8	1
		Making strange noises (with their mouths, making a crackling sound with paper, etc.)	T13	1

	Failing to fulfill their responsibilities	Listening to the lesson from the bed (participating from unsuitable settings)	T11	1
		Refusing the task (I can't do it, oh no)	T15	1
		Attending the class late	T11	1
Ways to discipline	Preventive strategies	Keeping in constant contact with parents	T2,5,7,11,12,13	6
		Determining classroom rules	T10,13,14	3
		Choosing examples from daily life in lessons	T1,14	2
		Holding parent meetings	T9,10	2
	Instant interventions	Verbal warning	T2,4,5,6,7,8,9,11,13,14	10
		Changing sound, camera, and board settings	T7,9,11,12,13	5
		Talking with parents (at that moment)	T1,6,10,11,14	5
		Reminding the rules	T5,11,13	3
		Highlighting expected/positive behaviors	T5,8	2
		Holding a parent meeting/meeting with parents (after class)	T5,10	2
		Giving the student a teacher role	T1	1
		Reminding the lesson objectives	T8	1
		Taking the student to the waiting room	T9	1

As seen in Table 10, the problems encountered by teachers were mostly related to technical issues. Students did not comply with rules about keeping the camera on (f:4), keeping the microphone off (f:4), keeping the microphone on (f:3), and scribbling on the screen during the class. Being indifferent to the lesson, students mostly engaged in talking with others, playing games, or surfing the Internet during the class (f:8). Also, they disrupted the class by talking about issues unrelated to the lesson, interrupting their friends, and speaking without asking for permission. As shown in Table 10, teachers often intervened in these behaviors by giving verbal warnings (f:10), followed by changing the sound, camera, and board settings (f:5) and meeting with parents at that moment (f:5). Teachers described their preventive strategies spanning throughout the process as being in constant communication with parents (f:6), determining/revising classroom rules (f:3), holding parent meetings (f:2) and giving examples from daily life in lessons (f:2). Some examples of teachers' remarks are as follows:

"The kid may turn off the camera and surf the internet. For example, even though they are small, when I say "It's your turn, son, read this", the kid does not turn on the microphone. No sound. Then, I called and talked to his mother. To prevent these behaviors, I always ask for their ideas and try to keep

them active. For example, there is Kerem. I say: Come on Kerem, you are the teacher, you do it, what can you do about this?" (T1)

"They usually turn off the camera. We experienced this a couple of times. Then, we agreed. No matter how much the rule of asking for permission to speak is in place, there are times that they step in without asking for permission to speak. I always warn." (T14)

"In general, students who talk a lot disrupt the course of the lesson. There are always students who get bored and say: Teacher, how long does it take to finish the class? If you do that again, I say, I'll kick you out of class. They become silent." (T4)

"I definitely meet with the parents. I meet them very often about everything. When something good or bad happens in that lesson, I ask them, did you do something different in your home?" (T5)

"At that time, when the kid does not listen, I try to handle the situation by calling the parent." (T10)

Findings Regarding the general problems experienced during the distance education process and the coping strategies

The other two questions directed to the teachers were about the general problems they experienced during the distance education process and what they did to solve them. The themes derived from their remarks are shown in

Table 11. *Encountered problems and generated solutions*

Theme	Code	Teacher	Total
Technical issues	Internet connection issues (freezing, disconnection, poor connection, etc.)	T1,3,4,5,6,7,8,9,10,11,12,13,15	13
		T1,2,3,4,5,11,15	7
	Insufficient internet quota in students' homes, and houses with no internet connection	T2,4,5,6,7,11	6
	Electric cut-outs		
	Issues related to EBA and ZOOM	T3,9,10,15	4
	Students have no computer/tablet	T1,2,3,5,11,14	5
Academic issues	Parents' failure to create a suitable classroom environment for children, their indifference	T3,4,7,8,12,13,14	7
	Being outside the home during the class, not making the necessary preparations, and so on.	T2,3,7,9,13	5
	Conditions created by being in front of the screen for a long time (distraction, boredom, etc.)	T9,11,14	3

	Others help students at home during the class	T6,13	2
	Inability to do effective measurement and evaluation	T6,7	2
	Students not attending the English classes	T9	1
	Crowded classrooms	T14	1
	Inability to work with students individually	T14	1
Curriculum-related issues	Overlapping class times of other children in the house	T3,5,11	3
	Inability to reach the foreign origin students	T7,12	2
	Dense course content	T6	1
Generated solutions	Meeting with parents	T3,6,7,9,10,11,13,14	8
	Sending/checking homework and activities via the class WhatsApp group	T3,7,12,15	4
	Providing suggestions for those who cannot attend the class (connecting the internet, using it alternately with their siblings)	T2,5,11	3
	Warning	T8,12	2
	Setting rules	T8,12	2
	Repeating that day's lesson the next day	T4	1

According to Table 11, under the technical issues, most teachers (f:13) stated that they experienced connection issues. Other technical issues they expressed were EBA and Zoom-related issues, students' having no computers/tablets, and those having one had inadequate technical equipment. For example, regarding the internet connection problems, T12 stated, *"We had many technical and internet problems. Disconnections happened. My voice would transmit interruptedly during the class and their voices would come interruptedly."* T5 had the following comments regarding the electricity cut-outs: *"Half of the village had electricity, and half did not. There are many houses with no internet line connected. There they go to others. I have many students who attend the class together."* As such, T2 stated, *"Electricity cut-outs happen here most often. Also, all students do not have the same equipment, which largely affects [the teaching-learning process]. Some have the display but have no sound. Unfortunately, these [issues] negatively affected our classes."* Deficient/incorrect learning (f:13), conditions created by being in front of the screen for a long time (f:5), and parents' failure to create suitable class environments for children (f:5) were the major problems from an academic perspective.

"Lagging in lessons and the kids' failure to achieve the learning outcomes effectively. I mean, all of them cannot be achieved. We cannot provide them effectively. We cannot evaluate them effectively... Now, it's the second semester of the second grade. There are still ten students who cannot read and write. When you tell the parents to come to the online class, they don't. Send their videos, they don't. In general, parents are indifferent." (T7)

"This did not work from the screen. This was our biggest problem. The kids learned incorrectly. Ok, thanks to the parents. They have them study. However, we read the sound as -b-, the parent reads and teaches as –be-." (T12)

"It's difficult to keep the child in front of the screen. They get bored." (T14)

The curriculum/syllabus-related problems were the overlapping class times of kids at home (f:3), inability to reach the foreign origin students (f:2), and dense course content (f:1). T3 provided the following examples in this regard: *"For example, when there are six classes, they attend two classes and leave. We are constantly experiencing problems like my brother has a class, my mother will go to the hospital, our internet is out."* As such, T11 provided the following examples: *"Some do not have computers and some do not have enough quota. Parents work, and there is no phone at home. One of our students' elder sister goes to secondary school. I told them to take turns now."* As seen in Table 11, teachers opted for meeting with parents (f:8) as well as sending and checking homework/activities through the WhatsApp group of the class (f:4) against these problems. For instance, T9 had the following views in this regard: *"I call the parents one by one. Actually, it's harder to get them together than at school."* Further, T15 stated, *"I take pictures of extra activities we will do from our books and send them through WhatsApp. Let's say that sentences would be written about the 'a' sound. I would edit the sentences about them and send them screenshots or send them through WhatsApp."*

Findings regarding the views on distance education

The last question directed to the participants during the interviews was about what the group thought about distance education and how they were affected by this process as teachers. The themes and codes obtained from their explanations are summarized in Table 12.

Table 12. *Views on distance education*

	Theme	Code	Teacher	Total
Distance education	Positive views	Easy access to different materials	T3,4,6,7,9,13	6
		Increase in the achievement of students who attend the class regularly	T2,5,10,15	4
		No interruption in education	T4,5,11	3

	Use of educational technology	T2,9	2
	Save time spent during transportation to school	T6,11	2
	Class durations (30 minutes)	T3	1
	Learning to access information	T1	1
	Learning to learn	T14	1
	Attracting students' attention to online courses	T3	1
	Shy students feel more comfortable at home	T5	1
	Allocating more time to learning	T8	1
	Involving families in the process	T8	1
Negative views	Presence of students who cannot participate in classes/inequality	T3,4,5,7,8,11,13	7
	Deficient/incorrect learning (failing to intervene as required)	T2,6,7,9,12,13,15	7
	Being physically distant from students/not being in the same setting	T1,6,9	3
	Decrease in academic achievement	T2,8	2
	Large number of courses	T3,13	2
	Short class durations	T5,8	2
	Families' lack of knowledge about distance education platforms	T10	1
	Families' indifference	T11	1
	The density of the content	T5	1
	Students stay before the screen for a long time	T3	1
Suggestions	Providing internet, computer, tablet, and so forth to students and teachers	T2,4,5,6,7,8,11,13,15	9
	Developing curriculum for distance education	T1,3,5,9,13	5
	Strengthening the technical infrastructure	T5,6,7,8,12	5
	Teachers' self-development	T2,9,14	3
	Improving the EBA	T8,9	2
	Informing families about distance education	T10,12	2
	The syllabus should not constantly be changed but kept fixed	T5	1
	Recording the courses for asynchronous participation	T2	1
	Developing professional skills	All	15
	Getting to know students closely	T3,5	2

Effects on teachers	The opportunities it provides	Spending time with their children and getting to know them closely	T2,5	2
		Gaining distance education experiences	T14	1
	The problems it creates	Physical ailments (lumber pain, backache, neck pain, eye pain, headache)	T1,2,5,6,7,8,9,11,13,15	10
		Negative emotions (Stress, unhappiness, tension, boredom)	T3,4,5,8,9,11,12,14	8
		Being unable to devote time to one's own family	T8,9,13	3
		Expansion of the scope of teaching in terms of time and space	T2,4	2
		Additional workload created by indifferent families	T8	1

As seen in Table 12, teachers generally perceived distance education positively in terms of easy access to different materials (f:6), and increase in achievement of those who attend the classes regularly (f:4), and the fact that no interruption occurs in the education process. Use of educational technologies (f:3), suitability of course duration (f:2), students' learning to access and learn information, and the like were the positively perceived features relating to distance education. For instance, T7 had the following views regarding access: *"I feel we have more resources at our disposal. We choose whatever we want in this world. According to the conditions of the kids, the learning outcomes, and the difficulty level, we choose what we want and reflect them on the screen."* T8 stated that they were able to allocate time for learning with the following phrases: *"Students who are interested in the lesson spend more time on the lesson than they used to because they can't leave the house. For example, students have not come to school until today after three months, but there are students who can read very fluently and have very good writing and can do whatever asked to do."* The presence of students who cannot access education, in other words, inequality is the most frequently mentioned negative feature (f:6), followed by students' deficient/incorrect learning (f:7), being physically distant from students (f:3), and large number of courses (f:2), and students' excessive exposure to technology/screen (f:1). For example, T11 stated that many students could not attend the classes: *"Unfortunately, it is a disadvantage that not every student can participate in this. For example, out of my 25 students, 15-16-17 attend the classes."* T3, who had a similar opinion, stated, *"I think there is inequality of opportunities in education. Children who have this opportunity can attend the class, and the*

children who do not cannot. What's their fault?" Sample comments from other teachers are as follows:

"A complete learning does not take place. I think learning is incomplete." (T9)

"For example, I think it would be incredibly effective if we had four classes instead of six in five days, and if we did it in the form of two plus two." (T13)

"The six-class thing seems like too much to me. A child's presence in front of the screen for six hours, on top of that, the homework we send through EBA, and being constantly exposed to mobile phone and technology are the negative features." (T3)

Participants mostly emphasized providing internet, computer, tablet, and the like to students (f:9), developing the curriculum in line with distance education (f:5), and strengthening the technical infrastructure (f:5) as aspects of distance education that should be improved. Teachers' self-development (f:3), keeping the curricula fixed (f:2), and improving EBA (f:2) were among the other suggestions that teachers expressed. For example, T4 had the following views about providing internet support: *"The internet should be free for everyone. For kids, you know, for those who do not have stable internet. For example, there are five siblings at home and two telephones. They have no tablets or computers. I think a solution should be found for this, too".* T5, who had a similar opinion, said, *"In order to solve the infrastructure problems fully and eliminate inequality, the kids should be provided with equipment. After all, the 8 GB internet provided is useless."* Sample comments from other teachers are quoted below:

"We can reduce the curriculum a little more… It shouldn't be too heavy for the kids." (T1)

"We still have many gaps in distance education. For example, the ministry can create its own channel in this regard. In other words, we can connect directly from EBA's own connection. We still use foreign-origin [programs], and all of them are in English. Since I don't know English, I may use many features of Zoom." (T9)

"I think our teachers should improve themselves a little bit. It doesn't work by just saying, open the book from here and read and write, my child. Actually, there are very effective internet tools and websites." (T2)

The majority of teachers participating in the study believed that distance improved their professional skills (f:13). For instance, T6 stated that they learned technology through this: *"I learned a little more technology. I cannot use these kinds of things too much. I mean I don't tire myself too much. I have mastered how to use EBA."* T8 realized that they needed to be ready for any kind of change. *"It drew my attention to the fact that education can be continued with different methods, education will not be only in the classroom,*

and that we and the governments should be prepared for such negative conditions and that we should develop ourselves more in this field." T14 said that they constantly did research, "*I read more children's books. I constantly search about how can I relate it to the subject?*" Gaining distance education experience (f:2) and the opportunity to get to know their students (f:2) and their own children closely (f:1) were other positive reflections. For example, of these teachers, T5 stated that they had the opportunity to know their kids closely: *"We do face-to-face education when we go to school and come back. Since we couldn't spend more time with our children, I learned that I have failed to know my own children enough. Since I spent more time with my children, I know their expectations better, and I approach my students with that view."* T14 said that they gained distance education experiences saying: *"It has been an incredible experience. How can I make myself loved even from distance, and what do I do to get their attention? It is good to make people laugh face to face, but it's very difficult to have 32-33 children at the same time from distance."*

The negative effects of distance education on teachers were expressed as health problems (f: 10), negative emotions (f: 8), not being able to spare time for themselves and their families (f: 3), and the expansion of the scope of their professional responsibilities (f: 2). Some of the explanations are quoted below:

"Inactivity. Constantly sitting. My eyes weakened because I was constantly looking at the screen." (T15)

"Being afar. I love doing activities, watching them while they are doing, and making them laugh. Not being able to touch or hug them is very bad. I am unhappy." (T14)

"Unstable class hours bothered me a lot. It greatly messed up the order in my home." (T5)

Discussion and Comments

As a result of the study, it was determined that teachers prepared for distance education courses by creating digital content and materials. In this process, they made choices by examining videos, slides, questions, and the like from educational websites on the internet, downloaded them to their personal computers, and used reference books in the activities. Many studies show that teachers often employ digital contents to positively influence student perceptions (Aktay & Keskin, 2016; Cahapay, 2020; Elçiçek, 2019; Elitaş, 2017; Ergüney, 2017; Hromalik & Koszalka, 2018; Kalemkuş, 2016; Koohang, 2008; Sharifabadi, 2006). It is also common for reference books to be preferred more than textbooks because they are interesting and more understandable, appeal to individual differences, contain questions suitable for the central examination system, and are diverse (Gökçek & Hacısalihoğlu

Karadeniz, 2013; Özmantar, Dapgın, Çırak Kurt, & İlgün, 2017; Taş & Minaz, 2018). It is of primary importance for the success of the course that teachers prepare the content and materials they will use in distance courses in advance by referring to different sources and keeping them within their reach (Alea, Fabrea, Roldan, & Farooqi, 2020; Dilci, 2012; Yıldırım, 2020). Past studies also support that coming to the class planned provides advantages in time management and that time management changes in direct proportion to academic achievement (DonGiovanni ONeil, 2009; Gözel & Halat, 2010; Kayode & Ayodele, 2015; Üstün, Nural, & Değer, 2005). Therefore, the preparations that teachers make before the lesson could be evaluated functionally under the principles of relevance to students, being up-to-date and affordability, as well as in terms of effective teaching and time management.

Students are more interested in methods and techniques appropriate to them (Gaytan & MxEwen, 2007). Therefore, be it face-to-face or distance education, uncovering students' potential and increasing their success depends on the use of teaching strategies, methods, and principles that suit their individual differences (Arı, 2014). In particular, considering that teacher-student interaction is relatively less in distance education, it is necessary to employ various strategies, methods, and techniques in the lesson to offer more opportunities to students who learn in different styles. However, the results obtained in this study indicated that besides using visual materials, teachers mostly teach their lessons using the lecture and question-answer methods. This situation, which does not meet the principle of student-friendliness, may have resulted from a swift shift to online education during the pandemic. In other words, the curricula that are not adapted to distance education and short online course durations may have led teachers to convey the course content directly to complete the curriculum on time. Supporting this comment, teachers who participated in this study also stated that they had to prolong the course duration despite having plans and being prepared to complete the subject matters, they took the time of other courses (Physical Education, Music), and gave some activities as homework. It is not possible to discover all conditions that are suitable for every student in the teaching-learning process (Felder & Brent, 2005). However, the current technological developments provide great opportunities for teachers in terms of applying more innovative teaching strategies (Natarajan, 2005). Thus, teachers' keeping on applying traditional teaching methods (Apaydın & Kandemir, 2018; Demir & Özden, 2013; Karasu Avcı & Ketenoğlu Kayabaşı, 2019; Koçak, Demirel, Karakuş, & Göktaş, 2016) and experiencing problems in enriching their lessons (Akdeniz & Uzun, 2022; Şenocak, 2020) may stem from their techno-pedagogical inadequacies and their unawareness of distant classroom applications such as Google Class, Kahoot, Quizizz, and the like.

The study showed that teachers mostly used similar strategies such as using pictures/images relating to the topic, singing, playing games, asking riddles, talking, making jokes, encouraging, using nice words, and so forth to motivate and attract student attention. Several studies have also determined that teachers use visual materials, reinforcements, and humor to motivate and grab student attention toward the course (Erdem & Bayraktar, 2018; Faruzi & Khusuma, 2020; Godwin & Fisher, 2011; & Ceyhan, 2018; Uçar, 2016). Stimuli appealing to students' knowledge, desires, interests, needs, curiosities, and expectations attract their attention more easily (Wei, Wang, & Klausner, 2012) and effective teaching practices (Risko, Anderson, Sarwal, Engelhardt, & Kingstone, 2012; Wang, 2015), learning something new (El Hmoudova, 2014), and materials (Senemoğlu, 2018) positively influence student motivation. In this case, one could argue that the participant teachers in this study applied attention-grabbing and motivational strategies appropriate to students' developmental characteristics. However, the fact that teachers used the same stimuli to ensure attention and motivation suggests that they may have failed to distinguish the difference between these two variables that affect learning. Attention refers to when individuals focus their mental power on a certain stimulus (Solso, MacLin, & McLin, 2011), and the motivation is moving individuals toward action (Bandura, 2009). The motivation level of individuals facilitates gathering attention (Smith & Kosslyn, 2014; Wei, Wang, & Klausner, 2012), however, every attractive stimulus does not provide motivation. Focusing on the same topic for a long time, having to do the same thing (listening, watching, etc.) and encountering the same stimuli cause decreased attention, experiencing difficulties in perception, and decreased motivation (Cummings Hlas, Neyers, & Molitor, 2017). According to studies, student motivation in online courses is influenced by group sizes and students' interaction with each other (Barak, Watted & Haick, 2016), and the absence of face-to-face education reduces motivation (Galusha, 1998; Hebebci, Bertiz, & Alan, 2020). Motivation means keeping students' energy high and giving them the strength to maintain their active states in learning. Therefore, it could be stated that teachers should go beyond constantly offering similar stimuli and try to create meaningful and diverse learning opportunities where students can interact directly with each other and the subject matter they are learning. Otherwise, students' inclination towards off-class behaviors would be inevitable.

Another important result of the study was that students often exhibited behaviors such as doing things unrelated to the lesson, turning the camera/microphone on and off, scribbling on the screen, speaking without asking for permission, and speaking about issues unrelated to the lesson during the distance education process. Although indifference to the lesson, disrupting the class, and not fulfilling one's responsibilities are the problem behaviors

observed in face-to-face education (Arı, Kızılaslan Tunçer, & Demir, 2016; Erol, Özaydın, & Koç, 2010; Tonbuloğlu, 2017), novel negative behavior patterns relating to technology utilization have also emerged in students in the education process (Akdeniz & Uzun, 2022; Can, 2020; Choudhary, Noor, & Khushnood, 2020; Efriana, 2021; Fidan, 2020; Özdoğan & Berkant, 2020). These behaviors may stem from the attention and motivation problems of students who spend a significant part of the day sitting before the screen and not knowing about how to use the platforms where distance education is provided. Students have remained afar from structured learning environments (school, classroom) during the pandemic, and since they were dependent on their parents to use technological tools because of their age (Fauzi & Khusuma, 2020), they attended the lesson from learning environments created for them. According to studies, how well families can prepare an appropriate educational environment for their children is closely related to their education level, sociocultural status, and economic conditions (Behtoui & Neergaard, 2016, Flores-Vance, 2013; Mollegaard & Meier Jeager, 2015; Pitzalis & Porcu, 2016; Radu, 2018; Sheng, 2016). Whether there is an internet connection at home, how much support they will provide to their children since they are the owners of the mobile phone, how many children go to school in the home environment, and whether the child is alone at home or not are very important in terms of providing support and cooperation to teachers (Rasmitadila et al., 2020). In this case, the characteristics of the environments where children attended classes during distance education may also have led to the development negative behavior patterns. Supporting this interoperation, as in this study, many studies have determined that teachers consider the environments where students attend classes unsuitable for learning (Arslan, Görgülü Arı, & Hayır Kanat, 2021; Başaran, Doğan, Karaoğlu, & Şahin, 2020; Hebebci, Bertiz, & Alan, 2020; Yılmaz, Güner, Mutlu, & Arın Yılmaz, 2020).

Students need to receive education in suitable environments to prevent problems related to attending courses and fulfilling their responsibilities. In this context, one could consider it a natural result of the process and a preventive approach that teachers who participated in this study determined new classroom rules regarding the use of computers, microphones, and cameras, learning environment, class participation, and time management. Classroom rules support organizing the teaching-learning processes, helping students to develop positive personality traits and acquire self-discipline. For instance, Frazier and Sterling (2010) determined in their study that gaining a habit of preparing course materials in advance contributes to students' being respectful towards each other. As such, when students' course materials are ready, their communication increases with the class (Şahin, 2014), and following the rules gives the students positive habits over time (Yılmazsoy, Özdinç, & Kahraman, 2018). According to Bickford (2020), the fact that

students come to the class unprepared may even discourage teachers from their planned activities. However, the interventions made when the rules were not obeyed were mostly limited to verbal warnings, changing the sound and camera settings, and meeting with family members present at home at that moment, which could be interpreted as focusing on short-term solutions or teachers not going beyond certain coping strategies.

Studies show that with positive teacher communication, children feel safer at school (Kıldan, 2011), feel connected to school (Birch & Ladd, 1997), and students who think that they are valued by their teachers adapt to school more easily (Hallinan, 2008). In this study, the fact that teachers spared time for talking with their students about current issues, making jokes, and having fun with activities such as mind games and keeping rhythm is critical in terms of not neglecting to establish emotional bonds with their students. On the other hand, the fact that teachers do not refer to channels such as body language and tone of voice that affect the communication quality suggests that they do not employ all communication channels in the lesson and do not employ an alternative that could be effective in preventing undesirable behaviors. The reason behind this might be problems related to the internet and technical issues, as mentioned by teachers and supported by the literature (Choudhary, Noor, & Khushnood, 2020; Çilek, Uçan, & Ermiş, 2021; Dubey & Pandey, 2020; Fidan, 2020; Mahasneh, Al-kremieen, Alrammana, & Murad, 2021; Özdoğan & Berkant, 2020). The probability of experiencing problems with the connection may have made teachers allocate more time to activities and stop communicating with students after the class. In this context, the fact that after-class virtual socialization, making video calls, creating WhatsApp groups, and messaging stand out in the research could be considered natural as a requirement of the pandemic process. Research studies indicate that parents expect teachers to call students as often as they consider convenient (Yılmaz, Güner, Mutlu, & Arın Yılmaz, 2020) and that teachers value establishing communication with them (Koç, 2018), showing that communication channels should be kept active even beyond the class. Other problems experienced by teachers during the distance education process were related to the curriculum/syllabus and practices, which were attempted to be solved with parents' cooperation, similar to the relevant literature (Adıgüzel, 2020; Özdoğan & Berkant, 2020; Sarı, 2020; Şeren, Tut, & Kesten, 2020). According to the results of the study, distance education was perceived positively in terms of easy access to different materials, an uninterrupted continuation of education, and an increase in the academic achievement of students who regularly attended the courses during the pandemic. This result is also supported by relevant studies, and access to materials, not being deprived of education, and the opportunity to study in a comfortable environment are emphasized as positive features of distance education

(Başaran, Doğan, Karaoğlu, & Şahin, 2020; Demir, 2014; Fadillah, Nopitasari, & Pradja, 2020; Hebebci, Bertiz, & Alan, 2020; Mulenga & Marban, 2020b; Mulenga & Marban, 2020a). The factors that have a negative impact on distance education processes are that students who have no technological tools cannot attend class, deficient and incorrect learning occurs, and not being in the same environment with students. Students not experiencing distance education in rural areas, deficient or incorrect learning, decrease in academic achievement, and excessive exposure of young students to the screen are the factors mentioned as negative aspects of distance education in many studies (Çilek, Uçan, & Ermiş, 2021; Dubey & Pandey, 2020; Jena, 2020; Kaynar, Kurnaz, Doğrukök, & Şentürk Barışık, 2020; Mailizar, Almanthari, Maulina, & Bruce, 2020; Radha, Mahalakshmi, Sathish Kumar, & Saravanakumar, 2020). In this case, the participant teachers in this research suggested increasing efficiency in distance education by providing students with internet, computer, tablet, printer, and so forth, adapting the curriculum to distance education, and strengthening the technical infrastructure, which could be interpreted as the consistency of research findings. Although teachers addressed the negative effects of distance education processes in terms of physical (lower back, back, and neck pain), emotional (stress, unhappiness, tension) and social (failing to spare time for oneself and family), teachers' seeing distance education as an opportunity for professional development could be interpreted as a positive result in terms of cognitive awareness. Supporting this interpretation, in a study by Cao, Zhang, Chan, and Kang (2021), the majority of teachers stated that they learned how to use different functions of digital platforms during distance education.

Conclusion and Implications

The study showed that the preparations made by the teachers before the class are functional in terms of both effective teaching and time management (1), however, teaching strategies, methods, and techniques cannot be adapted to distance education (2), teacher-centered processes are dominant during the class (3), and there are time management problems (4). Teachers (5) who employ attention-grabbing and motivational strategies through strategies suitable for students' developmental characteristics fail to ensure persistence in attention and motivation (6). The distance education process has necessitated new classroom rules regarding participation in online classes, the use of microphones and cameras during the class, and the learning environment (7). Although some preventive approaches have been followed, efforts to provide discipline have been limited to strategies that focus on short-term solutions (8). During the pandemic, distance education practices took teacher-student communication beyond the class and expanded it to a much wider period of time, and virtual socialization (making video calls, creating

WhatsApp groups, and voice or text messaging) has become a natural and desired type of communication (9). Quick access to materials, increase in the achievement of students who attend classes regularly, and not being deprived of education during the pandemic have been the positively perceived features of distance education (10). The problems experienced showed that the key point in distance education is the technological infrastructure, appropriate learning environment, and curriculum (11). Despite experiencing many problems, gaining distance education experience was perceived as an opportunity for professional development (12).

In the distance education process, which entered our lives along with the Covid-19 pandemic in a mandatory and unprepared way at all educational levels, every teacher had to create a new order in their classrooms or in the lessons they thought. Therefore, in order to improve the deficiencies identified in terms of classroom management in teachers' practices and to strengthen distance education practices, one could suggest:

- Providing techno-pedagogical training programs that focus on teachers' and prospective teachers' competencies to integrate technology, pedagogy, and content knowledge into the teaching process
- Enriching digital content and material resources appropriate for all levels of education and increasing accessibility
- Ensuring the integration of the curricula with technology and distance education
- Providing information and support to all stakeholders on distance education

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Development of the Jefferson Scale of Empathy for Teachers (JSE-T) to Measure Empathy in Educationally Relevant Situations

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Abstract

The Jefferson Scale of Empathy is one of the most commonly used scales in medical education to measure empathy. It is specific to the field of medical education and geared toward orienting medical students to physician empathy in patient care situations. The scale was transferred to the educational context in teacher education. In doing so, the questionnaire was reduced from the original 20 items to 9 because of content and methodological issues. A CFA showed good model-fit parameters for a three-factor model, and correlations with the German version of the Interpersonal reactivity Index were in line with the magnitudes reported in previous literature. In total, the JST-E scales show evidence for their factorial and convergent validity and their reliability. The JSE-T proves to be a good instrument for measuring empathy in educational contexts and thus closes the gap between trait measurement procedures such as the IRI and concrete-situational judgment tests, so that an economical, multidimensional testing of empathy becomes possible.

Keywords: Empathy, Jefferson Scale of Empathy, teacher education

Introduction

Empathy is the ability to understand, comprehend and sympathize with the internal state of another. This includes both cognitive and affective abilities such as perspective taking, empathy, and compassion. Saxena et al. (2017, p.

765) describe empathy as "the ability to understand and share in the internal states of others (...) as well as the abilities to react to the internal states of others, and to distinguish between one's own and others' internal states." Thus, it is a complex construct consisting of several components and, depending on the research direction, the focus is placed more on affective or on cognitive processes.

Empathic individuals are more successful in social interactions with others (Baron-Cohen & Wheelwright, 2004; Davis, 1983a; Mehrabian & Epstein, 1972). A teacher's empathy skills are therefore also among the strongest predictors of positive academic as well as affective and behavioral student outcomes (Cornelius-White, 2007). It is helpful in many phases of teaching, such as classroom management (Emmer & Stough, 2001), in recognizing learners' emotions such as anxiety, anger, or even joy in various learning activities (Weisz et al., 2021), but also in dealing more effectively with disruptions (Stojiljković et al., 2012) or bullying (Bilz et al., 2017). Teachers who rated their own emotion recognition skills higher rated their subjective teaching success more positively (Wu et al., 2019) and were also viewed as "more skilled" by their students (Ghanizadeh & Moafian, 2009; Khodadady, 2012). Therefore, acting empathically is considered an important aspect of educational professionalism (Auernheimer, 2016).

Affective empathy describes empathizing with the internal state of a counterpart and has a high genetic disposition (Farrell & Vaillancourt, 2020; Melchers et al., 2016), which is also supported by the fact that this trait changes little over the course of age (Ziaei et al., 2021). Perspective-taking ability, on the other hand, is a cognitive trait that, like all cognitions, first emerges and changes over development (Farrell & Vaillancourt, 2020; Zahn-Waxler et al., 1992) and also declines somewhat with older age (Ziaei et al., 2021). Therefore, most empathy training also aims to improve perspective-taking (Bas-Sarmiento et al., 2017; Fragkos & Crampton, 2020; Paulus & Meinken, 2022a, 2022b).

The Jefferson Scale of Empathy (JSE) is one of the most commonly used scales in medical education to measure empathy (Costa et al., 2017; Hojat et al., 2002; Hojat et al., 2001; Mehta et al., 2021; Nasr Esfahani et al., 2014; Preusche & Wagner-Menghin, 2013). It was originally constructed to measure medical students' orientation toward physician empathy in patient care situations and, more importantly, to assess prospective physicians' cognitive-empathic skills in dealing with patients. It measures three factors, Perspective Taking, Compassionate Care, and Walking in Patient's Shoes (Hojat et al., 2018)..

Perspective Taking contains 10 items, the content of which is aimed more at cognitive efforts to understand patients (e.g., "I try to think like my patients in order to render better care"), but also explicitly excludes affective

empathy components ("I believe that emotion has no place in the treatment of medical illness").

Compassionate care (8 items) aims at warm-hearted interaction with patients and "is defined as a combination of empathy and sufficient degree of sympathy, (it) is considered an essential dimension of the patient-physician relationship" (Hojat & LaNoue, 2014, p. 75). However, the items of this factor are partly formulated negatively ("I do not enjoy reading non-medical literature and the arts.") or mix cognitive ("I try to imagine myself in my patients' shoes...") and affective aspects ("I have a good sense of humor that I think contributes to a better clinical outcome") within the factor, so that it does not seem to be clearly interpretable to us..

The third factor, "*walking in patient's shoes*", describes the importance of empathy as a therapeutic factor ("I believe that empathy is an important therapeutic factor in medical treatment.").

One thing that is often discussed is the validity relation to other empathy questionnaires, especially the Interpersonal Reactivity Index (IRI) (Davis, 1980, 1983; Paulus, 2009, 2021). This approach to empathy measurement, which originates from social psychology, includes two affective (emotional concern, personal distress) and two cognitive factors (perspective taking, fantasy scale) respectively.

Perspective Taking measures the attempt to spontaneously see something from another person's perspective ("Before I criticize someone, I try to imagine how I would feel in their place"). The *Fantasy Scale* captures the tendency of the respondent to put himself in the place of characters in novels or movies ("I can imagine the feelings of a person in a novel very well"). The remaining two subscales represent operationalizations of an observer's typical emotional reactions: The *Empathic Concern* scale is designed to measure other-oriented feelings such as compassion or concern for persons in distress ("I feel warm feelings for people who are less well off than I am"), whereas the *Personal Distress* scale is designed to measure intrinsically focused feelings such as unease or discomfort in close interpersonal relationships ("Being in a tense emotional situation makes me anxious").

At best, moderate correlations (Costa et al., 2017; Hojat & Gonnella, 2017) between the questionnaires are reported. However, it is often forgotten here that the JSE has only situation-typical (i.e., rather state-) item contents, whereas the IRI in its item formulation focuses on (trait-) basic behaviors in different situations (Song et al., 2019). Moreover, the measured factors of the two questionnaires are not identical, although there are overlaps. "The IRI relies on the definition of empathy as a combination of both cognitive and emotional attributes, whereas the JSE was developed based on a definition of empathy in clinical context as a predominantly cognitive (as opposed to

emotional) attribute that involves understanding (rather than feeling) the patient's pain, suffering, experiences, and concerns" (Hojat & Gonnella, 2017, p. 743).

However, this situation specificity can also be utilized when transferring the contents of the JSE to other professional groups.

For our studies, the target group of the questionnaire was transferred from medical professionals to teachers and educational contexts, referring to the adapted version as the JSE-T. As a starting point, the items from Preusche and Wagner-Menghin (2013) were used. The transfer of the wording is shown in the following example item 2:

JSE: "Patients feel better when their physicians understand their feelings."

JSE-T: "Students feel better when their teachers understand their feelings."

However, this was not possible for some items because they were too far removed from the pedagogical context. This concerned items 4 ("Understanding body language is as important as verbal communication in physician-patient relationships."), 5 ("A physician's sense of humor contributes to a better clinical outcome."), and 19 ("I do not enjoy reading non-medical literature or the arts."). In addition, item 18 was not transferred due to negative wording and the associated difficulties of semantically correct answers in German. („Physicians should not allow themselves to be influenced by strong personal bonds between their patients and their family members.")
In transferring the item content, it was nevertheless attempted to replicate the three-factor structure with the caveat that our study's sample has greater variance than Hojat's (2018) because student teachers have a greater breadth of subjects than medical students. For the JSE-T, it was expected that the 3-factor structure corresponds to the structure of the JSE (Hojat & LaNoue, 2014), with factor 1 corresponding to the "Perspective Taking" factor, factor 2 corresponding to the items on "Walking in patient's shoes", and factor 3 corresponding to "Compassionate Care".

As described at the beginning, the two theoretical approaches of the IRI and the JSE differ to some extent (see above), so that high correlations are not to be expected. The correlations between the JSE scales and the relevant EC and PT scales of the IRI found in other studies are small to medium (Hojat et al., 2001, p. 361: $r_{EC} = .41$, $r_{PT} = .29$); Costa et al., 2017, p. 865: $r_{EC} = .23$, $r_{PT} = .27$). For our adapted version, medium correlations of the three JSE-factors with the EC and PT scale from a German version of the IRI, i.e., the SPF (Paulus, 2009) were expected.

Method

Sample

The sample consisted of 167 student teachers between the ages of 18 and 40 ($M = 22.81$, $SD = 4.168$), of which 116 were female and 51 were male. The SPF responses were also available from 77 subjects.

Data collection tools

The 16 items of the adapted version of the JSE (Preusche & Wagner-Menghin, 2013) was used as starting point, cf. appendix 1. The items were presented in combination with a 5-point rating scale, ranging from 1 = Strongly Disagree to 5 = Strongly Agree. In addition to that, the German version of the IRI, the SPF (Paulus, 2009), was used to measure trait empathy. The data were collected online to ensure that no missing values occurred.

Statistical analysis

The statistical analysis was performed with R with a nominal α level of $\alpha \leq .05$. The package lavaan (Rosseel, 2012) was used to conduct the exploratory and confirmatory factor analysis with maximum likelihood estimation.

Before conducting factor analyses, an item screening based on the descriptive statistics was considered. In this screening procedure, for each of the three potential dimensions of the JSE-T, those items were excluded which had a mean close to upper end of the rating scale and a small variance.

To examine the factorial validity of the JSE-T questionnaire, a two-step procedure was used: In the first step, it was investigated whether the assumed three-factor structure holds by means of exploratory factor analysis (EFA). The information criteria were used to determine the number of factors (Klopp, 2022). Models with 1 up to 5 factors were estimated and considered the AIC, BIC and SBIC. As the items were designed to measure three factors, the information criteria should have their minimum for the 3-factor model. Additionally, the usual fit indices to judge model fit were considered. Fit indices for the EFA model and the following models are made using the guidelines provided in Schermelleh-Engel, Moosbrugger, and Müller (2003). In the second step, a confirmatory factor analysis (CFA) model was set up. A CFA model imposes a strict test of the simple structure in the sense of Thurstone (1947) as all cross loadings are assumed to be zero. Thus, a well-fitting CFA model provides strong evidence for the factorial validity of the JSE-T. In the first CFA model (model 1), the latent variables are measured by the pertinent items. In particular, the factor F1 should capture the scale *Show understanding*, the factor F2 the scale *Empathy as a pedagogical skill*, and the factor F3 the scale *Pedagogy instead of empathy*. To scale the latent variables, the latent variances were restricted to 1. With this scaling, the covariances

between the latent variables can be interpreted as correlations and the loadings reflect the amount of change when the latent variable changes one unit (Klopp & Klößner, 2021). From a measurement perspective, it would be desirable if all items had more or less equal loadings such that each item reflects the same amount of change of the latent variable. From a psychometric perspective, this corresponds to a τ-equivalent measurement model (cf., Brown, 2015). To test if τ-equivalence holds, a second CFA model (model 2) was set up with the restriction that the loadings had to be equal for each factor.

To investigate the convergent validity in the sense of the correlations of the factors with the SPF scales, a second CFA model (model 3) was investigated in which the SPF's scales EC and PT were considered. Again, to scale the latent variables, the latent variances were restricted to 1. Because of the small sample size ($n =77$) for model 3, bounded estimation (De Jonckere & Rosseel, 2022) were applied. In bounded estimation, bounds are set on certain model parameters to increase the convergence of the model. The bounds were set such that both the manifest and latent variances should be positive. In model 3, the EC and PT scales are entered as manifest variables represented by the standardized sum scores according to Paulus (2009). To judge the convergent validity, the correlation between the three latent variables and the EC and PT scales are considered.

Additionally, internal consistencies in the sense of Cronbach's alpha for the JSE-T scales were calculated. As in typical applications these scales will not be used in a CFA, the sum scores for each of the JSE-T scales were calculated to investigate the convergent validity for these scales. The sum scores for the JSE factors were calculated with the pertinent items for each factor. Pearson correlations were used to examine the correlations between the JSE-T sum scores and the SPF scales.

Results

Table 1. Descriptive data for adapted JSE-T Items cf. appendix 1 (Omitted items are shown in italics)

Item	Intented factor	Minimum	Maximum	M	SD
JSET01	*1*	*3*	*5*	*4.63*	*0.509*
JSET02	1	3	5	4.47	0.599
JSET03	*1*	*2*	*5*	*3.02*	*0.620*
JSET06	*1*	*1*	*5*	*2.94*	*0.726*
JSET07	*2*	*1*	*5*	*4.26*	*0.952*
JSET08	*2*	*2*	*5*	*4.32*	*0.641*
JSET09	*1*	*2*	*5*	*4.50*	*0.702*
JSET10	*2*	*1*	*5*	*4.16*	*0.760*
JSET11	3	1	5	1.81	0.819
JSET12	1	2	5	3.96	0.787
JSET13	1	3	5	4.26	0.713

JSET14	3	1	5	1.41	0.704
JSET15	2	2	5	4.53	0.657
JSET16	1	3	5	4.36	0.613
JSET17	*1*	*1*	*5*	*3.13*	*0.933*
JSET20	2	2	5	4.66	0.578

The final German items and English translation of the JSE-T questionnaire are shown in the appendix 2.

Because of the item exclusion, the factors of the JSE-T scale assess the following dimensions:

- **Factor 1 (F1, "Show understanding"):** The factor describes perspective taking in conversations with students. This makes the relationship between teacher and student more trusting and more understanding on the part of the teacher.
- **Factor 2 (F2, "Empathy as a pedagogical skill"):** Empathy is generally valued as a pedagogical skill that can increase teacher success.
- **Factor 3 (F3, "Pedagogy instead of empathy"):** The view here is that pedagogical measures and rules, especially in the case of school problems, are more important than empathy and that emotions should be left out of the solution of school problems.

Table 2 shows the descriptive statistics for the items of the JSE-T and the SPF scales. With regard to the first step in investigating the factorial validity of the JSE-T, all three information criteria indicated a three-factor solution, see table 3. As indicated by the fit indices, this model fit the data well.

Table 2. Correlation matrix of the JSE-T items (cf. appendix 2), EC, and PT scale

	Item 1	Item 2	Item 3	Item 4	Item 5	Item 6	Item 7	Item 8	Item 9	EC	PT
Item 1	-										
Item 2	**.348**	-									
Item 3	**.400**	**.409**	-								
Item 4	**.256**	**.323**	**.492**	-							
Item 5	**.305**	**.403**	**.431**	**.416**	-						
Item 6	**.266**	**.323**	**.230**	**.345**	**.380**	-					
Item 7	**.295**	**.336**	**.366**	**.351**	**.450**	**.603**	-				
Item 8	.070	-.078	-.115	-.143	-.130	-.063	-.147	-			
Item 9	-.131	-.149	**-.176**	**-.251**	-.145	**-.180**	**-.278**	**.477**	-		
EC	**.236**	.207	**.268**	.141	**.280**	.222	**.314**	-.130	-.143	(.74)	
PT	.066	**.276**	**.316**	.182	.221	.052	**.244**	**-.450**	-.150	**.257**	(.78)

Note. Correlation coefficients in bold are significant. The numbers in brackets indicate Cronbach's α of the EC and PT scales

Table 3. Information criteria and fit measures for the EFA model selection

factors	AIC	BIC	SBIC	χ	df	p	CFI	SRMR	RMSEA	RMSEA CI lower	upper	p_{close}
1	2848.281	2904.405	2847.414	95.947	27	.000	0.804	0.085	0.124	0.097	0.151	.000
2	2819.710	2900.777	2818.458	51.376	19	.000	0.908	0.051	0.101	0.068	0.135	.007
3	**2794.525**	**2897.418**	**2792.935**	**12.191**	**12**	**.430**	**0.999**	**0.023**	**0.010**	**0.000**	**0.080**	**.750**
4	2799.622	2921.224	2797.744	5.288	6	.507	1.000	0.014	0.000	0.000	0.094	.727
5	2805.609	2942.801	2803.490	1.275	1	.259	0.999	0.007	0.041	0.000	0.215	.352

Note. Bold numbers indicate the factor model with the minimum information criteria.

Table 4 shows that the CFA model 1 fits the data very well indicating evidence for the factorial validity of the JSE-T scale. CFA model 3 provides evidence for the convergent validity of the JSE-T factors. Firstly, the model fits the data, see table 4.

Table 4. Fit measures for the CFA models

	χ^2	df	p	CFI	SRMR	RMSEA	RMSEA CI lower	upper	p_{close}
Model 1	27.735	24	.271	0.989	0.041	0.031	0	0.072	.734
Model 2	41.737	30	.075	0.967	0.077	0.048	0	0.081	.499
Model 3	46.730	36	.109	0.922	0.075	0.062	0	0.108	.328

Table 5 (left panel) shows the factor loadings. As can be seen, all factor loadings load positively on all the factors as intended per item construction. Two notable results are the rather low error variances of item 7 and item 9. Whereas the error variance for item 7 is statistically significant ($p = .008$), the error variance for item 9 is not ($p = .876$). This is in contrast to all other manifest error variances which are statistically significant (all $p \leq .001$) and may indicate potential problems with these items. The factor correlations are as expected, factor 1 and 2 show a strong and significant correlation ($p \leq .001$), where factors 1 and 3 show a medium negative and significant correlation ($p = .006$) and the same applies to the correlation between factors 2 and 3 ($p = .006$).

Concerning the τ-equivalence of the measurement model, model 2 in table 5 (right panel) indicates a rather good model fit providing evidence that each indicator contributes equally in the measurement of the three JSE-T factors. All factor loadings and all manifest residual error variances are significant. The correlation pattern among the factors remains the same, although their numerical magnitudes change slightly.

Table 5. Loadings, manifest error variances θ, and factor correlations in CFA Model 1 and 2

CFA Model 1				CFA Model 2			
Factor loadings							
Variable	F1	F2	F3	θ	F1	F2	F3	θ
Item 1	.304			.264	.411			.257
Item 2	.413			.319	.411			.316
Item 3	.542			.322	.411			.372
Item 4	.447			.305	.411			.322
Item 5	.407			.208	.411			.205
Item 6		.458		.219		.479		.205
Item 7		.497		.086		.479		.099
Item 8			.402	.504			.528	.409
Item 9			.679	.031			.528	.204
Factor correlations							
	F1	F2	F3		F1	F2	F3	
F1	-				-			
F2	.682	-			.708	-		
F3	-.284	-.316	-		-.311	-.348	-	

Note. All loadings are significant, $p \leq .001$, all factor correlations are significant, $p \leq .01$

Table 5 shows that whereas the loading structure mostly remains the same as in Model 1, the correlation between factors 1 and 3 almost vanishes and is no longer significant ($p = .774$). The correlation between factor 1 and 2 is also lightly lower than in model 1, but remains in the medium range and is no longer statistically significant ($p \leq .114$). However, the correlation between factor 1 and 2 remains on a high level and also remains significant ($p \leq .001$). The correlations between the JSE-T factors and the SPF scales are as expected: Factor F1 shows medium correlations with the EC and PT scales ($p = .001$, and $p = .002$) and factor 2 shows a medium, significant correlation with the EC scale ($p = .006$). Additionally, for factor 2, the correlation with EC is also significant ($p = .045$). Lastly, for factor 3, the expected negative medium correlation with the PT scale was found which was significant ($p = .001$).

A noteworthy result in model 3 concerns factor 3. For this factor, the loadings of the items now differ largely in their magnitude. Item 8 now has a manifest error variance of zero which corresponds to the lower bound in the bounded estimation. A further observation for factor F3 is that in model 3, the magnitudes of the loadings now differ largely, which is not the case for the other factors in model 3. Additionally, for factor F2, Item 7's manifest error variance is very small which is an analogous result to model 1. However, in model 3, Item 7's manifest error variance is non-significant ($p = .250$). Again, and in analogy to model 1, this is an indication of potential problems with the items.

With regard to the reliability, the correlations of the JSE-T as operationalized by the scales' sum scores with the SPF scales were considered as shown table 6. The derived scales show medium internal consistencies in sense of Cronbach's α. In particular, the derived scale for *Pedagogy instead of empathy* has a rather low internal consistency.

Table 6. Loadings, manifest error variances θ, and factor correlations in CFA Model 3

Factor loadings				
Variable	F1	F2	F3	θ
Item 1	.269			.334
Item 2	.279			.316
Item 3	.488			.344
Item 4	.325			.338
Item 5	.364			.244
Item 6		.236		.228
Item 7		.326		.043
Item 8			.874	0 (lb)
Item 9			.372	.385

Factor and SPF scale correlations					
	F1	F2	F3	EC	PT
F1	-				
F2	.673	-			
F3	-.040	-.216	-		
EC	.426	.381	-.129	-	
PT	.412	.271	-.447	.254	-

Note. All loadings are significant, $p \le .001$, all factor correlations are significant, $p \le .01$. lb: lower bound, this estimate reached the lower bound of possible values in the bounded estimation.

Regarding the question whether there is also evidence for the convergent validity of the JSE-T's sum scales (table 7), the scale *Show understanding* shows a medium positive and significant correlation with the SPF's EC and PT scales. The scale for *Empathy as a pedagogical skill* also shows a medium positive and significant with the PT scale. However, the scale for Pedagogy instead of empathy shows a medium negative, significant correlation with the PT scales. All correlations are in line with theoretical expectations and correspond to the pattern of correlations found in model 2. As described in the introduction, the two theoretical approaches of the SPF and the JSE-T differ to some extent, so that high correlations are not to be expected. For both the correlations of the JSE-T with the SPF in model 2 and in terms of sum scores, the correlations found here are in line with other studies such as Hojat et al. (2001, p. 361) or Costa et al. (2017).

In total, the JST-E scales show evidence for their factory and convergent validity and their reliability.

Table 7. Internal consistencies and correlations between the JSE sum scores and the SPF sum score scales

Sum score scale	Cronbach's α	EC	PT
Show understanding	.75	**0.347**	0.**330**
Empathy as a pedagogical skill	.75	**0.312**	0.159
Pedagogy instead of empathy	.64	-0.156	**-0.360**

Note. Correlations in bold are significant, $p \leq .001$. EC: Empathic concern, PT: Perspective taking

Discussion

In the context of empathy research, predominantly questionnaires are used that are more trait oriented such as the IRI (Davis, 1980), the E scale (Leibetseder & Laireiter, 2001), MET (Dziobek et al., 2008), or the EQ (Baron-Cohen & Wheelwright, 2004). These capture more general empathic behaviors and attitudes that are exhibited across situations. However, this makes these measurement methods only partially suitable for providing information about the empathic behavior of individuals in very specific contexts such as medicine or even pedagogy. The situation specificity of the JSE was made use of by transferring the item contexts to pedagogical and school situations in order to be able to obtain specific statements about empathy-relevant behavior in school situations as a supplement to the IRI. Thus, the gap between trait-oriented measurement methods and concrete-situational questionnaires such as those represented by the Situational Judgement Tests (Chao et al., 2020; McDaniel et al., 2007; Patterson et al., 2016; Wolf et al., 2020) was closed. The JSE-T, which focuses on the attitudes of prospective teachers, can replicate the factor structure of the original JSE (albeit with different contexts of the factors) and is also more economical to use with only 9 items instead of 20. The correlations to the factors of the SPF are within expectable orders of magnitude and indicate theoretically justifiable directions.

Of course, this study represents only a first approach to the construction of such a scale, and there are also some limitations that should be considered when applying the JSE-T, especially when it its used in the context of latent variable models. This refers to the issues of small and not statistically significant error variances. A possible reason for this finding is the almost identical content of the items. Further investigations should refine the items measuring the second and third factor, in particular their wording. In addition to that, any statements about short- and long-term retest reliability cannot yet made, since no data on this is available yet. However, the reliability calculations via Cronbach's alpha show good internal consistencies of the three factors. Thus, the scales can be used in typical applications in which sum or mean scores are used, e.g., to investigate correlations with other constructs.

The JSE-T proves to be a good instrument for measuring empathy in educational contexts and thus closes the gap between trait measurement procedures such as the IRI and concrete-situational judgment tests, so that an economical, multidimensional testing of empathy becomes possible. Due to the only medium sample size, further studies on this are needed, but the test-statistical results form a solid basis of the usefulness of the approach chosen here.

Conclusion

The aim of the study was to construct a questionnaire to measure empathy in the specific context of school. In doing so, it was attempted to apply the items of the JSE, a questionnaire frequently used in medical education to measure empathy, to school contexts. This was not possible for all items. The content validity of the remaining items was tested by means of several CFA models and three factors with good model-fit criteria emerged.

With the construction of the JSE-T it succeeded in a first attempt to develop a more state-oriented instrument for empathy in pedagogical contexts. Thus, we add to the repertoire of applicable questionnaires for studies whose research questions aim to explore the relevance and influence of empathy in the education of student teachers, but also in the direct school context. The use of a more state-oriented questionnaire thus complements and extends the previous more trait-specific measurement methods. This is particularly recommended in the context of empathy training to show whether training methods or contents are more likely to prove successful in the short or long term. Short-term changes are more likely to occur in situation-specific (state) contexts, whereas changes in personality structure (traits) are more difficult to achieve.

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Appendix 1

Adapted items of the Jefferson Scale of Empathy for Teachers (The numbers refer to the numbering in Preusche & Wagner-Menghin, 2013).

1. Teachers' understanding of their students' feelings and the feelings of their students' families does not influence pedagogical treatment.
2. Students feel better when their teachers understand their feelings.
3. It is difficult for a teacher to view things from a students' perspectives.
4. Because people are different, it is difficult to see things from a students' perspectives.
5. Attention to students' emotions is not important in history taking.
6. Attentiveness to students' personal experiences does not influence treatment outcomes.
7. Teachers should try to stand in their students' shoes when providing care to them.
8. Students value a teacher's understanding of their feelings, which is helpful in its own right.
9. Only pedagogical measures can solve students' school problems; therefore, teachers' emotional ties to their students do not have a significant impact on solving school problems.
10. Asking students about what is happening in their personal lives is not helpful in understanding their learning complaints.
11. Teachers should try to understand what is going on in their students' minds by paying attention to their non-verbal cues and body language.
12. I believe that emotion has no place in the treatment of school problems.
13. Empathy is a pedagogical skill without which the teacher's success is limited.
14. Teacher's understanding of the emotional status of their students, as well as that of their families is one important component of the teacher-student relationship.
15. Teachers should try to think like their students in order to render better care.
16. I believe that empathy is an important factor in pedagogy.

Appendix 2
Jefferson Scale of Empathy for Teachers (JSE-T)
(5-point Likert-type format, ranging from 1 = Strongly Disagree to 5 = Strongly Agree)

Items (German – Englisch) JSE-T	Item number in Preusche and Wagner-Menghin (2013)	Factor affiliation
1. Schüler fühlen sich besser, wenn ihr Lehrer ihre Gefühle versteht. - Students feel better when their teacher understands their feelings.	02	I
2. Lehrer sollten versuchen, sich in die Lage ihrer Schüler zu versetzen, wenn sie mit ihnen reden. - Teachers should try to put themselves in their students' shoes when they talk to them.	09	I
3. Es ist hilfreich, Schüler danach zu fragen, was gerade in ihrem Leben passiert, um ihre schulischen Probleme zu verstehen. - It is helpful to ask students about what is happening in their lives right now in order to understand their school problems.	12	I
4. Lehrer sollten versuchen zu verstehen, was in den Köpfen ihrer Schüler vorgeht, indem sie auf ihre nonverbalen Hinweise und Körpersprache achten. - Teachers should try to understand what is going on in their students' minds by paying attention to their nonverbal cues and body language.	13	I
5. Eine wichtige Komponente in der Beziehung zwischen dem Lehrer und den Schülern ist es, dass Lehrer für das emotionale Befinden der Schüler Verständnis haben. - An important component in the relationship between the teacher and students is for teachers to be understanding of students' emotional state.	16	I
6. Empathie ist eine pädagogische Fertigkeit, ohne die der Erfolg eines Lehrers eingeschränkt ist. - Empathy is an educational skill without which a teacher's success is limited.	15	II
7. Ich glaube, dass Empathie ein wichtiger Factor in der Pädagogik ist. - I believe that empathy is an important factor in pedagogy.	20	II
8. Nur pädagogische Maßnahmen können die Schulprobleme von Schüler lösen; emotionale Bindungen von Lehrern zu ihren Schülern haben deshalb keinen bedeutsamen Einfluss auf die Lösung schulischer Probleme. - Only pedagogical measures can solve students' school problems; therefore, teachers' emotional ties to their students do not have a significant impact on solving school problems.	11	III
9. Ich glaube, dass Gefühle keinen Platz bei der Lösung schulischer Probleme von Schülern haben. - I believe that feelings have no place in solving students' school problems.	14	III

Bringing Design Thinking into Greek Secondary Language Classrooms

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Abstract
This study tries to describe the method by which Design Thinking, a dynamic, innovative model of problem-solving procedure for the challenges of our time, can be adjusted to the modern school language curricula and make language courses meaningful and interesting to secondary students. Design Thinking (DT) traditionally originated from architecture, design and the world of enterprises and business, has given educational environments (schools and institutions) up to date pedagogical tools to reframe the way they prepare students for modern societies. The author and secondary teachers' coordinator/trainer made an effort first to adjust the Stanford DT five working stages in Greek language curriculum and courses and then train secondary language teachers accordingly, so as to implement DT in real life school settings. This effort comprised seminars and a main training workshop, regular contact with the schools and the participant teachers' attitudes' investigation. So, the final purpose of the study was to explore the main impact of the DT classroom application in Greek language lessons in the basis of advantages and disadvantages, as there is a need for further work and research in the field.

Keywords: Design Thinking, language curriculum, innovative and cooperative educational tools, problem solving skills, communicational language practice

Introduction
Design Thinking. From the world of enterprises in the world of education.

Design is becoming a more recognizable and significant part of the work of teachers generally, but, despite the flowering of tools and methods over the past 20 years it is still up for debate whether teachers can easily comply with all new design methods and creatively make complex design

choices in their everyday practical work (Gooyear & Dimitriadis, 2013). There is always a gap for them between theoretical instructional framework, usually developed in close educational projects, and the activities to do in real class. In fact, what happens in educational systems is the absence of a connector link that will unite the findings of pedagogical science with educational reality and new skills. Teachers prefer to follow more traditional and familiar methods of learning which consequently leads to what is characterized as "21st century gap" (Noel & Liub, 2016).

As the educational landscape continues to become increasingly complex, it suggests a need for a teacher-driven creative approach to developing instructional lessons (Elwood, K., Jordan, M.E.,2022). Scholars and practitioners alike increasingly recognize that teaching is an activity that requires not only implementation expertise, but also design expertise (Bennett et al., 2018; Penuel & Gallagher, 2009; Svihla et al., 2015; Weiner et al., 2020) and according to many of them (Elwood, K Jordan ME 2022: Goldman S., Zielezinsky M. B 2022 De Sutter, D., Stieff, M. 2017: Aranda, M.L., Lie, R. & Selcen Guzey, S 2020) these increasingly complex curricular expectations for teachers can be met through Design Thinking creative process.

Coming to Design Thinking (DT) model and to what new brings in terms of learning action and educational activities, as it comes from extra educational settings, where scientists and entrepreneurs attempt to reframe the way we see world, it embeds methods and strategies for dealing with crucial issues and finding the way out. Exactly these strategic steps and methods are those which can reframe the emerging educational classroom activities.

More specifically, the term and use of 'design thinking' is originated in architecture, design, art and later in management and was basically associated with a certain way designers thought. The term has gained popularity in business media and become a label for the awareness that any kind of business and organisation can benefit from the designers' way of thinking and working (Tschimmel, K., 2012). Over time, the concept of design thinking has been stretched and is understood as a complex thinking process of conceiving new realities, expressing the introduction of design culture and its methods into a wide range of fields. So, at present, DT is identified as a paradigm of creative thinking – first found in Rowe, 1987 "a method of creative action" – and problem solving in many fields considered 'as a novel approach to develop 21st century skills in a non-traditional way, making the learning process more interesting and challenging' (Luca, A. 2019). In the last decades, working in fast evolving work environments and dealing with complex social, environmental and social problems, makes Design Thinking more and more attractive as a holistic, flexible model for generating ideas and solutions. That's why its framework can be applied across a wide range of

fields and its approach makes DT a 'toolkit for innovation' (Rishma Hansil, 2020).

Not surprisingly, during recent decades, DT has gathered popularity in education. Universities and colleges first have started to teach Design Thinking in the courses and degree programs. Likewise, the use of design thinking in K-12 education has increased as well. It became popular because DT includes experiences such as remembering, understanding, applying, analyzing, evaluating, and creating, which are considered crucial cognitive human experiences targeted in the 21st-century educational goals (Koh, Chai, Wong, & Hong, 2015). Especially, cultivating design thinking in educational programs is encouraged to meet industry needs and build a bridge between education and industry in the global age (Ruveyda KARAMAN DUNDAR, 2022). Design thinkers are people who can solve complex problems by cross-disciplinary groups or by individuals (Curedale, R., 2016). So, the actual process of engaging in design thinking helps K-12 students to develop knowledge, skills and mindsets that are important for problem-solving (Goldman S., Zielezinsky M. B 2022, McLaughlin, J.E., Wolcott, M., Hubbard, D. et al. 2019). Through DT projects, students become introduced to and start developing and mastering a toolkit of skills, activities and mindsets that they bring to problem-solving. Alongside problem solving abilities, DT also presents additional educational advantages as reinforces students' motivation, eliminates stress and embarrassment, enhances real life situations understanding (Luca 2019).

Design Thinking for Language Learning

According to the Stanford School, DT involves five key stages: Empathize, Define, Ideate, Prototype and Test and this approach is most effective when addressing problems that are unknown or ill-defined (https://www.interaction-design.org/literature/topics/design-thinking) .

In the mainstream language learning classroom DT can help bridge the gap between creative problem solving and structured learning. It gives teachers additional tools to build understanding and provide students with frameworks for critical thinking and problem solving (Rishma Hansil, 2020). In the second language classroom, design thinking is a powerful way to engage students with the target language and cultures in a creative, authentic way, as structured thinking in the process, leads to original text and language production in the target language (Ron Sperling, 2022*).*

Generally speaking, in language classrooms students are asked to practice empathy by questioning, observing, and conducting research, which can help drive learning about different cultures. Students usually enjoy the creative freedom and flexibility that DT affords and they can generate impressive ideas. They are engaged with real-life tasks anchored in authentic

language and the resulting interactions are important parts of the design thinking process that can lead to new ideas and authentic use of the target language (Ron Sperling, 2022*).*

It is also found that by integrating DT into language courses design, the design process becomes more collaborative, creative and efficient and the teachers' experiences gets improved both in the design process and when teaching the course (Kelley Crites, Emma Rye, 2020). DT practitioners can get very creative through various strategies as writing down ideas, collecting information, causing brainstorming, whereas collaborating skills enhance students' communication and thinking skills (Cleminson, T., & Cowie, N. 2021)

Up to this point, language may be linked with problems deriving from other epistemic disciplines and is used as the communication vehicle for negotiation, analysis, evaluation, suggestions. What, happens, though, if language itself, through speaking and writing, is faced as a problem to be solved?

Writing a text is a complex meaning-building process, similar to the problem-solving process, where the student-writer must spontaneously manage content and language problems (Flower, 1994). Thus, since writing itself is a demanding, high-level intellectual task (Flower, L. S. & Hayes, J. R., 1977), much research has focused on how teachers/educators can provide facilitation techniques for students to overcome language problems and reduce anxiety about correct expression by connecting language activities to real life situations of students (Richards, J. C., & Rodgers, T. S., 2014).

Apart from this way of introducing DT in language classrooms, another way may imply reflection on linguistic issues themselves. As reflective thinkers (e.g., linguistic experts) hold the epistemic belief that knowledge can be seen as a relative truth, then the solution to a problem is the best choice in a given context and is justified by contextual considerations. For example, in analyzing a language issue, students they will not only explore the prescriptive language rules, but also consider other perspectives, such as language reality and their own language intuitions (Wijnands, A., van Rijt, J., Stoel, G., Coppen, P., 2022).

Neverthless, applying DT in language courses somehow constitutes a method of cognitive approach, as it forms a problem-centered framework of information search, language practice through use and exchange of ideas, which is basically closer to Haliday's communicative approach and Bakhtin's concept of language as a language intertwined with communicative acts from real life and action (Bakhtin, M. M., 1986) The language is learned, improved, enriched, expanded, adapted according to the problem, the deceptions it raises, the linguistic goals of the teacher, the questions and responses (Shirkhani, F., Nesari, A. J., & Feilinezhad, N. 2015). Language is learned in its

contextualized uses and does not obey normative frameworks, indirectly preparing students for an already fluid, unpredictable, rapidly changing world. So, in the teaching of the mother tongue and related (humanitarian-social) subjects in the study programs of various countries, the problem-centered approach is understood as a confrontation, a discussion of the students on various topics that touch the real world that lead the students to an argumentative speech or writing

Also, often, language teaching is applied cross-curricularly through correlation with subjects of the S.T.E.M area (physical, technological, mathematical sciences). The recent emphasis on teaching science, technology, engineering and mathematics through language teaching can be successfully incorporated into the problem-based model (Boothe, D. et al, 2011) and by extension into DT model. From this point of view, it is emphasized that the connection with the real world enhances students' lifelong learning skills and competitiveness in the labor market, while at the same time strengthens language competence within a wider range of cognitive subjects (Boothe, D. et al, 2011).

Bringing Design Thinking in the Language courses of Greek Secondary schools

In the present study, the DT model is used with the prospect of refreshing language courses in secondary school settings and eventually making them more interesting and meaningful for students. Language awareness and fluency does not become an end in itself, but is being acquired in communicational settings and scenarios, according to the above theoretical framework.

The basis of the present educational DT based scenario was adjusted to the Stanford Model which consists of a sequence of five steps: Empathy – Identifying – Ideating – Prototyping – Testing (https://dschool.stanford.edu/resources/getting-started-with-design-thinking). The whole process is designed so as to generate thoughts, ideas and suggestions in a problem solving venture in real world situations.

The DT model, as mentioned above, was launched in an educational environment, however not in the familiar STEM area, but in the Greek Senior High School language curricula. The instructional design, through the above five working stages, had to be associated with linguistic aspects, the official curricula needs and the emerging students' expected performance in the subject field. It has to be connected with language curriculum skills referring to comprehending and composing verbal and written speech, studying and reflecting on the world around us (merits, attitudes, current issues, course content), exercising language skills through the use of appropriate spelling and structural rules.

Schools, where subjects are taught as isolated disciplines and the technologies employed consist mainly of textbooks and the use of the chalk/white board are referred to as traditional schools (Koh, Chai, Wong, Hon, 2015). Actually, Greek secondary schools continue to moderate on the basis of separate subjects and their textbooks. As the education system is strongly centralised, the dominant teaching practice is driven by a single textbook per subject (Koutsogiannis D., et al, 2020). Their technologies, though, comprise interactive whiteboards, high internet connection and computer labs. Additionally, new curriculums increasingly recommend interdisciplinary connections between subjects, something that is not highly served by teachers, as this assumes proper educational planning and training.

Under these conditions, Design Thinking is not an everyday educational tool for those working in Greek state Secondary Education. In fact, very little is known about DT as an educational approach. Lesson planning, teaching and learning is organized in small units and sessions according to the official school books instructional pattern and the curriculums' directions. Additionally, classroom pedagogy is based on teachers' personal educational culture and the evaluation criteria during the final, annual exams as set by the educational legislation and related circulars. Despite the above restrictions, there are many secondary teachers who struggle to arouse their students' interest in school knowledge and are willing to try more challenging and motivating teaching practices in their classrooms.

As a Secondary Teacher's Coordinator, working for a Regional Educational Center of the Ministry of Education (PE.K.E.S of Sterea Ellada), the writer of the article introduced the concept of Design Thinking in Education by organizing teachers' seminars in collaboration with the University of Thessaly (Dec. 2021) and then organized a special workshop for Language teachers, where she presented ways of implementing and applying DT in language courses. The last workshop was attended by twenty five (25) secondary school teachers. Language practice should be held in certain subject units in accordance to school curriculum and a variety of language acquisition skills had to be met (oral and written expression, comprehension, genres study). So, the writer/trainer decided to apply the DT model in the following indicative thematic field of social inequality and injustice in everyday life problems. The trainer had to find ways to deal with these matters in a creative, experiential and communicational manner as is dictated by the DT model. At the same time, she had to indicatively apply such educational tools which would facilitate the teachers' work in each DT phase and would work as an example for further utilization in their classrooms. Each step had to be designed carefully so as to comprise a set of teaching suggestions and ideas on how to activate thinking and share knowledge among students, but also to provide tools for language/communication/vocabulary practice.

At this point, it' s worth saying that in secondary education, students, when they sit final language exams, are always asked to express their opinion and ideas in a rational, argumentative manner. Even if this writing task is given in a situational frame ("suppose you have to write a speech, article, letter, blog…"), or is bound with certain approaching attitudes towards the texts and different writing styles are to adopted, usually what the students are expected to do in the end, is to develop their thoughts and knowledge in an argumentative, rational and persuasive way which complies the following elements: defining the issue, analyzing it by explaining causes and results or advantages-disadvantages, proposing solutions and measures to be taken. As a result, most of the language teachers during their courses give concept-maps or handouts with detailed plans of essay compositions in their effort to cover all the aspects of the subject under negotiation. Inevitably, though, because this way of delivering knowledge is basically a teacher-centered, one-way procedure, often students become indifferent and hardly do they manage to assimilate all this packaged information. This mainly results from the fact that teachers believe that their main goal is to provide knowledge about a subject and this prevents them from finding time in their lessons to let students be self-active about their learning (Vosniadou et al., 2020).

A reason that DT found very positive response on behalf of the language teachers in this workshop was because DT model met their need to cover a subject thematic area in the classroom in an argumentative, multifaceted way and, at the same time, experiential, practical and interesting for the students. The tasks of defining the issue, explaining causes and results or advantages-disadvantages, making proposals -proposing solutions /measures to be taken were carried out through the DT process and its comprised educational tools.

In this article, I describe how I implemented DT in teachers' training on new pedagogies in language classroom, the type of learning environment and student engagement it facilitated and the knowledge it generated.

Introducing Design Thinking into Language teachers' seminars and workshop

During the workshop, the trainer (and writer of the article) indicatively adjusted the DT model into a social problem, that of the social inequality as it is described below. The teachers, in a students' role-playing situation, had to carry out tasks related to various techniques in each of the five DT phases. In the table below these techniques and the tools they comprise are given in their five phases of the DT model which is the time sequence of the teaching scenario phases.

Table 1. DEALING WITH SOCIAL INEQUALITY in LANGUAGE CLASSROOM THROUGH DT MODEL

The paradigm as was presented in the workshops	
EMPATHIZE (The concept of being socially disadvantaged: what and how it is)	
Indicative educational tools & practices	
Interviewing	The teacher asks students to address some questions to people they know (friends, relatives, older siblings, neighbors.) and come back to class with their interviews completed. The students may address questions like the following: - Have you ever felt social injustice? - Were there times, that for some reason, you were not treated the same way as the others? - Can you give examples of social inequality/injustice that you have met in your life?
Commenting on photos and images	The teacher brings into classroom pictures referring to social injustice situations and asks students to put themselves in the people in photos place or to describe what is happening in or to think about the reasons/the consequences of their situation…
Building awareness through discussion in teams	Students are divided and work in groups: Each member reports to the others the cases of social inequality that they brought as examples from their interviews. The teams write down their cases. They decide to tell the plenary 2 typical examples of social injustice and discriminatory treatment.
Filling questionnaires	The teacher brings into the classroom questionnaires about 'what do we know about inequality' and discusses the results with the students.
Reading and interpreting	The teacher distributes photocopies of selected readings from literature, press and other publications of various textual genres. The selected readings refer to various forms of social injustice and present graded difficulty in terms of reading and literacy. The selected texts must provide information that answers the following questions: How does the offended person feel? Can you put yourself in to his/her place? What was the problem that the main person of the story faced? What are his-her dominant emotions? What effects did the discrimination have on his-her life? What are his/her expectations or wishes?
DEFINE	
Indicative educational tools & practices	
Categorizing the cases of the previous stage. The various cases of social injustice are grouped and analyzed in the classroom according to their characteristics. See the following example.	

POVERTY	SEXISM	GEOGRAFICAL BARRIERS	JOBS' DESTINCTIONS
1. "My mother's family didn't have as much money as her classmates" – "for example, she couldn't participate in the school's excursions"	1. "They didn't let me attend college because I was female"	1. "I had never been to theater because I used to live in the village"	1. "People treat doctors differently than other professionals. Doctors enjoy a higher prestige".
2. "My uncle worked during summers while others were on vacation.."	2. "I didn't have as much freedom in going out and having fun as my brother did"	2. "There was no high school in my village and I had to take the bus. Many times I was late or did not go to school at all".	2. "Others didn't take me seriously when I told them my job" (e.g. actress, singer, clown, etc.)
3. "My father couldn't wear expensive clothes or go on trips with his parents"	3. "I do most of the housework because I am a girl/woman"	3. "Living in villages/remote places we often feel forgotten. We have to go down to the city to visit a doctor or go to the hospital"	3. "Many freelancers do not declare their income to the tax office and do not provide receipts of the services they are paid for"
4. "There are children who do not have extra curricular activities because their parents can't afford them"	4. "There employers who avoid hiring women or dismiss them because of pregnancy or family obligations".		4. "Everybody expected me to do my father's job. They were surprised to hear that I am going to university.."
5. "Some people can't afford a lawyer to get their rights"	5. "Mothers do the most of the household and they do not find time to deal with the commons or make a career"		
6. "Because 'X' could not pay extra money for expensive hospital treatment, he had serious health problem"			
7. "I and my siblings don't have our own room space at home to do our homework".			

Putting questions in order to investigate and identify the nature and the extent of the problem(s): Who or what conditions caused the problem(s), what are the symptoms and characteristics of various cases of discriminations, in what contexts they appear (description), can we hypothesize consequences in people's lives or describe emerging feelings?

Drawing general conclusions and patterns on how e.g. poverty, sexism, residence and job affect social equality

Creating multimodal content:
> A poster for social campaign
> A report for a newspaper, blog readers, the ombudsman of the citizen, human rights watch institutions and so on
> Sketches/videos

Playing games e.g 'the treasure game' by which we pick up social rights notes from the 'social treasure' box, read them loudly and then identify those which are being violated in certain case studies projected on a digital screen.

Decision making for the next stage:
Each group or the whole class decides which field/category of social injustice will deal with thoroughly (e.g. sexism) in order to move on to the next stage

IDEATE
Each group of students goes on with one aspect of injustice. (e.g. gender discrimination). How does the teacher help students to generate ideas to solve the specific problem, that is, for example, to minimize social discrimination against women?

Indicative educational tools & practices
The students are asked to:

a) suggest a solution for each case in the table (Table 1). How easy is it to be applied? Perhaps further measures have to be taken…

b) suggest ideas-solutions-key-words starting with a letter of alphabet: a, b, c…….
  e.g. **A**id/Action, **B**elieve, **C**ommunity, **D**emand, **E**quivalent, **I**ntegration, **L**ine, **M**orality

c) take inspiration from images-photos the teachers bring into the classroom

d) take ideas from texts, ads, news reading that promote initiatives, measures, etc

e) play roles: what I would do as an individual, family, municipality-community, school, neighbor, state, legislator
PROTOTYPE **Indicative suggestions**
- The students, in groups, are asked to propose a package of measures and actions that can be implemented with the assistance of the Municipality. The problem is put in a real-world situational framework (e.g. referring to the local women's low access and participation rates in the commons and labor market). Each group draws up a text of proposals: a declaration, a letter, an article, a memorandum of actions. They work together to propose, draft, correct their product of measures and ideas and finally deliver it to another group for evaluation. - The students may be encouraged to create a short video/film by making a scenario/script, editing and merging photos, playing roles. - …………………………….
TESTING **Indicative suggestions**
Groups take on the role of evaluating the other group's work: - How easy is it to carry out the specific measures? Are there realistic enough? - Are the proposals clear enough or do they have to be more specific? - Are there any other proposals and ideas? - Did the film/video managed to touch socially sensitive matters and propose alternative solutions? - ……………….
In the end, the students may turn to specialists (e.g. the competent deputy mayor, a consultant, their parents, etc.), hand in their findings and proposals or even publish them.

Methodology and Data Collection

Teachers who participated in the workshops committed themselves to follow the DT model in their own classrooms in any of these thematic fields of social inequality. They also proposed that DT could perfectly much in war and peace topics of discussion/writing in classroom (situations, consequences). They were asked to implement the DT pedagogy as presented and discussed in the workshops, evaluate their students' correspondence and give feedback back to the trainer during the application.

At the end of the workshop the attendees completed a short questionnaire (Table 2) where they were asked to check advantages and disadvantages of the DT based teaching model according the workshop' s experience. Their answers are presented according to their descending percentages, as for the advantages they were asked to check from a list of positive characteristics and for the disadvantages they were asked to note down their first notifications and aspects in short.

Table 2. Teachers' questionnaire answers at the end of the workshop

Main Advantages rating from 1-6 (from the most significant to the least significant): You think that DT process is:	
- **Creative**	95%
- **Cooperative**	93%
- **Exploratory**	82%
- **Motivative, stimulating**	70%
- **Cognitively constructive**	56%
- **Encouraging**	45%
Main Disadvantages ('Write down 3 main disadvantages you think they hinder DT' classroom application').	
- **Demanding** from the teacher's perspective in terms of time and recourses needed	100%
- **Time consuming** in class (it takes s set of lessons to fully complete the five stages)	60%
- **Not fully educationally realistic** in the sense that school conditions and students' extracurricular activities do not allow much space for empathy practices	52%

Most of the workshops' participants finally applied partially the DT model by implementing only some of pedagogical tools and techniques in their lesson plans. They found it more convenient and much easier to carry out only few of the techniques they were shown, as that was less stressful and time consuming. Though, three of the teachers completed the tasks of all the five DT model's phases. They came from the following schools of Fthiotida: High School of Raches, High School of Stylida and Evening High School of Lamia and they applied the DT model in order to cover curriculum subject areas and the correspondent book units regarding social matters (everyday life problems-types of injustice) and war and peace issues. These three teachers gave the trainer regular email feedback during the whole process of classroom application in their schools. Some indicative pieces of their mail correspondence are given in the Table 3, below. Finally, the teachers and I, as their trainer/coordinator, made a common online Webex meeting (May 2022) during which I applied some open-ended questions and conducted a short polling test (Table 4).

Table 3. Email feedback from the teachers applied the DT model in classroom during the 2021-2022 school year

Teacher A (27/02/2022, Stylida High School)

………..

I just finished unit 6 (in the language book) I really liked your suggestion about design thinking. The kids enjoyed the teamwork (it took me a long time to use it too, due to covid). …………………….I want to add that, because of the pandemic, the children are finding it difficult to do homework, soI tried to apply DT in two school classrooms of Stylida Gymnasium, but one responded much better. I made a post on alldayschool blog (https://alldayschool.blogspot.com/2022/02/blog-post.html) detailing what I have done.

I'll keep trying anyway. The ideas we shared in the workshop were very good and practically inspiring. They helped a lot with group handling, group tasks and students' motivation.

Teacher B (from Raches High Scool)

In class we started by talking about social inequalities, exploring the term 'inequality'. The students gave examples of social inequality that they or their own people have experienced (examples of poverty, gender discrimination, geographic inequality, discrimination in the school environment, etc.).

In plenary we studied the following texts (see the attached sources) …………………………

Then the students worked in pairs and created a multimodal text with a social message. Also, by following a hypothetical scenario (as presented in the workshop) on gender inequalities, according to which in our Municipality, during the pandemic, many women were left unemployed and others faced the violence of a partner/husband, the students were asked to write an announcement for the local newspaper. The announcement regarded measures for addressing the above problems with the aid of the local authorities.

From the book, 2-3 texts were selected mainly for the study of adverbial clauses and for lexical items (pronouns). The unit ended by discussing rights, social problems and volunteering in general.

Understanding the way design thinking works in a real classroom was really interesting and helpful. It is about a dynamic and innovative tool in education. The students really enjoyed the teamwork method and asked to work again in the same way! They are looking forward to get engaged in another theme through DT.

Teacher C (from the Evening School in the city of Lamia)

I applied the DT model and the educational tools in the schoolbook unit concerning 'War and Peace'. The challenge was to understand what war is, in the sense of everyday life effects and try to find solutions for the problems are caused. My students were definitely benefited and I wish I could implement DT for all school sections. The students enjoyed it because they participated! The whole procedure looked like a step by step discovery of things, like a game of hidden treasure! Everything was done in the classroom. Blackboard notes and flows, photocopies, boards/concept maps, questionnaires and a lot of team work were fully utilized. Of course, I had to guide them through the process. Unfortunately, students have little or none digital literacy and find it difficult to correspond to multimodal text writing when this was asked. They work hard on ideas and solutions through the techniques we worked on during the seminar. We mainly used the classroom board to note down thoughts and then I transferred them myself to a digital format/presentation (have a look in the attached files)…

Certainly, it is a different way of teaching, much more attractive to students, as the burden of learning is shifted to them, but we need time in order to get familiarized with it, because we are used to traditional teaching methods!

However, the workshop helped us very much, because you made it very experiential, while until now all this was on a theoretical level in our minds!

Table 4. Webex on line meeting with teachers who applied DT

Open-ended questions addressed to teachers	1. Which were the strongest advantages of applying the DT in your language classroom? 2. Which are the main restrictions/difficulties you faced when applying DT? 3. How was your role in class changed?
Poling questions & automatic results 1. I could / I couldn't successfully implement DT in my language classroom without the workshop 2. For me, it was necessary/not necessary to have regular support and feedback from my trainer/coordinator 3. It is easy/not easy to get prepared for DT implementation in class (real life problems to be addressed, connection with book units, choosing strategies, resources and tools) 4. Applying DT in class is manageable/hardly manageable 5. DT reinforces 21st century skills in what ways (write down 3 key-words) 6. DT reinforces language literacy adequately /not adequately 7. Would you strongly recommend DT as suitable for interdisciplinary educational practices/scenarios? YES/NO	1. I couldn't/t 100% 2. Necessary 80% / not necessary 20% 3. Not easy 90% 4. Manageable 80% / hardly manageable 20% 5. 'problem solving' (85%), 'alternative/new ideas'(70%), 'social caring'/'active citizenship' (90%), 'work in groups'/'cooperation' (95%) 'taking initiatives'(55%), 6. Adequately 90% - not adequately 10% 7. YES 100%

Findings

According to the data collected from the email feedback and the teachers' answers in the final Webex online meeting, they appeared to agree on some crucial positive points.

Covid-19 pandemic and the obligatory in distance schooling by digital means affected students' behavior and relation with school community and classroom (Huck, C., & Zhang, J., 2021). Students, coming back to school, faced difficulties in regaining previous characteristics of studentship such as careful attendance, high level of classroom concentration, high levels of engagement, self-disciplined study (UNESCO, 2021), whereas there were

many cases of social and psychological deviation. The emerging situation had made teachers' work in classroom especially difficult and they all agreed that rarely their students corresponded to traditional homework.

By bringing DT in their language courses, they activated their students' participation and engagement in classroom and surprisingly most of them managed to analyze the under negotiation subjects within the available time. They found out that the time spent on handouts, traditional reading comprehension activities and writing was about the same with the DT circle of five working stages when the learning benefits seemed to be more essential now, in terms of skills and knowledge as well.

Teachers agreed that DT gave them innovative and flexible tools to analyse problems from different perspectives and this strengthened their students' ability for deeper understanding. The pedagogical techniques employed through the DT stages unlocked students thinking skills and cooperation in teamwork. As teachers, they had certain tools in their hands by which they managed to bring their students in an experimental and meaningful learning process. They also noticed that, being already well prepared for every DT working stage, it was easier for them to carry out activities since the main burden of work was transferred to students, whereas they were mediators and supporters to the whole procedure. Students were guided through mental situations, various social data, thoughts, ideas, complex variables of the problems, logical suggestions, evaluative critical thinking, imaginative but necessarily realistic solutions while being exposed in communicational and argumentative situations. Their students connected theoretical knowledge with real life world and complex challenges and this augmented learning motivation. The majority of their students -even those with low performance and participation – corresponded very well by taking part in groups' work, in brainstorming, speaking and writing.

The whole process led to various results: guided speech, memorandums, posters, letters, meetings with local authorities. These final products were either artistic or constituted more practical solutions driving to action policies. In fact, they said that being creative in the process helped students to reach the generation of creative products. This actually is very important since "the focus is not only on the product itself but also on what the product means to those who create it, how creativity can change their conceptions of language, and how the process of creation affects student motivation" (Cleminson, T., & Cowie, N., 2021). In result, all the teachers that applied DT agreed that DT based instructional design improves language literacy in the end.

They also underpinned the model's strength to cultivate social caring and active citizenship. Finally, they noticed that DT pedagogical design and strategies fit very much with the "Skills Laboratories" that the Ministry of

Education and Institution of Educational Policy had introduced in Greek state for the development of twenty-first century skills in schools. Actually, one teacher linked "Skills Lab" with her language classroom in an effort to achieve a cross curricular connection and show her students how different knowledge areas are connected when it comes to real problem-solving. Actually, all the participants remarked that DT gives them and their students to approach a problem from different scopes and how knowledge from other sciences are helpful in their language class.

The data, on the other hand, also revealed main difficulties and constraints in everyday classroom application in Greek schools. The participants admitted that without the appropriate training and the fact that they were actually exposed in DT working model during the workshop, they could not easily find the appropriate tools and manage the time so as to guide their students through DT phases. They would very much hesitate shifting from their safe zone of conventional teaching to an experimental situation. By practicing strategies and methods in the workshop found themselves more confident to manage time, activities, groups and process in classroom. They need not only a clear theoretical framework, but also specific examples adjusted in units of their language courses compatible with the official language curriculum. Some of them, also, seemed to feel less safe with the open and less predictable nature of DT procedure, but they overcome their inconvenience when they saw their students think and express themselves in unpredictable, surprisingly creative ways. They underpinned, though, their need to be continuously trained and refresh their techniques. Finally, they agreed that the 'whole system (many school subjects and demanding extracurricular activities for students) is very tightly close for such an open, innovative method and the final exams define significantly' the way they teach'. However, the DT teaching and learning experience renewed their language classrooms and brought new skills' exercising along with new knowledge.

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Creativity and Academic Achievement: A Meta-Analysis

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Abstract

The ability to think and act creatively is significant for individuals as well as societies. Within the context of education, creativity is considered as one of most the fundamental aspects of cognitive development and thus creativity playing an important role in educational settings has drawn attention in view of its association with academic achievement. In this respect, the purpose of the current study was formed to investigate the impact of creativity on academic achievement in educational settings. To that goal, a meta-analytic approach was applied and studies published in Academic Search Ultimate Database, ERIC and SCOPUS between 2005 and 2022 were included in the analysis. The meta-analysis was solely confined to studies that provided the correlation coefficients between the variables. To this end, 18 relevant papers with a total sample size of 6846 were included in the study. The findings showed that the overall effect size was ,619 and this figure points a medium-sized effect according to the classification of effect sizes. In other words, it can be concluded that the total effect size of creativity on academic achievement is medium. The findings of study and their implications were discussed.

Introduction

As the ability to think creatively is essential and significant for individuals along with societies (Batey & Furnham, 2006; Lucas, Venckutė, & Kampylis, 2020; Olatoye, Akintunde, & Yakasai, 2010; Sanchez-Ruiz, Hernandez-Torrano, Perez-Gonzalez, Batey, & Petrides, 2011; van Hooijdonk, Ritter, Linka, & Kroesbergen, 2022), the interest in creativity in the realm of psychology and education has a long history (Bano, Naseer, & Zainab, 2014; Hansenne & Legrand, 2012; Swanzy-Impraim, Morris, Lummis, & Jones, 2022). Despite being an elusive as well as an evolving

concept (Swanzy-Impraim, et al., 2022) and the lack of consensus on its definition, which is claimed to impede its development (Acar, Burnett, & Cabra, 2017), creativity is taken to mean the production of ideas that are different from those of others, in order to develop and produce distinct ideas (Guilford, 1967; Torrance, 1974), to develop sensitivity to problems and look for solutions to them (Torrance, 1974); the tendency to produce something new and valuable (Amabile, 1988; Martin & Wilson, 2017); to be willing to try new things (Montgomery, Bull, & Baloche, 1993); to generate unique, helpful and practical ideas (Martindale, 1989) and to appreciate both uncertainty and ambiguity (Lucas et al., 2020).

Guilford's contribution to the field with his three-dimensional Structure of Intellect Model (SOI), has allowed researchers to examine the multifaceted nature of creativity. The model is important in terms of making important implications to the literature and making the distinction between convergent and divergent thinking, which is mostly used to explain creative thinking (Simon, & Bock, 2016; Sternberg & Grigorenko, 2001). The distinction that Guilford made between convergent and divergent thinking formed the basis of most theories of creativity and led to the development of many measurement tools. (Eysenck, 1993; Guilford, 1967; Runco, 2013). Convergent thinking is a type of thinking that aims at obtaining the best, most accurate answer or solution to a clearly defined and stated question or problem. This way of thinking, therefore, follows the method in which a ready-made answer is available and it is mostly recalled from stored information (Akers, 2008; Cropley, 2006; Razumnikova, 2013). Divergent thinking, on the other hand, is a thinking process that is based on the assumption that only one answer may not be the correct response to any problem and is used to generate many different and diverse ideas (Giancola, Palmiero, & D'Amico, 2022; Lu, Luo, & Yang, 2021; Paek, Alabbasi, Acar, & Runco, 2021).

Although it is necessary to employ both divergent and convergent thinking to make creativity functional, since any creative action, whatever its nature, will result in a decision-making process (Lu et al., 2021; Cropley, 2006), divergent thinking focuses on generating a large number of appropriate and unique alternative responses and is, therefore, often associated with creativity, involving the generation of multiple, diverse, original or unusual ideas in response to an open-ended questions (Guilford, 1967; Javaid & Pandarakalam, 2021; Özaşkın & Bacanak, 2016; Roberts et al., 2021; Runco, 2013). Torrance expanded on the concept of divergent thinking by adding an extra component called elaboration and he created one of the most well-known tests of creative thinking using these components - Torrance Tests of Creative Thinking (TTCT) (Lucas et al., 2020). Amabile (2012) proposed the componential theory of creativity which includes "three components within the individual-domain-relevant skills, creativity-relevant processes, and

intrinsic task motivation--and one component outside the individual-the social environment in which the individual is working" (p. 2).

Within the context of education, creativity is considered as one of most the fundamental aspects of cognitive development and according to Bloom's revised taxonomy, creativity in particular has been designated as the ultimate cognitive activity (Rojas, 2015). Therefore, creativity playing an important role in educational settings, has drawn attention in view of its association with academic achievement. The study sparking the interest in creativity and academic achievement was that of Getzels and Jackson's (1962). In their research, they compared a group of pupils who performed better on IQ tests with those who performed well on Guilford's creativity tests. They discovered that highly creative pupils outperformed the ones with high IQ in scholastic accomplishment tests (Ai, 1999). A response to this assumption, Torrance developed a hypothesis based on Anderson's (1960) threshold theory and he contended that IQ would have an influence on academic accomplishment up to a particular IQ level (about 120), beyond which additional increases in IQ would have no effect, but creativity would begin to have an effect (Ai, 1999; Weiss, Steger, Schroeders, & Wilhelm, 2020). However, Karwowski and Gralewski (2013), taking into account their findings, argue it is philosophically and practically questionable to believe that once one reaches a certain level of intellect, intelligence loses its value for creativity.

Academic achievement and creativity may engage in a complicated and unpredictable relationship. As Bentley (1966) points out, although creativity was once thought to be synonymous with intelligence and, as a result, was included in the amount of capability represented by an IQ assessment, later on it was asserted that intelligence and creative ability do not always have to be attached to each other. As creative thinking includes the capacity to think outside the box, produce original ideas, and approach issues in novel ways, while academic achievement, on the other hand, is often measured by how well a learner performs on standardized examinations, at first look, academic success and creativity might seem to be mutually exclusive. Furthermore, to Chamorro-Premuzic, (2006) as the concept itself has not received adequate priority in educational settings, despite its significance and long history, it has long been theoretical and hypothetical predictor of achievement. However, subsequently, it is asserted that since learners who think and act creatively are more likely to experiment with various ideas, perspectives, and approaches, encouraging students' creativity has emerged as a crucial educational concern in many nations (Asuk, 2020; Bolandifar & Noordin, 2013).

In this sense, numerous studies, examining the link between creativity and academic achievement yield contradictory findings. While some of them have confirmed the significant relationship between creativity and academic

achievement (Abedini; 2021; Anwar, Aness, Khizar, Naseer, Muhammad, 2012; Asuk, 2020; Ayverdi, Asker, Aydın, & Sarıtaş, 2012; Bano et al., 2014; Chauhan & Sharma, 2017; De la Pena Alvarez, 2019; Kim, 2020; Naderi, Abdullah, Aizan, Sharir, & Kumar, 2010; Nami, Marsooli, & Ashouri, 2014; Ospid, Raesi, & İrani, 2020; Pastor & David, 2017; Prakoso, Ramdani, Tae, & Riandika, 2020; Rindermann & Neubauer, 2004; Safarieh, 2020; Surapuramath, 2014; Zirak & Ahmadian, 2015), some others have reported that the link between them is insignificant or too weak to be evaluated (Arya & Maurya, 2016; Candrasekaran, 2013; Gajda, 2016; Gogoi, 2017; Olatoye, Akintunde & Ogunsanya, 2010; Zabelina, Condon, & Beeman, 2014; Zokaee, Baghbanian, & Abbas Nejad, 2020).

It is worth highlighting that the studies conducted to examine the relationship between creativity and academic achievement have revealed contradictory findings and thus make it unlikely to draw broad conclusions regarding the afore-mentioned association. It seems clear that researchers have not yet come to an agreement on how creativity and academic success are interdependent. Therefore, a meta-analysis conducted on the relationship between creativity and academic achievement can be considered as a need in that it provides a kind of consensus in the field as a result of the fact that individual research focusing on the relationship may yield conflicting and contradictory results. A thorough synthesis of the available information might be achieved using a meta-analysis, allowing us to spot associations and patterns spanning many studies. A meta-analysis may also produce a more thorough and statistically strong study by merging data from numerous sources, improving the accuracy and generalizability of the results. Furthermore, fostering creativity while upholding high academic standards requires the development of successful educational practices, which depend on knowledge of the relationship between creativity and academic success. Additionally, meta-analyses can be used to investigate prospective moderators that could affect the association between creativity and academic achievement. Researchers can learn more about the contextual variables that may influence outcomes by looking at different sample parameters, such as age categories, cultural origins, or evaluation techniques. In this way, researchers can evaluate the potential generalization of results throughout various groups, backgrounds, and educational settings using meta-analyses, which will increase their validity. In addition, findings from meta-analyses can be useful for policymakers, instructors, and practitioners because they offer a strong basis for making decisions about educational methods. Understanding how creativity affects academic performance can help educators build instructional strategies and instructional designs that encourage both creativity and academic achievement. Furthermore, researching this link assists educators in

recognizing and encouraging learners who might have difficulty with traditional academic techniques but have talents for creative abilities.

Against the backdrop of outcomes that are contradictory or ambiguous as a consequence of different sample sizes, techniques, and environmental variables, the purpose of the present study is to help scientifically clarify the link between these two concepts through a review of the literature. It is thought that further consideration and insights are necessary to apprehend the concept's multidimensional nature, and a more thorough view is required to make the relationship more explicit and to comprehend to what extent creativity affects academic achievement in light of the previous studies. Furthermore, the scarcity of scientific research examining the aforesaid association in a holistic way is also another rationale for the research. Therefore, the goal of the current study is to identify the overall effect size of the relationship between creativity and academic achievement. To this end, it is believed that examining a number of studies that analyze the relationship between the specified variables in a more thorough and precise manner will result in a better comprehension of the association. Therefore, in order to offer a holistic and comprehensive perspective as well as a reliable generalization and to interpret the data from several studies conducted in different contexts, the meta-analysis method, which makes it possible to compile data from numerous populations, was applied in the current study. Within this context, the answer to the following question emerged as the goal of the current study: What is the effect level of creativity on academic achievement?

Method

A meta-analytic approach was applied in this study with the aim of synthesizing the findings from several different research studies. The method allows us to compile the data from previous research in order to reach a more reliable and valid overall conclusion. In this methodology, numerous studies that focus on the same subject matter are accumulated to obtain more comprehensive, accurate, valid, and unbiased generalizations (Dinçer, 2014; Gogtay & Thatte, 2017).

Data Collection

The related studies in the academic databases were located and scanned after an extensive and meticulous search process. For this purpose, the research studies published in Academic Search Ultimate Database, ERIC, and SCOPUS between 2005 and 2022 were scrutinized. In the first step of the study eligibility, the keyword phrases "creativity, creative thinking, creative behavior, academic achievement, academic success, academic performance, GPA (Grade Point Average)" were searched. The related articles were further scanned based on the following criteria: (1) the studies conducted in

quantitative methods; (2) the studies that provided the correlation coefficients between creativity and academic achievement; (3) the studies that specified the correlation coefficients that could be converted into r (studies presenting the regression analysis or experimental research patterns were excluded); (4) the studies that were published between 2005 and 2022 in a peer-reviewed journal (thesis and reviews were not considered and excluded); (5) the studies that were written in English and Turkish or provided required information in the abstract; (6) the studies that had open-access option and accessible through academic databases were included in the study. Figure 1 below illustrates the process of literature review and coding.
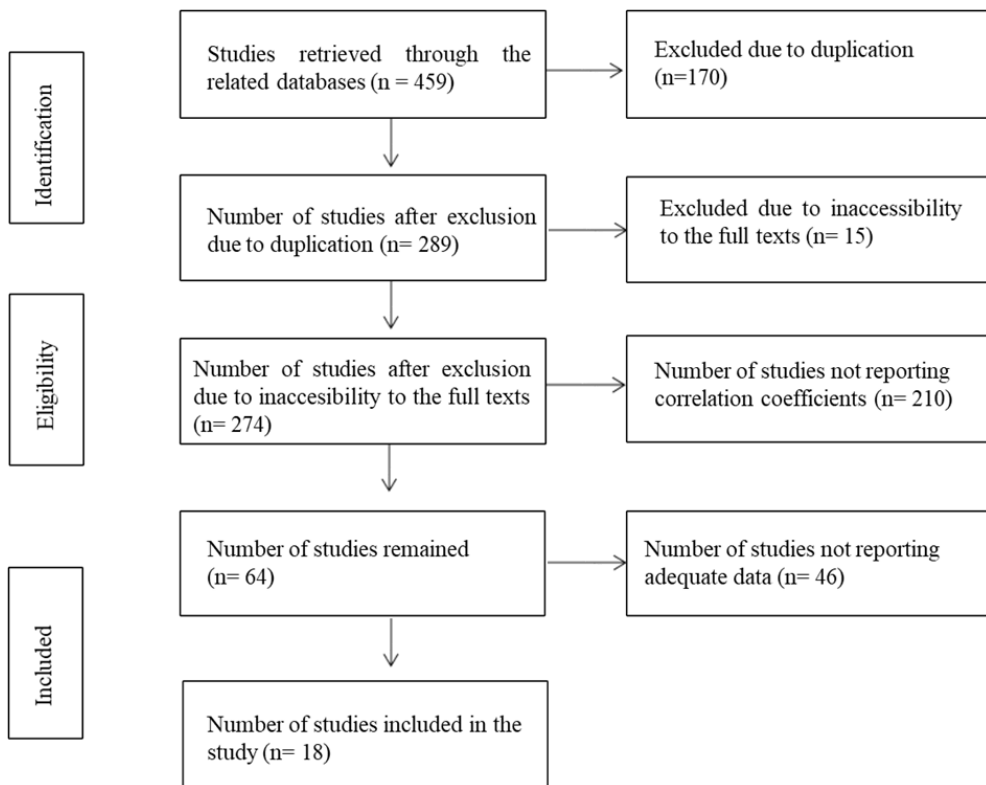
Figure 1. The flowchart of literature review

The data from the literature review were extracted through meticulous and detailed analysis of each research study. Firstly, the titles and abstracts of the relevant studies were examined and assessed in accordance with the specified inclusion and exclusion criteria. After this step, the articles were analyzed to determine whether they reported the correlation coefficients between creativity and academic achievement. A total of 441 studies were excluded as they failed to meet the required criteria. Finally, 18 publications were decided to be convenient for the purpose of the current study. Table 1

demonstrates the studies included in the meta-analysis along with their publication date, correlation coefficients, sample size, and tools of data collection.

Table 1. Studies included in the meta-analysis

Study	Date	r	Sample size	Tools of Creativity	Tools of Academic Achievement
Abedini	2021	,22	240	Creative Behavior Inventory (Linger),	GPA
Ayverdi et al.	2012	,38	145	Scientific Creativity Test	GPA
Bano et al.	2014	,66	257	Creativity Rating Checklist (CRC)	5th Grade Promotion Examination
Baran et al.	2011	,14	80	Torrance Test of Creative Thinking – Figural Form A	Test of Early Mathematics Ability- 3 (TEMA-3)
Bernabeu-Brotons & De la Peña	2021	,12	105	PIC-A test	The Average Grade of the Course
Bolandifar & Noordin	2013	,81	100	Nicolas Holt Creativity Test (NHCT)	Cumulative Grade Point Average (CGPA)
Chamorro-Premuzic	2006	,16	307	Alternate Uses Test	Grades of 4-year Period
De la Pena Alvarez	2019	,31	100	Creative Imagination Test for Adults	EvAU (the university admissions test)
Desmet et al.	2021	,09	710	Test for Creative Thinking– Drawing Production (TCT-DP)	The Mean of Student's Final Grades
Gajda	2016	,14	1106	Test of Creative Thinking—Drawing Production (TCT-DP)	GPA
Gralewski & Karwowski	2012	,07	589	Test of Creative Thinking-Drawing Production (TCT-DP)	GPA
Jaberi et al.	2014	,89	91	Khatena-Torrance Creativity Perception Inventory (KTCPI)	General English Proficiency Test
Karwowski et al.	2009	,17	1316	Test for Creative Thinking-Drawing Production TCT-DP	GPA
Olatoye et al.	2010	-,004	235	Nicolas Holt Creativity Test (NHCT)	Student Cumulative Grade Point (CGPA)

Pastor & David	2017	,42	40	Creative Attitude Survey (CAS), Two Samples Of Creativity Tests; Four Tasks of Generating Alternatives	The Mean Results of Four Subjects: Mathematics, Romanian, Geography
Saw & Han	2022	-,06	328	Kaufman Domains of Creativity Scale (K-DOCS)	GPA
Taylor et al.	2017	,02	60	Torrance Tests of Creative Thinking	GPA
Zhang et al.	2022	,34	1037	Innovative Behavior Scale	Geography Test Scores

Data Analysis

The Comprehensive Meta-Analysis (CMA 2.2) software program was used in the present study in order to measure and perform the necessary statistical calculations of the individual and overall effect sizes of creativity on academic achievement. In order to identify the overall effect size, the following scale was used: -0,15 - 0,15 negligible; 0,15 - 0,40 small; 0,40 - 0,75 medium; 0,75 - 1,10 large; 1,10 - 1,45 very large; 1,45 - excellent (Dinçer, 2014).

While computing the effect sizes in the meta-analysis, it is suggested to decide whether to utilize a fixed effects model or a random effects model. In order to examine if there is any variation among the publications in the analysis, the heterogeneity test is supposed to be carried out. The fixed effects model is applied when the effect sizes are scattered homogeneously, while the random effects model is utilized when the effect sizes are distributed heterogeneously (Dinçer, 2014; Karagöl & Esen, 2019).

Results

Having identified the correlation coefficient of each research study, it was attempted to analyze the overall effect. Figure 2 displays the individual effect sizes of each study as well as the total effect size of the studies included in the meta-analysis.

Study Name	Statistics for each study							Hedges's and 95% CI	R. Weight
	Hedges' g	Stand. Error	Lower Limit	Upper Limit	Var.	Z	P		
Abedini (2021)	0,450	0,133	0,189	0,710	0,018	3,387	0,001		6,06
Ayverdi et al. (2012)	0,817	0,180	0,464	1,171	0,033	4,528	0,000		5,62
Bano et al. (2014)	1,752	0,167	1,425	2,078	0,028	10,519	0,000		5,76
Baran et al. (2011)	0,280	0,228	-0,167	0,727	0,052	1,228	0,219		5,14
Bernabeu-Brotons & De la Peña (2021)	0,240	0,198	-0,148	0,628	0,039	1,212	0,226		5,45
Bolandifar & Noordin (2013)	2,741	0,344	2,068	3,415	0,118	7,978	0,000		3,98
Chamorro-Premuzic (2006)	0,323	0,116	0,096	0,551	0,013	2,790	0,005		6,20
De la Pena Alvarez (2019)	0,647	0,212	0,232	1,063	0,045	3,053	0,002		5,31
Desmet et al. (2021)	0,181	0,075	0,033	0,328	0,006	2,393	0,017		6,47
Gajda (2016)	0,283	0,061	0,163	0,402	0,004	4,650	0,000		6,54
Gralewski & Karwowski (2012)	0,140	0,083	-0,022	0,302	0,007	1,695	0,090		6,43
Jaberi et al. (2014)	3,871	0,464	2,962	4,780	0,215	8,349	0,000		2,99
Karwowski et al. (2018)	0,345	0,056	0,235	0,455	0,003	6,160	0,000		6,56
Olatoye et al. (2010)	-0,008	0,131	-0,265	0,249	0,017	-0,061	0,951		6,08
Pastor & David (2017)	0,907	0,355	0,211	1,603	0,126	2,555	0,011		3,87
Saw & Han (2022)	-0,120	0,111	-0,337	0,097	0,012	-1,082	0,279		6,24
Taylor et al. (2017)	0,039	0,262	-0,473	0,552	0,068	0,151	0,880		4,79
Zhang et al. (2022)	0,723	0,066	0,593	0,852	0,004	10,933	0,000		6,51
Random	0,619	0,108	0,407	0,830	0,012	5,740	0,000		

-1.00 0.00 1.00 2.00

Figure 2. The distribution of effect size values of the studies

Figure 2 displays the effect sizes for each study that was a part of the analysis, as well as the lower and upper bounds of the effect sizes within the 95% confidence interval. The data show that except for two studies (Olatoye et al., 2010 (-0,008) and Saw & Han, 2022 (-0,120)) - all the others have positive effects ranging from 0,039 to 3,871.

Following the calculation of the distribution of effect size values, the heterogeneity test, which identifies the presence of variability in the data and

specifies the heterogeneous or homogeneous characteristics of the studies in the analysis, was applied after the analysis of the individual and total effect sizes of the studies. By conducting the test, it becomes possible to decide whether to use fixed effects model or random effects model. Table 2 presents the results of the heterogeneity test.

Table 2. Heterogeneity test of the meta-analysis

| Model | N | Estim. | 95% CI | | Z-val. | P-val. | Q-val. | df (Q) | p-val. | l-squared |
			Low.L.	Up. L						
Fixed	18	0,217	0,194	0,240	18,17 7	0,000	393,3 47	17	0,00 0	95,678
Random	18	0,310	0,197	0,416	5,171	0,000				

The studies included in the study are characterized as heterogeneous since the Q value in the x2 significance table for 17 (df) is 35,719 and 393,347 is higher than this value (p<0,005). Furthermore, the p value of 0,000 confirms the finding that the random effects model should be applied. Thus, the analysis was conducted applying the random-effects model in accordance with the findings. The findings showed that the overall effect size was 0,619, and this figure points to a medium-sized effect according to the classification of effect sizes. In other words, it can be concluded that the total effect size of creativity on academic achievement is medium.

Furthermore, funnel plot and Rosenthal's Safe N methods were conducted to determine the validity and reliability, as well as the publication bias of the studies included in the meta-analysis. Figure 3 depicts the funnel plot of the collected studies' effect sizes.
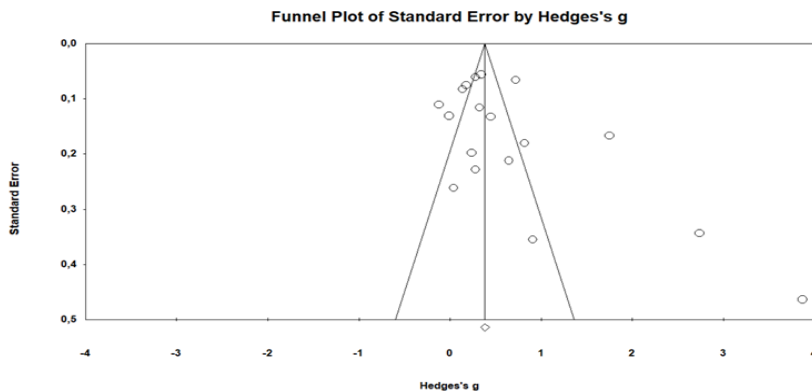

Figure 3. The funnel plot of standard errors

The funnel plot represents the relationship between the size of the study on the vertical axis and the size of the effect on the horizontal axis. The top of the graph shows large studies, which have a tendency to group together close to the mean effect size, while the bottom of the graph points to smaller

studies. The studies are distributed symmetrically around the total effect size if there is no publication bias. On the other hand, if bias exists, there is a bigger concentration of studies on one side of the mean than the other at the bottom of the plot (Borenstein, 2005). Although there are few dots beyond the funnel lines, as can be seen in Figure 3, the majority of the others have a shape that is close to symmetrical, and it can be argued that the scattering indicates that the publication bias is minimal.

Following the funnel plot analysis, the Fail-Safe N analysis was performed to determine the number of studies that must be included in the analysis that are missing before the overall effect becomes insignificant. Table 3 displays the results of the analysis.

Table 3. Classic fail-safe N analysis

Z-value for observed studies	16,60
p-value for observed studies	0,00
Alpha	0,05
Z for alpha	1,95
Number of observed studies	18
Numb. of missing studies to bring p-value to > alpha	1274

The results of the fail-safe N analysis in Table 3 show that the p value (0,00) is lower than the alpha value (0,05), suggesting that the analysis' publication bias is admissible. Further, the table also demonstrates that, in order to invalidate the results of the current meta-analysis, 1274 additional non-significant studies are needed in order to raise the p value over the alpha value.

Discussion

The present meta-analysis synthesizes the data from previous research examining the relationship between creativity and academic achievement. The analysis comprised papers published between 2005 and 2022 in the Academic Search Ultimate Database, Education Resources Information Center (ERIC) and SCOPUS, with a total sample size of 6846. Following the heterogeneity test, the analysis was carried out using the random effects model, and the total effect size was found to be r= 0,619 across 18 studies, corresponding to a medium effect size.

The finding that creativity had a total impact size of r= 0,619, which is a medium effect size, highlights a significant and significant association between creativity and the variable under study. A medium effect size implies a strong correlation between the two variables, indicating that creativity has a significant impact on the final outcome. The moderate impact size reveals there is a proportionate enhancement in performance as creativity levels rise. Such a finding has significant ramifications for a number of areas, including learning, the field of psychology, and educational development.

This finding is consistent with earlier studies that consistently demonstrated a positive correlation between creativity and the variable being studied. That the link between creativity and academic achievement is noteworthy can also be evidenced in Gajda, Karwowski, and Beghetto's (2017) meta-analysis, in which the average correlation was found to be r = ,22. The findings also confirm the results of many studies, indicating a positive and significant link between the two variables (Anwar et al., 2012; Asuk, 2020; Naderi et al., 2010; Nami et al., 2014; Ospid et al., 2020; Surapuramath, 2014). However, there are those whose findings yield negative and mostly non-significant relationships (Arya & Maurya, 2016; Gajda, 2016; Olatoye et al., 2010; Zabelina et al., 2014). The contradictory results among the studies highlight the sophisticated and multifaceted nature of creativity as well as the complex representation of the relationships.

The considerable effect size of creativity suggests that promoting and supporting creativity may have a significant effect on the relevant variable. This implies that integrating creative thinking and activities into the curriculum in educational settings may enhance students' academic performance, problem-solving abilities, and general cognitive development. Additionally, encouraging creativity among staff members may improve inventiveness, problem-solving abilities, and adaptation within the learning system.

What should also be noted is that the search for moderators could be important due to the heterogeneity of effect size values in the current study. Many factors are thought to have an impact on the alleged relationship between creativity and academic achievement, and heterogeneity may result from these variables. Hence, it could make remarkable differences to take into account any potential influences on the correlation between creativity and academic achievement such as cultural backgrounds, age, gender, size of the sample, assessment criteria for academic performance or success, data collection tools to measure creativity, characteristics of the participants, various pedagogical approaches, schools' climate, even dynamics of the classrooms and teacher manners (Gajda et al., 2017b), and so forth, suggesting that additional moderating factors might be involved and might have a role in terms of the association. Furthermore, the link between creativity and the result may be influenced by various factors, and it is important to remember that effect sizes do not indicate causality. To examine possible moderating factors and better comprehend the processes behind this association, more study is required.

In short, it should be mentioned that creativity serves as a crucial key component for learning, future careers, and even continuous development (Zhang et al., 2022) and is a natural part of learning. Creativity promotes deep cognitive processes since creativity requires broad knowledge and the

appropriate use of information (Patston, 2021). The results of the current meta-analysis allow us to draw the conclusion that encouraging creativity in educational settings will result in an upsurge in academic achievement.

The findings of the current research highlight valuable insights to consider in terms of creativity. For one thing, creativity is a multi-faceted construct that needs a methodical and systematic understanding in educational settings. As Runco (2008) states, when given the opportunity, students can generate their own unique and original interpretations. Therefore, the curriculum, along with educators and policymakers, should support it and provide adequate opportunities for students to have the chance to contemplate vague, open-ended assignments and projects that do not require merely memorizing and rote learning. What is required for this is to nurture children's natural talents and potential.

Conclusion

It is determined that a thorough consideration and insights to comprehend the concept's multifaceted nature as well as a more detailed view to make the relationship more explicit in light of the previous studies have been acquired in the present study, whose overall aim is to synthesize the findings from numerous research studies that examined the relationship between creativity and academic achievement. The analysis has been carried out with the necessary steps of meta-analysis. The result of the analysis, showing that the overall effect size was 0,619, has revealed that creativity has a medium-sized effect on academic achievement. In light of the findings, it can be concluded that creativity as a concept itself has a significant role in learning as well as in educational settings. As a whole, the study's medium impact size emphasizes how crucial creativity is in the realm of academic achievement. The incorporation of creativity as an important talent into several facets of education and school life may have significant advantages and lead to favorable outcomes.

Study limitations

The present study is undoubtedly subject to certain limitations. To begin with, the research studies in the meta-analysis were chosen using a specific statistical procedure: the correlation coefficients. Therefore, it would be advisable to take into account the studies examining the mentioned link between the variables using a different method for future studies. Furthermore, while gathering relevant studies from databases, it is probable that certain papers that should have been included in the meta-analysis were ignored or misvalued by the researcher unintentionally.

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Families' Involvement at Primary School and Its Impact on Their Children's Performance in Mathematics

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Abstract

This paper focuses on examining the influence of parents' involvement in class on the students' performance in math, the way parents get involved with the school, and their effects on the pupil's success. The study attempts to identify a number of aspects that influence parents' involvement or uninvolvement in education and factors that impact student math performance. In this context, the researcher conducted quantitative research using three questionnaires for students, parents, and teachers. The validity and reliability of the questionnaires were checked and the results were analyzed in SPSS. A total of 302 people participated in the study: 132 sixth graders, 67 parents of the students, and 103 mathematics educators. This study was carried out in Arab elementary schools in Israel within the period of 2022-2023. The findings show that parents' involvement in the decision-making process of their children's education increases based on the parents' level of education. In other words, the higher the parents' level of education, the more they get involved at school. The findings reveal that parents and educators also have a high level of trust and the way parents track their children's education reflects their involvement in school. There is also a statistically significant relationship between student success and parental involvement at school. The researchers recommended focusing on communication between parents and mathematics teachers in the school and the meaningful participation of parents in the school.

Keywords: Families' engagement, parent involvement, student achievement, elementary school

Introduction

Families impact their children's growth, exploration of the world, and the knowledge and morals they need to help them communicate with others to get their needs. The most critical factor in children's growth is their academic performance, particularly their success. Educative performance is a highly systematic and challenging concept both psychologically and educationally, with a number of social, personal, and school variables that play their own influencing roles. It is a philosophy overwhelmed with challenges, the first of which is the uncertainty of the idea, which can be expressed in both the school and the academic achievement of the students. The phenomenon of studying performance has awakened the interest of psychologists and sociologists. It has now become apparent to them that the causes for struggle, or the inability to achieve success, are due to the pupil's intellectual capabilities and several other aspects that lead to lowering the chances of success.

Even for a pupil with a high level of intelligence, this does not ensure success. Similarly, a low-intelligent student cannot become despondent, indicating the existence of variables rather than intelligence that can affect academic performance. In this context, this study emphasizes that parents' involvement at school is one of the indicators of school success.

Families' involvement in education is a factor that helps develop the child's mental, social, and psychological capabilities. There are various forms of parental involvement in schools, such as the isolated trend, neutral practice, active involvement, medium participation, and indirect participation. Consequently, the research is aimed at determining the influence of parental involvement on educational results. By examining a variety of sources, it is clear that most researchers believe parents' involvement in the learning system is both necessary and enjoyable. On the other hand, some opponents argue that parents' involvement in the learning system is negative. In light of the aforementioned, 132 sixth graders, 103 educators, and 67 students' parents participated in the study. Therefore, this study aims at examining if parents' participation in their children's education helps or hinders their achievement.

The goal of the study is to examine the way parents' involvement with school affects students' academic performance. The study focuses on the patterns of parent's involvement with education, as well as the degree to which they are involved or not involved with the school work.

The Main Question of the Research

What is the impact of parent's level of involvement on the students' academic achievement?

The sub-questions:

- Does the student's school stage have an impact on parents' involvement in school?

- Is there any connection between the family's socioeconomic status and the frequency of parent's involvement in school?
- Is there any connection between the family's cultural status and the frequency of parent's involvement in school?
- Is there any effect of the student's order in the family on his/her parents' involvement in school?

Literature Review
Parents' Involvement at School

During pre-school years, the parent-child relationship influences children's attitudes towards the universe and themselves. Also, it demonstrates the way children deal with various situations and develop their emotional understanding of the surrounding. As a social institution, the family shapes its social standards, sanctions, and types of children's behavior, directs the relationship among parents and their children, and encourages reciprocal care and mutual moral responsibility. The family serves as a foundation for shaping children's opinions and methods of interacting with the environment, thereby improving their self-identity and social abilities during pre-school period (Shabas, 2016). Parental involvement refers to various practices in which parents get involved with their own children or other critical people who affect their children's development. This refers to parents' interactions with their kids or the school personnel to improve and promote their kids' academic performance (Rosenblatt & Pelt, 2003; Kraft, 2017; Emerson, Fear, Fox, & Sanders, 2012; Wilder, 2014).

Increasing parental involvement in their children's education has been recognized as an essential method for improving the effectiveness of the educational quality in the last decades. Reinforcing parental involvement is perceived critical within this framework because it provides better independence for schools. This is based on the notion that parents could be considered a source of strength with an entrenched consciousness and thus have the ability to reconcile the efforts of school boards and directorates at different moments. Parental involvement influences the children's social and cognitive improvement. When analyzing school-parent cooperation, one can track at least two kinds of involvement: parent-initiated parental involvement and school-initiated parental involvement (Driessen, Smita & Sleegers, 2005). Empirical results have revealed a positive relationship between academic development and the involvement of parents in education (Pérez Sánchez, Betancort Montesinos, & Cabrera Rodríguez, 2013; Tárraga, García & Reyes, 2017), as well as the enhancement of the self-esteem of children and academic achievement (Garbacz, Herman, Thompson & Reinke, 2017). There is also well-established evidence from international studies demonstrating the positive effect of parent's involvement in school performance, as affirmed by

various conceptual analysis across diverse populations and educational backgrounds (Castro et al., 2015; Jeynes, 2016; Ma, Shen, Krenn, Hu & Yuan, 2016).

Families' involvement in the school process varies depending on the school's characteristics, educational goals, and staff and student structure (Leenders, Haelermans, de Jong & Monfrance, 2018). Parents' involvement in education can be graded according to their degree of involvement, the obligation towards school, or the content of their involvement in school. Furthermore, the pattern of parental involvement with schools and the areas of parental involvement strongly correlate. The more transparent and participatory the involvement, the better the school can promote this involvement (Wilder, 2014; Fisher & Friedman, 2002). However, there are some conditions that may prevent parents from getting involved in their kids' learning. Moorhouse and Beaumont (2020) point out that parents' job duties and workload do not allow them to participate actively in their children's achievement at school.

Leenders et al. (2018) confirm a positive relationship between family, school involvement, and the educational benefits children can get. The researcher believes that parental participation helps in developing children's learning ability and achievement. Furthermore, parental involvement strengthens and enhances a variety of skills within schoolboys, such as improving their self-assurance and self-image and minimizing conflicts and aggression. School-parent engagement increases the consistency of the partnership and qualified proximity between parents and the school staff (Fisher & Friedman, 2009).

According to Epstein (2008), school principals could motivate parental participation by encouraging parents to participate in school meetings, addressing the children's demands, and informing the parents by sending them letters or messages to ensure their appearance. This stage develops trust that needs to be established between parents and school. This trust grows when this active participation reaches the educational aspect, the degree that families are aligned with the duties and responsibilities of the instructor, the way school values and respects students' interests, and the extent to which school allows parental involvement in its goals, strategies, and general work (Fisher & Friedman, 2002).

According to the study (Leenders et al., 2018), families' involvement is related to the abilities of teachers to help those parents get involved. School must develop instructional programs to help teachers improve their skills and develop their professional relationships with parents to increase students' participation and confidence in class. According to the researcher (Omoteso, 2010), parents' presence leads to improved academic and cognitive

performance, increases self-confidence and self-acceptance, and reduces behavioral issues.

Højholt and Kousholt (2019) divides parental involvement in the educational process into five categories. The first category identifies family as observers, which describes parents who do not actively participate in school activities but observe from a distance. This is the most common phenomenon. Documents are among the practices through which the school principal informs parents of essential information such as trips, payment plans, and end-of-year certificates. The other category that Højholt and Kousholt (2019) mentions is family as service providers who are not dynamically active in the learning system. This trend is defined by families' voluntary participation in activities that are not fundamental to the learning process, such as decoration, bazaars, party planning, etc. School principals and teachers welcome this kind of involvement. Højholt and Kousholt (2019) also discuss the family as students, i.e., showing incomplete involvement. This involvement includes domestic enjoyable and personal development activities (i.e., sewing, cooking, gymnastics), which allow families to develop themselves as future leaders. The other category Højholt and Kousholt (2019) mentioned is families as educational partners. This pattern of parental involvement in the learning process is designed to teach the parents several strategies. Therefore, they believe that the more they think about school homework and tests, the more they can help their children succeed. The last category is family as decision-makers and indicators of goals (in other words, complete involvement). The most robust and practical design of involvement in school life is for parents to share in the choices made by school principals and be seen as essential members of the executive frameworks.

Features Influencing Parents' Involvement in the School

According to several researchers, there is a number of factors that influence parents' involvement at school (Fisher & Friedman, 2009; Højholt & Kousholt, 2019). The first factor is the parental educational status (the higher the status of the parents' education, the greater the degree of their school involvement). The other factor talks about families with both parents as opposed to single-parent families (families with both parents have a higher involvement rate than single-parent families). Furthermore, the researchers mention the children's age (the older the kids, the lower the parents' involvement). The fourth factor the researchers discuss is the number of ways school invites parents to get involved in school activities (the involvement rate gets higher when parents are invited to participate at school). Another factor put into consideration is the level of harmony between families and school and parents' trust in the school administration and teachers (the higher the parents' trust in the school's educational objectives, the happier they are to participate).

The last factor is the parents' trust in the values of education (the higher parents trust teachers, the more likely they tend to send their children to school).

Academic Achievements

Academic achievement refers to organizational outcomes demonstrating the extent to which a person has achieved specific goals which were the focus of actions in educational environments, specifically in college, school, and university. Generally, school systems characterize cognitive goals that either pertain to various fields of study (e.g., critical thinking) or include acquiring knowledge and expertise in a specific intelligent field (e.g., literacy, proficiency, history, and science). As a result, student performance should be viewed as a multi-layered principle encompassing various fields of learning. Since the field of academic success is so vast and encompasses such a broad range of educational outcomes, the concept of academic accomplishment is dependent on the indicators utilized to assess it (Steinmayr, Meißner, Weidinger & Wirthwein, 2015).

Factors Affecting Academic Achievement

Parental involvement is one of the essential features influencing pupils' achievement. Past research on students' educational performance in math found that numerous factors can affect the students' educational math performance, including attitudes of lecturers and students, academic self-efficiency of students, and student-lecturer interactions. These factors have continued to be the most important determinants of academic achievement (Tenaw, 2013; Abd Algani & Eshan, 2019).

According to Ganyaupfu (2013), lecturing is a cooperative task that includes interaction between the lecturers and the students, which leads to changes in the students' behavioral aspects. However, psychosocial aspects in the teaching and learning activities are a multi-dimensional method of quantifying various interconnected learning features in an educational system, such as academic self-efficacy, attitudes of students towards lecturers, and student-lecturer interaction. As a result, assessing the aforementioned psychosocial aspects is critical (Tenaw, 2013).

Abd Algani and Eshan (2019) argue that parental involvement is one of the most significant reasons that affect academic achievement. Positive involvement increases the motivation to learn and decreases the anxiety to succeed. Abd Algani and Eshan's (2019) study addresses the reasons for the high level of academic achievement in mathematics at Israeli schools. One of those important reasons is related to parental involvement which influences the students' learning style and, in turn, affects students' academic performance. Another factor is parents' socioeconomic status. Many studies have found that family background variables could explain most of the

variation in the students' school performance. The positive connection between academic development and SES continues from infantile to adolescence and is constant across races (Reardon, 2011; Berkowitz, Moore, Astor & Benbenishty, 2017; Lawson & Farah, 2017)

The Influence of Parental Participation on Student Performance

Parental involvement in the learning system is vital and beneficial to children, parents, teachers, and society (Højholt & Kousholt, 2019). Furthermore, there is a clear correlation between parental engagement and student achievement (Hutchison, Paatsch & Cloonan, 2020). Shin and Seger (2016) and Wilder (2014) assert that there can be no effective educational process with sufficient production designed to improve and develop the school without the involvement of parents. As a result, parental involvement is not only a process of growth and improvement but also a prerequisite for healthy teacher-student relationships and is essential for children's societal and educative development. Fisher and Friedman (2009) state that a parent's involvement with the school influences academic achievement and improves kids' societal manners.

Despite these challenges, parents admit they are not skillfully trained, which makes it hard to see them as academic partners. As a result, teachers prefer to be seen as service providers (Lerner, Grolnick, Caruso & Levitt, 2022). Furthermore, a group of pupils believe that parents' participation in their education will harm their academic success and social interactions at school (Magwa & Mugari, 2017). Rached (2015) stated that pupils' success in primary school is more advanced than their achievements in high school. This is because parents are more involved at this stage than in junior-high and high schools. Consequently, parents' involvement becomes minimal and they believe that their children are matured and no longer need their own involvement at school.

Based on the aforementioned, the following research main question has been generated: What is the impact of parent's level of involvement on the students' academic achievement? However, the main question leads to the following sub-questions: Does the student's school stage have an impact on parents' involvement in school? Is there any connection between the family's socioeconomic status and the frequency of parent's involvement in school? Is there any connection between the family's cultural status and the frequency of parent's involvement in school? Is there any effect of the student's order in the family on his/her parent's involvement in school?

Methods

The researchers used the quantitative method to answer the research questions. The pupil's academic level was assessed based on their performance

in the 3rd semester of 2022-2023. The research was carried out at the school with the permission of the school principal. The questionnaire was handed to the sixth-graders promising to protect their confidentiality and privacy.

Research Tools

To achieve the research goals, the influence of the parents' level of involvement on their children's performance alongside the following research questions need to be answered: Does a parent's involvement in the school affect the pupil's performance? What is the appropriate level of commitment that is needed to achieve excellent school results? Is there any connection between parents' school attendance and their children's attendance? Is there any connection between parents' socioeconomic status and their children's school involvement? Is there any connection between the parents' cultural level and their children's school attendance? Would there be any effect of parents' involvement in school? In Arab elementary schools in Israel, the researchers administered three questionnaires to students, parents, and teachers, which is the primary tool for this study. The parents', teachers', and students' questionnaires consisted of 26 questions, 16 questions, and 14 questions, respectively. All questionnaires have a 5-Likert scale.
(Examples of survey questions can be seen in the attached link https://shorturl.at/mnU56)

Validity of the Questionnaires

 The logical validity of the three questionnaires (Tables 1, 2 and 3) were examined and checked by a specialized committee, which included several education faculty members from universities and school teachers with rich experience in teaching in elementary schools. They were also presented to specialists in technology. Afterward, the questionnaires were modified to meet the experts' guidance and recommendations. Thereafter, the questionnaires were given to an Arabic language expert who translated the questions before the questionnaires were given in their final form.

The analyst conducted a pre-test phase and the SPSS Item/Total Analysis to strengthen the internal validity of the questionnaire survey. This assessment calculates the average correlation among each item in the questionnaire and the overall mark of the randomly chosen samples. To improve the internal validity of the initial questionnaire, this analysis could be used to discard the weakly correlated questions (Friedman, 2005, p.231-239).

Reliability of the Questionnaire

The research teams used the questionnaire form as a sample to assess their reliability. The SPSS program was used to perform the Alpha Cronbach analysis.

The researcher designed the pertinent information from the pre-test sample to establish the Alpha Cronbach reliability coefficient index for every task in the questionnaire. To determine the dependability of every item, the investigators used the SPSS program again. The alpha index of the questionnaires could be improved by discarding items with lower reliability scores (Friedman, 2005, p.225-230).

The Alpha Cronbach was evaluated utilizing the SPSS program, and the findings were as follows: 88.6 percent for the parents, 78.8 percent for students, and 80.1 percent for teachers.

The investigators forwarded the similar questionnaire to the same test for the second attempt two weeks later to ensure the questionnaire forms were correctly completed. The Alpha Cronbach was assessed again utilizing the SPSS program, thus yielding the following results: 81.4 percent for the student's questions, 88.1 percent for the parents, and 81.3 percent for the teachers.

The final reliability of the overall sample appears in Table (1).

Table 1. The Alpha Cronbach for the current research

Questionnaire	Number of items	Cronbach's alpha
Parents questionnaire (N=67)	26	78.3%
Student questionnaire (N=132)	14	82.5%
Teachers questionnaire (N=103)	16	88.1%

Research Sample

The study took place in Israeli elementary schools. 103 mathematics teachers, 67 parents, and 132 students from a sixth-grade class made up the study sample (Figure 1). Sixth graders were selected on purpose because they are at an age where they can credibly express how they feel. Questionnaires were filled out after explaining the research objectives to the research sample and obtaining their consent to participate in the research.
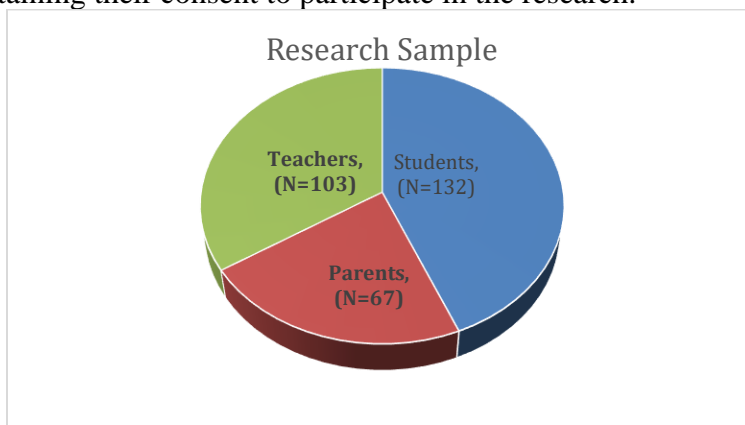

Figure 1. Distribution of the research sample

Data Analysis

The data was evaluated by counting the number of times each response was given in each study sample. The degree to which the consistency of the student's connection with the educator was expressed in academic attainment (first-grade rate) was implied.

Results

Two types of statistics were used to address the research questions: descriptive and deductive. The findings and the conclusion will be discussed in the following sections.

The parents' attitudes toward the school's involvement in its programs are shown in Table 2.

Table 2. The rate and standard deviation for every comment on the instructor survey questions

	Lower socio-economic status		Medium socio-economic status		Higher socio-economic situation	
	Avg.	SD	Avg.	SD	Avg.	SD
Participation of families in social activities and in class/school.	2.10	0.35	2.89	0.23	3.95	0.21
Families file complaints with teachers about infractions in class/school.	1.50	0.12	2.11	0.21	2.98	0.23
Families file a complaint with the appropriate authorities when their children fail to complete their schoolwork.	1.40	0.13	2.54	0.22	2.75	0.14
Families express their rage in front of the principal about infractions in class/schoolwork.	1.35	0.32	2.01	0.12	2.74	0.32
Families volunteer/ help with daily school work.	2.30	0.22	2.98	0.23	3.55	0.12
Families file a complaint or give a warning about inappropriate behaviour by teachers at school in front of various quarters.	1.52	0.23	2.50	2.30	3.01	0.25
Families use power in school to achieve things.	1.30	0.25	1.32	0.32	1.32	0.12
Families criticize teachers.	1.7	0.25	2.1	0.45	2.23	0.12

According to Table 2, teachers report that parents with a higher socioeconomic status participate in many school activities than parents with a lower socioeconomic status. For example, parents with a higher socioeconomic position have a higher rate (M=3.95) than parents with a lower socioeconomic position (M=2.10). Also, the statement that "Parents engage in the organization of activities in school/class (such as donations, school days/bazaar)" is higher (M=3.95) than for parents in a lower socioeconomic position (M=2.10). The above-indicated table also reveals that parents with low socioeconomic status grumble at a far lower rate (M=1.52) than parents with higher socioeconomic status. The average of parental involvement based on a cultural level is indicated in Table 3.

Table 3. Average family participation based on cultural level

	Lower cultural level		Higher cultural level	
	Avg.	SD	Avg.	SD
Families are effective and interactive members of the Parents Committee.	2.5	0.45	3.51	0.23
Families are involved in decision making about variations in different areas of the school.	2.41	0.32	3.78	0.12
Families generously share their experience and knowledge of educational programmes with the class/school.	2.30	0.32	3.55	0.32

Table 3 shows an apparent variation in parents' engagement in cultural events at the school. As families' cultural levels rise, the median level of parental collaboration in decision making rises. For example, for parents with low cultural level, stating that "Parents are partners in deciding improvements in various school fields" is (M=2.50). On the other hand, for parents with a high cultural level, it is (M=3.51). Consequently, the spectrum of school attendance is influenced by the cultural community of parents. Table 4 depicts the parents' level of interest in having their children collected by many family members.

Table 4. Rate of interest of parents in their children's achievement based on their family members

	Large family		Small family	
	Avg.	SD	Avg.	SD
Families allocate time for school activities at class/school (trips, decorations, different shows).	3.52	0.12	2.51	0.12
Parents monitor and are concerned about their children's academic progress.	2.75	0.12	3.72	0.12

Table 4 shows that the more family members increase, the less involved parents are in picking up their children. The average attention level paid by parents to their families is (M=3.72), while the same level of consideration is (M=2.75) for parents with large families. The number of parents and the degree to which families are concerned about their children's academic success are inversely related.

Table 5. Parent-school relationship rate and mutual trust

	Avg.	SD
I believe that teachers at school tell the truth during parent-teacher conferences	3.521	0.212
I believe the school is making obligations to parents	3.754	0.113
We could depend on teachers at school	3.245	0.112
I get the feeling that teachers at school are requesting the final decision	3.776	0.324
I believe that when problems arise with parents, teachers at the school exploit the situation	1.231	0.333
I believe that teachers at school fulfill their obligations	3.754	0.512
I get the feeling that teachers are trying to evade their responsibilities at school	1.751	0.113
Teachers, in my opinion, meet the expectations of parents and schools in an equitable manner	3.556	0.232
I feel like walking into school might upset the teachers	1.252	0.241
I think that going to school disturbs my children and puts them under pressure	1.251	0.253
The school administration has invited me to deliver a lesson/lecture in the class where my son is enrolled	1.754	0.262
I am a member of the parent committee at my school	2.101	0.251
Faculty members notify me of the decision at school	1.502	0.784
I believe the school is carrying out parental commitments	2.746	0.248
My son's teacher has learned where to go for assistance in class	2.754	0.212
My son's class teacher consults with me as a parent on educational issues	1.503	0.214
I am acquainted with each educator and teacher at my son's school	4.201	0.213
When I need assistance, I turn to the school staff	3.745	0.211
I am familiar with the social dynamics in my son's class	1.204	0.452
When I participated in school, the school staff made me feel at ease	2.753	0.535
I have a concept for social gatherings in my son's class	1.751	0.232
I'm familiar with the syllabus at my son's school	1.751	0.323
I believe that teachers undervalue my role as a parent	1.542	0.121
I have a suggestion regarding the main crucial decisions made by the school staff	2.781	0.231
I am interested to visit my son at school to know about his academic progress	3.012	0.213
I believe I was more interested in paying visits to my eldest son's school than to his younger brothers	3.254	0.322

Table 5 shows that teachers and parents have a higher confidence level than the general population. The median of saying things like "I believe the school is making promises to parents" is above average (M=3.75), and the average of saying things like "We can rely on teachers in school" is also above average (M=3.75). This indicates that parents have high trust in the school and its teachers (Figure 2).
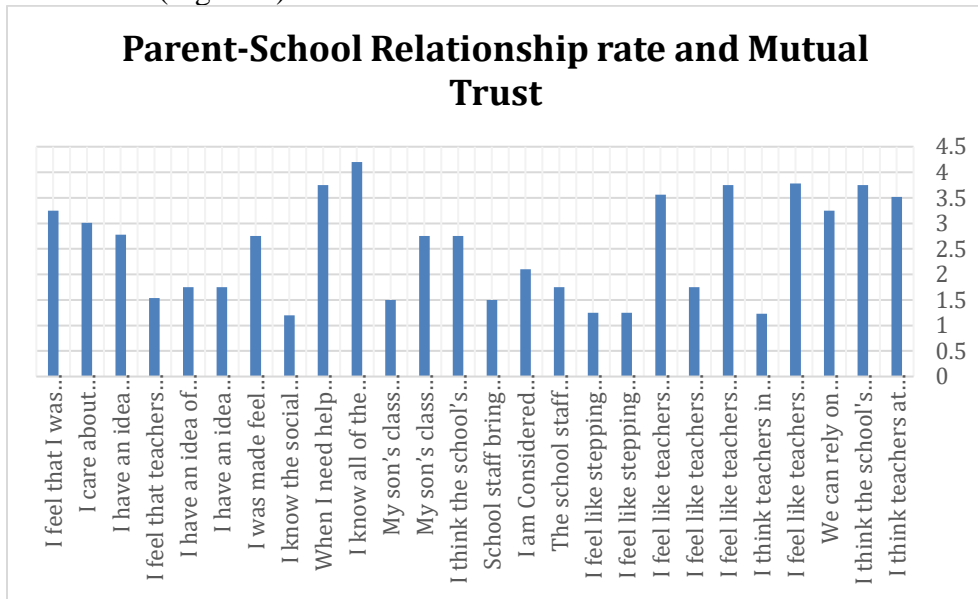

Figure 2. Parent-school relationship rate and mutual trust

Table 6. The average level of parental involvement at school according to the students

	Avg.	SD
I believe that teachers at school say the truth in their communication between parents	2.753	0.122
I believe that when problems arise with parents, teachers in the school exploit the situation	1.228	0.221
My parents attend parent-teacher conferences	2.749	0.233
My parents are members of the Parents' Class Council	2.754	0.315
My parents are engaged to organize class parties	2.102	0.231
My parents manage school trips	1.203	0.446
My parents have a key role in investigating the class's finances and money	2.151	0.212
My parents assist me in studying for the exams	3.751	0.152
My parents handle the exam results	3.453	0.172
My parents step in when I request a teacher to re-evaluate the grade I received	3.752	0.783
When I and some other teacher argue, my parents intervene to support me	2.75	0.21
When I and the teacher argue, my parents intervene to support the teacher	2.867	0.281

Table 6 shows that the families' exam preparation level is a significant indicator of their involvement in education. The phrase "My parents help me prepare for the tests" (M=3.75) gave the best image of parents engaging in education. The term "My parents govern for class trips" (M=1.20) resulted in the lowest school participation samples (Figure 3). In addition, assisting children with exam preparation demonstrates the need for parental involvement in school.
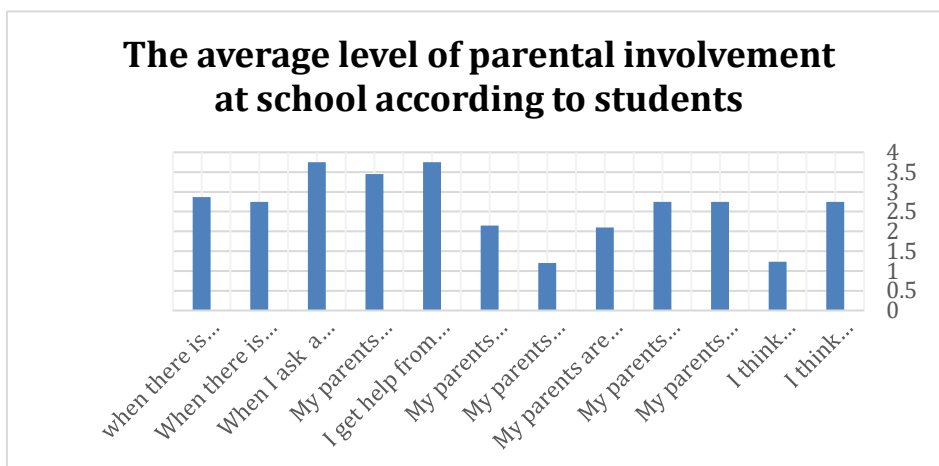

Figure 3. According to students, the average level of parental involvement at school

To examine the relation among school parents' involvement and the overall ranking, Person's correlation was measured.

Table 7. Calculation of Pearson's correlation for a variety of forms of parental involvement with the school

Participation forms of Parents	Pearson Correlation
My parents are members of the parent's class council.	**0.442
My parents assist me in preparing for exams.	**0.453
My parents are worried about my exam grades.	**0.354
My parents intervene when I request a teacher to re-evaluate the grade I received	**0.251
My parents attend parent-teacher conferences	**0.276

**Correlation is significant at the 0.01 level (2-tailed)

Table 7 illustrates a statistically significant relationship between parental engagement in school and the grade rate of children. There is a statistically significant definitive relationship between the involvement of parents in the parent's group and the mark rate (r=0.44, p0.001), as well as a statistically significant direct relation among families assisting the children in preparing for their examinations (r = 0.45, p0.01). According to the table, there is a statistically crucial direct relation between the attendance of parents at

community meetings and the mark rate (r=0.28, p0.001). In summary, the table illustrates a statistically crucial strong relation between parents' attendance in school and their children's average grade levels.

Discussion and Conclusion

The objective of this study was to investigate the impact of parents' level of involvement with the school on their children's performance in Arab elementary schools in Israel by answering the following research questions: Does the student's school stage have an impact on parents' involvement in school? Is there any connection between the family's socioeconomic status and the frequency of parent's involvement in school? Is there any connection between the family's cultural status and the frequency of parent's involvement in school? Is there any effect of the student's order in the family on his/her parent's involvement in school? The scholars handed the questionnaire to pupils, educators, and parents. One of the study's most interesting findings reveal that the degree and amount of parental involvement in the school affects the student's achievement. This finding is consistent with the studies of Hutchison et al. (2020) and (Shin & Seger, 2016; Wilder, 2014).

Furthermore, the research revealed a substantial difference between parents' attitudes towards their children's involvement in school events and the school's overall functioning. This result is similar to the research findings of Driessen (2005) and (Epstein, 2008; Leenders et al., 2018). Educators agree that parents with a good financial status engage in the school programs significantly more than parents with low socio-financial status. A vital distinction is seen between parents' involvement in school activities based on their cultural level. When parents' cultural level rises, the required level of cooperation in making decisions increases (Reardon, 2011; Berkowitz et al., 2017; Lawson & Farah, 2017).

Furthermore, it is shown that the larger the number of family members, the less interested families become in their children's academic performance. This implies that there is a negative relationship between the number of family members, the parent's involvement in school, and thus the children's academic achievement. Teachers and parents have an above-average level of confidence. The degree to which parents observe and plan for their children's exams is a significant indicator of parent involvement in education. As a result, helping students prepare for tests may infer motivation for parent involvement in the school. This finding is in line with Garbacz et al. (2017), Magwa and Mugari (2017), and Pérez Sánchez et al. (2013). In addition, there is a numerically significant constructive association between parents' involvement in school and their kid's grades. The findings of the study depend on earlier studies of Ofarim (2014) and Abd Algani and eshan (2019), who discovered a positive correlation between parent involvement and student achievement. It

is also accepted that this correlation is fundamental. Therefore, the extent to how dominant parents are, the higher the kid's achievement. In addition, Shin and Seger (2016) stated that the more parents are involved at school, the better the students' achievements at school. Based on the results of this research, the two researchers recommend putting an emphasis on parent communication and meaningful involvement in schools, as well as promoting the relationships between parents and school administration and staff. This also includes creating a supportive home atmosphere that leads to children's educational achievement. Subsequently, the researchers recommend full parents' participation in school meetings and parent committees. Finally, the researchers encourage parents to accept school invitations and attend activities such as conferences, workshops, societies, committees, shows, theatre groups, and various sports events.

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The Issue of Human Resources Aging in the Education System

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Abstract

In contemporary society, the problem of population aging and, related to it, the problem of human resources aging is raised more and more frequently. As documented by many researchers, it has been found that the aging changes occur at both physiological and psychosocial levels and affect each employee differently. When it comes to the educational environment, the aging of teaching staff represents an increased interest at the moment, especially in Romania, even more so in the context of a possible voluntary increase in the retirement age in education. In the first part of this paper, we will carry out a review of the most relevant academic findings in relation to the challenges that arise with the aging of human resources in general and those in education, in particular. Afterwards, we will present possible openings for future research, such as those on the impact of the proposed voluntary extension of the retirement age in the education system in Romania. We will conclude with a series of practical considerations related to the challenges that the management of human resources in education will likely face under the pressure of the mentioned impact

Keywords: Aging, human resources, education, teaching staff, aging workforce

Introduction

The World Health Organization claims that "the aging of the population is one of the greatest triumphs of mankind, but also one of the greatest challenges of today's society. Worldwide, the proportion of people aged 60 and over is growing faster than any other age group" (WHO, 2002). Thus, it is important to be aware of the changes among human resources that occur with aging, and more precisely, to observe the effects of this process among teaching staff. Since this topic is little explored in recent studies, we will start in this endeavour by presenting the main aspects characteristic of the

workforce aging, and then we will present what the workforce aging entails in the educational system. We will deepen this section and make some literature-based arguments about the challenges of new technologies among older teachers, and then review the major health challenges of older teachers. In the final section of this paper, we will present some openings regarding future research aimed at the impact of a possible voluntary extension of the retirement age in the education system in Romania, and we will conclude by discussing the challenges that human resources specialists will have to manage, following the eventual implementation of the draft law that provides for this extension of the retirement age in education.

Workforce aging

Aging refers, notes Sion (2003, p. 228-231), to the inevitable and irreversible decline of the human body functions, which occurs over time, even in the absence of the negative impact of injuries, diseases, environmental risk factors or life style. Employees with high physical demands at work are at high risk of occupational diseases such as cardiovascular diseases, locomotor disorders and long-term absences from work due to illness. These aspects could affect work capacity (Ilmarinen, 2002, p. 2) and are associated with changes in employee's functional capacity and health condition.

In terms of work organization, shift work affects employee's performance, as summarized by Varianou-Mikellidou et al. (2021). Thus, as a result of the natural aging process, physical capacities decrease (Ilmarinen, 2002), with changes in the cardiovascular and respiratory systems, circadian adaptations and sleep patterns (Varianou-Mikellidou et al., 2021), affecting performance, especially for employees who have physically demanding jobs. If a high level of well-being of teachers contribute to positive outcomes both personally and institutionally (Selçuk, 2022) we can infer that the decrease of well-being caused by ageing, will directly influence teachers' work outcomes. Previous studies have also compared work ability between peers of both sexes, showing that women may have lower work ability due to the multiple roles they have in the family and at work (Varianou-Mikellidou et al., 2021). On the other hand, professional experience, expertise, wisdom and strategic thinking accumulate with age (WHO, 1993), factors that can achieve higher performance at work.

A 2019 Estonian study demonstrated that older employees are just as productive as younger employees (Wissemann et al., 2022, p. 2). In general, the evidence seems contradictory, and a meta-analysis proved that the relationship between productivity and the age of employees is not yet clearly established from an empirical point of view (Wissemann et al., 2022, p. 2). Another aspect to consider is that younger employees' knowledge of new ways of working and new technologies is often perceived as more explicit.

The implicit knowledge of older employees, acquired through experience, is particularly important, especially for performing complex tasks. Research has shown that older people perform more consistently on cognitive tasks than younger people. Older employees may have skills that younger employees have not yet developed. Thus, the skills of younger employees and older employees are complementary rather than substitutable for each other (Wissemann et al., 2022, p. 3).

The aging of teaching staff

Over time, studies have identified several important components, related to the evolution of older teachers. First, older teachers were found to have the job stability component in common. Second, older teachers were also found to receive high ratings from principals for their responsible and systematic conduct in the classroom (Ryan & Kokol, 1988, p. 4). If the achievements of older teachers seem positive, we must not forget the wisdom gained and the success gathered while passing through the mid-career period. They are considered to have an increased ability to get along with students, including "the new trends in student-teacher relationship as cooperation, mutual respect and trust and also students' right to complain" (Safotso, 2018). They find that they have made a change in their teaching methods and that they have to get used to membership in professional organizations. However, the level of satisfaction that older teachers derive from long years of service is not very high (Ryan & Kokol, 1988, p. 4).

Content-specific teaching strategies and skills are the next component. This involves knowing the best methods and the best curriculum for the teacher to succeed. During the teacher's internship, this component begins to gain some importance, but the greatest attention needed with this component occurs in the first five years (Ryan & Kokol, 1988, p. 8). The final component for a teacher's development is professional skills outside the classroom, which involve activities such as coaching, membership of professional associations, or curriculum development. Obviously, this is of little interest to the early career student unsure in controlling a classroom, or to a probationary teacher concerned with demonstrating competence in the classroom. However, once teachers feel they have achieved some degree of mastery, they move on to other challenges, other ways to demonstrate their competence and contribute to the school community (Ryan & Kokol, 1988, p 11).

In relation to the aging of teaching staff, there are several concerns in the specialized literature, mentioning here, concerns related to: health, the use of technology, the management of interpersonal relationships. Regarding the health of older teachers, we would like to mention the studies conducted by Vangelova et al. (2018), Lingam & Boulton-Lewis (2012) and Kovess-

Masféty et al. (2006). We will briefly present the other two topics in what follows.

Aged teaching staff and adaptation to technology

Considering the increase in the use of technology in schools, teachers are forced to adopt technology as a way to increase the quality of the educational act and also the quality of the students' learning experience. Older teachers have seniority, experience and confidence in using classic/traditional learning strategies, less often using technology in the courses they teach (Tsai, 2015, p. 1).

A study analysed and presented by Tsai (2015), indicates that older teachers are not sufficiently prepared to use technology, not that they do not want to use it. Therefore, there is a need for research that aims to find out whether older teachers, who have many years of experience in the department, despite not having adequate technological skills or facing other difficulties, can sufficiently implement technology integration in class. The main reason for the lack of technology use is that teachers are not able to integrate technology into classroom teaching methods (Tsai, 2015, p. 1). Another study presented by the same author, argues that the integration of technology in the act of teaching should not involve focusing on improving the skills of using technology, but rather, it should support teachers in the appropriate combination of teaching strategies and mandatory knowledge within a discipline.

Teachers generally fall into two categories when it comes to their perspective on integrating technology into the classroom: some teachers demonstrate a positive attitude towards technology and believe that integrating technology will not only make teaching more effective, but also increase student motivation and will demonstrate the knowledge interdisciplinarity (Tsai, 2015, p. 2), while other teachers believe that technology overshadows students' concentration and thus stifles learning. Studies have shown that teachers who do not combine teaching methods and strategies with the frequent use of technology give the illusion of insufficient teaching (Tsai, 2015, p. 2).

As for older teachers, their many years of teaching and extensive experience easily lead to the assumption that they should understand how to integrate technology into teaching and generate successful experiences in integrating technology. However, there are substantial barriers and it is unclear whether these also limit senior teachers in implementing technology integration (Tsai, 2015, p. 3).

According to analytical reports, senior teachers' perspectives on technology integration ranged from "technology as a teaching tool" to "technology as an enabler of learning". Experienced teachers focused on their

training and whether they have been achieved their teaching objectives. In addition, based on the results of the study, it is possible to identify the factors that determine the teacher's familiarity with technology and the appropriateness of integration with subject contents, influencing the integration of technology. Poor technology management risks reducing the willingness of senior teachers to implement innovative teaching technologies. When technology is an inconvenient teaching tool, teachers do not use it in the classroom. The reason why senior teachers rarely apply technology in teaching is the lack of sufficient skill to use it; however, as for the current generation of secondary school teachers, in-service training has equipped teachers with appropriate technological skills. Assuming that advanced technological skills are not a crucial factor in technology integration, it is reasonable to suspect that external factors such as equipment management are a key factor influencing senior teachers' technology integration (Tsai, 2015, p. 7).

Teachers' direct experience of using technology in the classroom not only enhanced their computer skills, but also affected their teaching beliefs and commitment to technology. A study presented by Chang & Hsu (2017, p. 1), suggested that the focus should be on changing teaching practices that produced good learning effects. In turn, this would reinforce the change in teachers' beliefs and attitudes.

The previously mentioned researchers stated that teacher learning groups improve teaching practice and student learning. A learning community is a group of people who share common academic interests and goals. Its aim is to continuously improve its knowledge, skills and attitudes through the exchange of ideas, participatory learning and mutual encouragement. A teacher learning community can be defined as a group of educators who share a common belief, vision, and goal, and who are committed to continually improving student learning by engaging in collaborative instructional inquiry and problem solving (Chang & Hsu, 2017, p.1).

In the study carried out by Chang & Hsu in 2017, the evolution of older teachers was explored within a learning community, built on the basis of a partnership between the university where the authors work and a secondary school, in order to improve the quality of teachers in training. Based on data collected over the entire academic year, older teachers appeared to have growth in classroom management, instructional design, perception of technology integration, and technology competence. In addition, older teachers are used to implementing technology integration in the classroom. This indicates that sufficient technology support from teacher learning communities increases senior teachers' willingness and confidence to integrate technology into their lessons. In such circumstances, senior teachers are more likely to have successful experiences that in turn inspire them to experiment more with technology integration. In conclusion, teacher learning groups

strongly benefit older teachers' professional development in terms of technology integration. This study also showed that older teachers' ingrained preference for teacher-centred instruction could limit their creative use of technology.

Conclusion and Openings

Even if aging in general, and that of teachers in particular, brings physical and/or cognitive changes, the role of older teachers in the educational system does not diminish its importance, especially if they accept the transition from traditional teaching methods to modern ones, which involve the use of technology in the classroom. Teachers should be aware that the use of technology allows them to even get through difficult times such as the pandemic period by implementing distance education which took "a crucial role to prevent problems in closed-up schools" (Karalar, 2021). It is very important that pre-service teachers engage in collective inquiry into the content of teaching and learning for a possible shift towards more student-centred approaches. In fact, senior teachers have enormous influence over their younger colleagues. Although several challenges need to be addressed, the professional development of older teachers in terms of technology integration should not be left out and overlooked, but the opposite (Chang & Hsu, 2017, p.5).

In this sense, a draft law was discussed in Romania and recently adopted, which, among other things, proposes the possibility of voluntarily extending the retirement age, up to the age of 70. The decision of teachers to work beyond retirement age is influenced by both work-related and non-work-related factors, observe Matthijs & Visser, 2011. The authors reveal in literature some motivations for teachers to work after the retirement age as mentoring, self-managed disciplinary teams or others, shaped by three key work-related factors: organizational support, opportunities to alter their job roles and financial inducements (Matthijs & Visser, 2011). Future studies must take into account the impact that the implementation of such a project will have, both from the perspective of the teaching staff performances, and from the perspective of students and their parents, but not least, from the perspective of recent pedagogics graduates who want to enter the education labour market.

The challenge is a significant one and this challenge falls to the specialists in the management of human resources, in order to manage effectively and beneficially in the service of the most vulnerable part influenced by this possible change in the education law.

Data Availability: All the data are included in the content of the paper.

Conflict of Interest: The authors reported no conflict of interest.

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Evaluation of a Creative Drama Practice for Noise Awareness in Primary School

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Abstract

This study aims to investigate students' awareness of the level, causes and negative effects of noise in schools through the utilization of creative drama activities. The objective of this sample application is to contribute to the development of a more tranquil and peaceful school environment. A single case study design was employed for this research, with the study group comprising 16 fourth-grade students from a primary school. Student interviews served as the primary data collection tool, supplemented by observations and video recordings. Thematic analysis was employed to analyze the data, resulting in the identification of four main themes related to noise awareness: "lack of tranquility," "noise phenomenon," "conflict exacerbation," and "creative ideas". By incorporating the Visual Arts and Science curriculum, students demonstrated important life skills such as innovative thinking, effective communication, and analytical reasoning. Additionally, this interdisciplinary approach allowed for the attainment of learning objectives within the Science curriculum's sound unit, while also addressing the "Visual Communication and Formation" domain of the Art curriculum.

Keywords: Visual arts, primary school, sound, noise pollution, creative drama

Introduction

Play serves as the primary means through which children express and explore their world. Vygotsky (1967) emphasizes the significance of play, stating that during play, a child surpasses their usual capabilities. Play is a fundamental activity for child development, and its integration into education

necessitates innovative teaching approaches that transcend traditional practices of teacher-centered instruction. As societal needs rapidly evolve, so do the expectations placed upon education. This dynamic environment presents an opportunity to introduce new approaches into the educational landscape.. According to Karakaya (2007), creative drama stands out as one such approach. Creative drama, emerging spontaneously within children's play, enhances their empathetic abilities, artistic sensibilities, and creativity (Pinciotti, 1993). Engaging students actively in the classroom and creating a dramatic environment with real-life examples are among the most effective methods of instruction (Moore, 2004). Drama in education proves invaluable in improving language skills, fostering social interaction, and teaching children the art of listening (Thompson & Evans, 2005). Numerous studies have highlighted the positive contributions of drama to student development, including the cultivation of empathy, communication and problem-solving skills, vocabulary acquisition, nurturing a positive self-image and imagination, as well as enhancing motivation in foreign language learning (Akbaş, 2011; Arieli, 2007; Başören, 2015; Güneş, 2019; Kadan, 2013; Karadağ & Göçer, 2018).

Drama in education is a process that is encompassed within national curricula, which outline not only what children should learn but also how they should learn, placing emphasis on the process itself (Baldwin & Fleming, 2003). However, according to Donbavand (2009), drama gradually diminishing from the educational environment as the curricula increasingly prioritize academic success. The literature offers various classifications for the stages of creative drama (Adıgüzel, 2006; Akyol, 2003; Çelikkaya, 2014; Karakaya, 2007; Özdemir & Üstündağ, 2007; Yeğen, 2003). For this study, the drama plan was developed based on several classifications, comprising three stages: preparation and warm-up, animation, and evaluation. Preparation and Warm-up: According to Bakkaloğlu (2017), The preparation and warm-up stage, as highlighted by Bakkaloğlu (2017), holds significance in terms of acclimating students to the activities. During this stage, if the group is engaging in creative drama for the first time, it is important to introduce simple-to-complex activities to facilitate adaptation. Animation: This stage encompasses the process of shaping and developing the subject matter over time, ultimately presenting it to other students (Adıgüzel, 2013). Evaluation: At this stage, evaluation takes the form of self-assessment by either the teacher or the student without the use of scoring (Adıgüzel, 1993). Each student is unique, and therefore,, teachers should approach assessment and evaluation processes flexibly, adopting alternative methods. These processes should encompass not only cognitive measures but also attitudes and actions (MEB, 2018). Curriculum: The curriculum is founded on the principle that development is holistic. Accordingly, lessons should be planned not only with

the desired learning outcomes in mind but also with the aim of developing skills alongside those outcomes (MEB, 2018).

Numerous studies have integrated the creative drama method into lessons to promote the acquisition of life skills (Aslan, 2008; Avcıoğlu, 2012; Bayrakçı, 2007; Kahriman, 2014; Kara & Çam, 2007; Önalan, 2006; Okvuran, 1995). Life skills encompass analytical thinking, decision making, creativity, entrepreneurship, communication and teamwork, all of which are related to accessing and utilizing scientific knowledge (MEB, 2018). In this study, the creative drama technique was applied through the integration of the Science and Visual Arts courses using the art integration method. Art integration is an instructional approach that combines art with different disciplines and fostering creative processes, and permanent and effective learning occurs (Dinç & Karahan, 2021). The assessment and evaluationof Science and Visual Arts achievements were conducted during the evaluation stage of creative drama process. The literatureincludes publications in which creative drama has been integrated into science or visual arts lessons (Dilmaç & Dilmaç, 2020; Gümüş, 2019; Kara & Aslan, 2018; Kök, 2011; Timothy & Apata, 2014; Uzun, 2019; Yalım, 2014; Yılmaz, 2006). These studies demonstrate that the creative drama method employed in the Science and Visual Arts courses contributes to students' skills, academic achievements, and attitudes. For instance, Dilmaç and Dilmaç (2020) found that the creative drama method used in Visual Arts lessons enhanced childrens' critical thinking skills. Additionally, Yeşiltaş et al., (2017) discovered that creative drama was more effective than the traditional methods in dispelling misconceptions in science lessons, while Yalım (2014) observed that dramain the Science course led to increased academic achievement.

Children perform tasks more effectively in quiet environments compared to noisy ones (Güler & Çobanoğlu, 1994). Slater (1968) demonstrated that students are more successful in a quiet environment than in a noisy one, emphasizing the disruptive nature of noise pollution in schools. Despite being a serious and potentially hazardous issue, noise is often overlooked in school settings (Bulunuz, Ovalı, Cıkrıkçı & Mutlu, 2017). Strategies for noise control can be categorized into three stages: control at the source, control at the receiver, and control in the environment. Raising awareness about noise is a critical aspect of environmental control (Güler & Çobanoğlu, 1994). In the 2018 Primary School Science curriculum, a total of 10 objectives related to the concept of sound were included at the 3rd and 4th grade levels. These objectives are also connected to the concept of noise. Sound is defined as the audible vibration detected by the ear (TDK, 1992). On the other hand, noise refers to unwanted sounds that interfere with each other and negatively affect individuals (Güler & Çobanoğlu, 1994). The Primary School 3rd and 4th-grade Science curriculum (2018) incorporates the topic of

sound through four units: "Sounds Around Us", "The Role of Sound in Hearing", "Sound Technologies" and "Sound Pollution". The learning outcomes revolve around the physical properties of sound, the role of sound in hearing, sound pollution, its effects, and control.

Recently, neuroscientists have dedicated efforts to unraveling the mechanisms behind the brain's generation of awareness. A significant aspect of human cognition, is closely tied to the pursuit of self-knowledge, as emphasized by ancient Greek philosophers (Köksal, 2018). In essence, awareness extends beyond mere consciousness; it involves the discovery and recognition of phenomena (Fromm, 2017). In order for students to assume responsibility and foster a calm and quiet school environment, they must develop an awareness of noise (Bulunuz & Özgür, 2021). While there is existing literature on noise prevention in schools (Bulunuz et al., 2017; Bulunuz & Özgür, 2021; Bulunuz et al., 2022; Shield & Dockrell, 2003; Shield & Dockrell, 2004; Shield & Dockrell, 2006; Klatte et al., 2010), a review of the literature did not yield any publications specifically addressing the use of creative drama to raise awareness of noise in educational settings. Therefore, this study presents an exemplary approach that utilizes creative drama to enhance students' awareness of noise issues at school and to contribute to the creation of a quieter school climate. The aim of this study is to utilize creative drama activities to unveil students' understanding of the scope, causes, and adverse effects of noise in the school environment, offering a practical model that promotes a more serene school atmosphere. The study focuses on creative drama practices, implemented in an interdisciplinary manner, at the 4th-grade level of primary education.

Methods
Research Design

This qualitative study isdesigned as a single-case study, incorporating interpretive paradigms. Qualitative research is a method in which the research problem is interpreted from the researcher's perspective using an interdisciplinary approach (Altınışık et al., 2010). Within interpretive paradigms, there is no pure reality and all elements are interconnected. A single case study is a research design that involves a detailed examination of an event through "why" and "how" questions within a real-life context (Balcı, 2011; Yıldırım & Şimşek, 2013). In essence, a single-case study is an in-depth investigation aimed at uncoveringthe patterns of a complex and functional event (Stake, 1995). The primary objective of this research is to enhance noise pollution awareness among primary school students through structured creative drama practices. In the study, sub-themes related to students' noise awareness were identified through creative drama practices. In the 3rd and 4th grade Science and Visual Arts courses, questions were posed regarding

potential sub-acquisitions, skills development, and values. The responses to these inquiries formed the interconnected sub-elements of the single case study. Data collection in this study relied on observation, followed by interviews and analysis of documents that emerged during the evaluation phase of the creative drama practices in order to augment the dataset.

Study Group

The study group for this application consists of 16 primary school students at the fourth-grade level. The selected school is one of the primary schools participating in the implementation of the TÜBİTAK project number 114K738. Creative drama activities were employed with the study group aiming to assess the students' awareness regarding the level of noise within the school environment, its underlying causes, and the resulting negative effects. The ultimate objective of these activities was to enhance the students' awareness of noise-related issues within the school.

Application Process of the Research

This study aimed to explore the learning domain of the "Visual Communication and Formation" lesson within the 4th-grade Visual Arts curriculum using creative drama activities. Specifically, within the unit focusing on Sound Technologies in Science, the study sought to assess students' awareness regarding the magnitude, causes, and detrimental effects of noise in the school environment. To achievethe study's objectives, the researchers were implemented creative drama activities with the student groups. The creative drama process comprised three stages: "preparation-warm-up", "animation" and "evaluation". The application was conducted over two 80-minute sessions. During the preparation and warm-up phase, introductory activities were incorporated to draw attention to the theme of noise pollution and facilitate group interaction among students.

Figure 1. Preparation Phase

During the animation stage, the students actively engaged in the improvisation technique by assuming roles that highlighted the detrimental effects of "Noise Pollution". The improvisation technique can be described as a pontaneous and unscripted development of situations that emerge from within. According to Üstündağ (1998), improvisation is considered the foundation of drama. Through this stage, students further solidified their acquired knowledge from the preparation phase and gained experiential understanding by immersing themselves in the roles they portrayed. Additionally, they developed empathy by exploring the diverse perspectives of various characters.

Figure 2. Preparation Phase

The animation studies commenced with the utilization of "Double Improvisation" techniques.

Figure 3-4. Double Improvisation

Following the initial activities, the study progressed towards the next phase known as "Group Improvisations".

Figure 5. Evaluation Phase

Finally, in the evaluation phase, students were tasked with creating a novel context for the issue of noise pollutionthey had encountered. Within this context, various products were generated by utilizing different disciplines and fields.
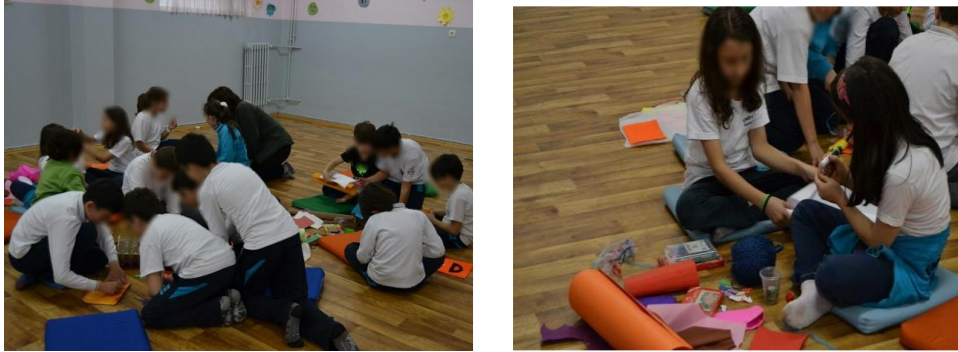
Figure 6- 7. *Product design*

Data Collection Process

The data collection process involved16 primary school students at the fourth-grade level. Prior to conducting the research, parental consent was obtained, and the participants were selected based on voluntary participation. The creative drama activities recorded using a camera, and data were purposefuly collected by the researchers through semi-structured observation forms. Additionally,, interviews were conducted with the students to provide further insight into their perceptions of noise.. These interviews aimed to explore their experiences, awareness, and perspectives, rather than assessing their knowledge. Within this context, the following questions were posed to the students:

1. Can you tell us about yourself? What is your name how old are you?
2. What did we do today? Can you explain a little?
3. Which of today's activities impressed you the most? Can you explain a little why?
4. Do you think silence is important? Why?
5. What is noise? Is it important to us? How does noise affect you?
6. Would you like more of these activities?
7. What did you do to avoid the noise? What did you name it? Why did you choose this name?
8. Can you show us what you designed? What is its purpose? Can you tell us about the connection between the materials you chose and noise pollution?

Data Analysis

The data set, comprised of audio recordings from observations and interviews, was transcribed and subjected to a thematic analysis to elucidate students' accomplishments, awareness, and perceptions regarding noise pollution. A case study was provided, showcasing direct findings derived from

the thematic table, observations, and interviews, systematically arranged using codes, categories, and themes.

Validity and Reliability Studies

All stages of the study were founded on volunteerism. The interviews were conducted individually in a tranquil setting, allowingstudents to express themselves comfortably. The draft of the interview questions was submitted to expert lecturers in the field of "Classroom Education" from two distinct universities to ensure validity. Based on the feedback received, the questions were revised accordingly. Attempting to address a multidimensional problem through a single data source is insufficient (Miles & Huberman, 1994). In this study, noise awareness at school represents a complex issue encompassing multiple parameters in its causes and solutions. Rather than gathering data for such a multifaceted problem froma single data source, a diversified approach was employed, utilizing observation, interview, and video recordings. Experts in qualitative data analysis subsequently categorized the collected data into themes and sub-themes.

Ethical Permission Information of the Study

In this study, all the rules stated in the Committee on Publication Ethics (COPE) were followed.

Ethics Committee Permit Information

Etic Board that Conducts the Assessment: Bursa Uludag University Clinic Research Ethics Committee.
Date of Assessment Decision: 09.06.2015
Assessment Document Number:2015-12-7

Results

Creative drama studies were conducted with students to address noise at school. Semi-structured interview forms served as the primary data source, enablingstudents to explore the noise phenomenon in-depth within the school environment. Video transcripts of creative drama practices were utilized to reinforce the interview data. The themes, categories, and codes derived from the analysis are elaborated upon below. Four main themes emerged from the thematic analysis. The issue of noise awareness, which is examined through thematic analysis, comprises "lack of tranquility", "noise phenomenon", "conflict exacerbation" and "creative ideas".

Lack of Tranquility

During the interviews with the students the following questions were posed: "Do you think silence is important? Why?", "What is the noise?" "Is it

important to us? How does the noise affect you?" The thematic analysis of their responses revealed the emergence of the "lack of tranquility" theme, encompassing the challenges and issues students face due to the absence of silence. These problems experienced by the studentswere further categorized into "communication problems", "health problems" and "academic problems".

Communication Problem

Communication comprises two fundamental elements: the source and the receiver. Without these two components, effective communication cannot take place. For communication to be successful, both partiesmust be able to understand each other and provide appropriate responses. Achieving this requires mutual audibility and intelligibility of sound. Based on the students' responses, two codes were developed pertaining tothis topic. The first code, "inability to be heard", signifies the challenge of communicating one's messageto the other party due to excessive noise. Betül's statement serves as an exemplary instance of this code:"It is important because someone will respond to someone, but they cannot raise their voice excessively"(Betül, Interview, p. 2). The second code, "difficulty in hearing", highlights the difficulty of the other party hearing us due to the high level of ambient noise. The words of Fikri, one of the students, "It is important because if there is too much noise, no one can hear each other." (Fikri, Talk, p. 2) supports this code.

Health Problems

Studies have demonstrated that noise has physical and psychological effects. In a noisy school environment, students may experience symptoms such as tinnitus and headaches. These physical issues among students were categorized under the "physiological" code. For instance, Gamze's statement, "It is important because if there is too much noise, we get headaches..." (Gamze, Interview, p. 2) exemplifies the physical problems encountered by the students. Similarly, students also encounter psychological challenges resulting from the impact of noise. Through the interviews, these issues were classified under the "psychological" code. An example of this code can be found in Özlem's statement: "I feel bad"(Özlem, Observation, p. 6).

Academic Issues

The school environment should be organized in a manner that promotes effective learning. While elements such as light, sound, and color are considered in the design of contemporary teaching environments, the tranquility of the setting is often neglected. . Noise is one of the most significant barriers to learning today as it leads to excessive adrenaline release, which in turn diminishes the brain's learning capacity. In interviews, students

reported that classrom noise hinders their ability to work efficiently. Based on these statements, the code of "inefficiency in work" was established. As an example of this code, Gamze's statement: "...We couldn't perform our tasks well."(Gamze, Interview, p. 2) is given. Students concur that noise negatively impacts their academic performance,. giving rise to, the "performance anxiety" code has emerged. A clear example of this code is the statement, "Noise affects me and prevents me from engaging lessons." (Gamze, Interview, p. 3). In our country, where assessment and evaluation are exam-based, test scores have become a source of concern for students. This sentiment is evident in the expressions of the students within the "grade anxiety" code. A student named Jale articulated her grade anxiety by saying "…if we have an exam, and we can't study quietly, we may receive poor grades."(Jale, Interview, p. 2). Another code that emerged under academic issues is the "focus problem". Arguably, the first step for a student to succeed is to concentrate on the lesson they are attending, the homework they are completing, and the exam they are preparing for. A student who is distracted by noises from the garden, another room in the house, or the street cannot study effectively. In response to the question, "How does noise affect you?" Jale stated, "…it's distracting. While studying for an exam, my parents turn the TV volume up too high. This distracts me. It causes me to make mistakes while working and to receive a lower grade because my mind remains preoccupied during the exam. "(Jale, Interview, p. 3). The student's words provide a compelling and illustrative example of this issue, offering an opportunity to rectify the errors made.

Noise Phenomenon

In the interviews, students were posed the following questions: "What is the noise? "Is it important to us? "How does the noise affect you?" These inquiries led to the emergence of the "noise phenomenon" theme, derived from the participants' responses and the analysis of video recording transcripts. This theme encompasses students' perceptions and definitions of noise, as well as its causes. The students' opinions were categorized into five distinct classifications: It has been classified as "definitions", "perceptions", "transformation of sound", "noisy memories" and "contrary associations".

Definitions

Within the definitions category, the codes of "human origin", "effects of culture" and "technological resources" are described below. The code of "human origin" was derived by associating noise generation with people. İpek's statement, "Noise is an environment where all people talk." (İpek, Interview, p. 3) serves as an example. Students also discussed their tendencies, such as one student mentioning that "pampered children" cause noise (Özlem,

Observation, p. 4). Lastly, the "technological sources" code emerged, as mass media was identified as a source of noise. Dialogues between the teacher and students during the study support this classification. For instance; when one student mentioned "microphone" as a noise source, other students provided similar answers such as "headphone" and "speaker" (Observation, p. 13).

Perceptions

Students defined noise in three distinct ways: "confusion", "concretization" and "relativism". The "confusion" code refers to the perception of noise as a combination of multiple sounds at a high volume. An example of this is Gamze's statement, "I think it's a mixture of noisy sounds." (Gamze, Interview, p. 3). Some students did not perceive noise as separate from other forms of pollution. From these statements, the "concretization" code was derived. For example, Betül said "Noise is sound pollution" (Betül, Interview, p. 2). In the last code of "relativity", some students found noise to be necessary. Similar to individual tastes and preferences, noise is a relative concept. Some people find crowded environments friendly and warm, while others find them uncomfortable. For instance, while noise is a problem and an obstacle for many students, Deniz stated, "If there was no noise, we could not have fun."(Deniz, Interview, p. 2). This suggests that some people perceive noise as a means to support entertainment.

Transformation of Sound

As is known, noise occurs as a result of mixing sounds with high volume or frequency. Noise is the simultaneous use of multiple sounds, in the wrong place, at the wrong time, and in the wrong tone. From this perspective, the "concurrency" code was created. The data obtained from the observations made with the students can be exemplified by the following dialogue:
Student: When you're making a sound and suddenly other people start making it.
Teacher: So when the sounds are mixed.
Student: Yes.
Teacher: Another?
Student: When everyone shouts.
Student: When everyone starts making noises.
Teacher: Is it noise when the voices start to mix?
Meanwhile, the student said something, but his voice was not understood.
Teacher: I couldn't hear, can you repeat what you said?
 Student: When the sound of speech increases"(Observation, p. 5).

Noisy Memories.This category includes students' accounts of their experiences in noisy environments. There are two codes in this category:

"subjective life" and "cultural life". The "subjective life" code relates to students' experiences within their families. An example of observations and dialogues during the study is presented below:

> Student: My brother's noise.
> Practitioner: Is your brother making noise?
> Student: It's surprising! The building is shaking because of my brother's noise. For example, he is playing house, shouting like that... He says let's play together."(Özlem, p. 5)

"Cultural life" encompasses social values. For example, in our culture, there are relatively noisy events such as, wedding, sending off soldiers, and social gatherings. One of the students, Özlem, shared, "I have such a memory. I was at a wedding, the music was too loud and everyone was shouting everywhere. When the person in the last corner shouted, the person in the other corner could hear him" (Özlem, Observation, p. 5).

Contrasting Associations

Under this category, two codes were identified as "sound concept" and "silence dilemma". It was observed that students evaluated the concept of sound as either silence or noise. In the category of "sound concept", students defined sound as "scream" and "noise" (Observation, p. 3). The "silence dilemma" code emerged as a result of some of the students stating that they liked noise, while others preferred silence. For example, Deniz said, "…We couldn't have fun even if there was no noise."(Deniz, Interview, p. 2) while Eren expressed, "…Because when we are quiet, we find peace"(Eren, Interview, p. 2).

Conflict Exacerbation

Within the scope of this study, warm-up activities and improvisation exercises with students were observed and recorded. By combining observations, recordings, and interviews, the theme of "*conflict exacerbation*" was identified. Two sub-categories of this theme, "precautions" and "solution suggestions" were classified. These classifications were based on improvisational drama studies.

Solution proposals

At the end of the improvisations, students were asked, "Is there a solution in case of a problem?" "If it didn't reach the solution, why didn't it reach it?" and "How can he reach the solution?" The data of this category was derived from the students' responses. Students' suggestions were classified as "distraction from the environment", "eliminating the source", "gradual practice", " sequential use of time", "sound reduction device", "disseminating the reward" and " implementing sanctions". An example of the code

"distraction from the environment," which refers to leaving a noisy environment and moving to another space, is Özlem's statement "I want to go to another room" (Özlem, Observation, p. 6). Noise always has a source. Eliminating, removing, or blocking this source will significantly reduce the noise. An example of this code, which is called "eliminating the source", is the sentence, "The melodica that causes noise is taken away" (Özlem, p.8). In double improvisations, most students chose to gradually move away from the noise source instead of suddenly stopping it. These approaches have been termed "gradual practice". An example of this is presented below:

Student: First I made the volume louder, then I turned it down gradually. Practitioner: Why did you do that?
Student: To get used to the dimming.
Practitioner: To understand the difference between high and low voice. How well your brother listened to you."(Ozlem, p. 7). In addition, some students mentioned the sequential use of environment and time. These views were categorized under the code "sequential use of time ". An example of this is Özlem's statement "One hour one would work, one hour the other would work" (Özlem, Observation, p. 9).

The codes and examples examined thus far pertain to dual improvisation studies. The following suggestions are expressed by students for school stakeholders and communities. One of the initial suggestions against noise is a "sound attenuator". This device was considered for warning against noise. Çiğdem explained this thought with the following sentences; "I think a device that reduces the sound should be used as soon as the noise gets louder during the lesson at school."(Çiğdem, Observation, p. 13). The "widespread effect of the rewards" aims to encourage students to maintain a noise-free school life. İpek said, "We can start something. What was his name? Anyway, that's how we can reward the quiet and the good. Then others will also be silent" (İpek, Observation, p. 13). These examples demonstrate how students can be encouraged to be calm. Finally, the tendency to resort to punishment or prohibition, which is common in the traditional education system, has been categorized under the "sanction code". For example, a student said, "Let's try to explain the situation to the students and punish them if they don't understand."(Özlem, Observation, p. 13).

Measures

The impromptu group activities with students focused on noise complaints, noise precautions, and solutions. Due to the improvisational nature, each student assumed a role and expressed their suggestions. The "measures" category derived from improvisation, is divided into two codes:"improving the environment" and "active participation of stakeholders". In addition to education on noise in schools, the necessity of

acoustically improvingthe school building is an indisputable fact. The code "improving the environment" highlights this requirement. One student said, "…the teacher of each class collects the necessary funds and the problem is fixed"(Özlem, Observation, p. 12). These stakeholders are not limited to just teachers and students. Uniting all stakeholders in the school with the common goal of creating a tranquil environment makes achieving this goal easier. Better results can be obtained when all stakeholders work together to prevent noise pollution. Students made similar points in their improvisations, leading to the code "active participation of stakeholders". Schools encompass numerous stakeholders. For example, the following dialogue took place between a student and the practitioner:

Student: Let the parents come to the lesson.
Practitioner: So you want parents to see toowhy the students are making noise?
Student: "Yes". (Observation, p. 13)

Creative Designs

At the end of the activities, students were asked to create a product based on the information they acquired about noise pollution. They were asked to consider the improvisations and warm-ups they participated in while creating the product. The products created were presented to the students, and two codes were determined based on this. These codes are called "associative" and "functional".

Associative

Associative code products are designs made by students to evoke noise or silence. Student products and the slogans they created for these products are provided below. The "Noiseless Hero" product designed by the students is shown in Figure 6.
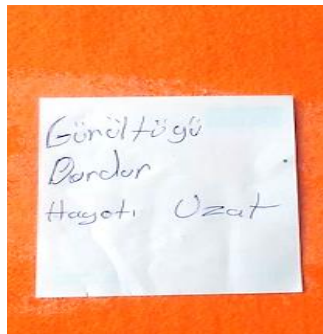
Figure 6. Hero Without Noise: Product example of associative code

Figure 6: The slogan "Stop Noise Extend Life": Product example of associative code. The slogan "Noiseless Hero" in Figure 6 is "Stop the noise, prolong life.".

Figure 7. Cyber Character: Product example of associative code

In Figure 7, Hüseyin, one of the students, explained the reason for designing the product he named "Cyber", "I created a character to prevent noise." (Hüseyin, Interview, p. 3).

Figure 8. Silence Design: Product example of associative code

Fikri, one of the students in Figure 8, explains the product he designed: "He tells that making too much noise is harmful. He told it to be silent and named it "Silence" (Fikri, Interview, p. 3). While some students preferred to create associative designs, others opted for functional designs. The designs in the "functional" code include products that can be used to prevent noise in daily life. Students' functional design products are provided below with their explanations.

Functional Designs

The designs created by the students to reduce noise or to promote quietnesswere coded as "functional". Student products and their functions are provided below with student descriptions.
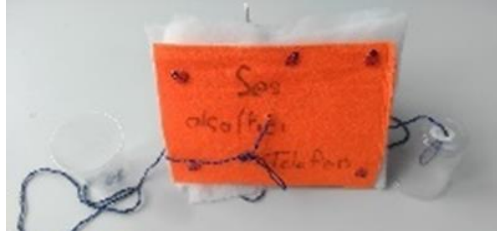
Figure 9. Noise Reduction Phone: Product example of functional code

One of the students, İpek, named the product she made a "Noise Reducing Telephone". "I made a telephone with wires to avoid noise. I named it a sound-reducing phone. I chose this name to find out how the phone came to this time"(İpek, Interview 1, p. 3).

Figure 10-11.   Bell: Product example of functional code

In Figure 10 and Figure 11, we can examine the products named "Bell" designed by the students with the slogan "It is in your hands to prevent the noise".

Discussion, Conclusion, and Recommendations

This study aimed to raise awareness about the dimensions, causes and effects of noise in schools by incorporating creative drama activities into Science and Visual Arts classes. In this context, the themes derived from student interviews, which serve as the primary source of study data, are presented in this section as conclusions, discussions, and suggestions. The

themes obtained from the interviews include lack of tranquility, the noise phenomenon, conflict exacerbation, and creative ideas.

Lack of Tranquility

Students reported that they could not hear their peers during noisy periods at school and struggled tomake their own voices heard. Consequently, students are aware of the lack of tranquility at school. This issue was addressed in terms of communication. Communication is a means of expressing one's thoughts and emotional needs and understanding others. Simultaneously, it is a social tool that inflences individuals' behavior towards their environment (Dağ, 2014). However, children's inability to express themselves or feeling misunderstood by their peers in an educational setting goes beyond a mere communication problem. Communication issues in the classroom are not just barriers to communication; they also hinder learning and may lead to social and emotional problemsIn fact, this study found students were negatively affected both physically and psychologically. Additionally, communication problems are particularly significant for disadvantaged students such as those in inclusive education and refugee children. Numerous studies in the literature demonstrate the negative effects of communication problems in the educational settings (Moralı, 2018; Erdem, 2017; Gök, 2013). Furthermore, it was concluded that students experience "grade anxiety". As anxiety increases, academic success decreases (Polat, 2017; Karaman, 2020). Thus, students' academic success is negatively impacted in noisy environments.

Noise Phenomenon

The theme of the noise phenomenon encompasses the categories of definitions, perceptions, sound transformation, noisy memories, and contrasting associations. In the interviews, students defined noise as originating from human and technological sources, attributing their peers' noisy behaviors to family upbringing and cultural influences. The concept of noise may be perceived differently across cultures. A behavior considered noisy in one culture might be deemed ordinary in another. The meanings societies attribute to noise are constantly evolving, with noise becoming increasingly commonplace and widespread in modern societies (Tan, 2021). This situation may be linked to changing perceptions in a globalizing world. Noise is a relative perception. In this study, some students characterized noise in the "Perceptions" category as a mixture of sounds and pollution, while others viewed noise as a trigger for pleasure.

Cultural habits, such as weddings, social gatherings, and military farewells, can contribute to noise. Almost everyone has experienced these noisy activities at some point in their lives. In this study, students found the sounds of such traditional activities from their neighbors to be noisy and

disruptive . The study group consists of children from families with medium and low socio-economic levels. This situation may be related to the poor insulation systems in buildings and the socio-economic status of the neighbors. In fact, according to Kagge (2017), noise is associated with class differences and socio-economic level. Low-income families are more exposed to noise from neighbors than high-income families. No publications contradicting this finding were identified in the literature. While students described the concept of sound as "silence" or "screaming", they characterized noise as both disturbing and entertaining. From this point of view, it can be said that noise creates contrasting connotations for students. This situation may arise from individual differences and gender disparities among students. Erdal and Tepe (2021), in their study examining individuals' music preferences based on certain variables, found that men prefer violent and loud music more than women. In addition, more active and extroverted children in the school environment found noise entertaining, while calmer introverted children found noisy activities disturbing. Contrary to this study, Erdal and Tepe (2021) discovered that introverts prefer intense music more than extroverts.

Conflict Exacerbation

At the conclusion of their improvisations, the students proposed solutions to address the issue of noise. These suggestions included "noise reduction" and "active student participation". Active learning, on the other hand, is an approach that necessitates active engagement in learning process (Açıkgöz, 2003). Students actively participated in the process through creative drama which led to improved suggestions and a clearer understanding of the situation.. In general, the students considered leaving the noisy environment or eliminating the source of the noise. Subsequently, they discussed implementing sanctions or a reward-punishment system for students. In this context, it appears that students tend to rely on general application methods.

Creative Designs

During the evaluation phase of creative drama, students were asked to develop designs that were functional and possessed symbolic associations. The designs created by the students featured names such as "Noiseless Hero", "Cyber", and "Silent". Additionally, they developed functional products such as telephones and bells. In terms of symbolic associations, students designed posters depicting unhappy human figures and heroic characters disturbed by noise, accompanied by supportive slogans. Regardingfunctionality, they conceived materials with the idea that communication and school tools could be silent. Consequently,, this research demonstrates that students achieved the Visual Arts lesson's Visual Communication and Formation learning objective,

"G.4.1.6. Creates three-dimensional studies using different materials.. This accomplishment will contribute to both the child's awareness and creativity by enabling them to develop their own solutions to current problems. Tantan (2022), found that three-dimensional studies enhance Children's creativity skills in his research examining the visual arts curriculum. According to Uysal (2005), creating three-dimensional designs allows children to strive to positively transform their environment. Furthermore, multidimensional art education alters the way children perceive the external world.

Results related to outcomes

While the students were describing the noise, they asserted that it was human-induced, that their cultural upbringing influenced the formation of the noise, and that technological sources were the primary causes of noise. Based on these findings, "FB 4.4.5.1. It can be concluded that the acquisition of "questioning the causes of sound pollution" has been achieved. Findings that noise is perceived as an environment of confusion, expressed through embodiment, and is a relative perception can be interpreted as negative views on the absence of calmness. In addition to these, in cases of tranquilitydeficiency, students experienced communication problems such as not being heard and having difficulty hearing; They stated that these situations might cause physiological and psychological health problems and that the lack of silence also causes academic problems such as inefficiency, focusing difficulties and success anxiety. Based on these views, "FB 4.4.5.2. It can be inferred that the acquisition "explains the negative effects of sound pollution on human health and the environment" has been achieved.

During the animation phase of creative drama, to the aim is to produce solutions for the existing problem by considering various conflict situations. In these conflict situations, the solution suggestions that students found during their encounters with noise included: distancing from the environment, eliminating the noise source, gradual practice by adjusting the sound levels, sequential use of time, sound-reducing devices, widespread impact of the rewards, and enforcement. These findings, through research, have demonsrated that students achieved the goal of "FB 4.4.5.3. producing solutions to reduce sound pollution". When evaluating the gains, the concept of noise is not directly included in the program, but can be associated with the gains under the title of the sound unit. During the interviews, misconceptions about the concept of sound and noise were identified. It is thought that this can be prevented by incorporated gains related to noise into the program. There are studies in the literature that support the current study, in which misconceptions about sound have been identified (Demirci & Efe, 2007; Küçüközer, 2009; Öztürk & Atalay, 2012).

Results on skills

In the research, behaviors towards various skills were observed by integrating creative drama into the fields of visual arts and sciences. Interviews conducted during and after the event were interpreted; it has been observed that students exhibited behaviors related to life skills such as analytical thinking, decision-making, innovative thinking, entrepreneurship, communication, and openness to teamwork. Similarly, Çakmakçı and Özabacı (2013) found that drama significantly improved their decision-making skills in their study with fourth-grade primary school students. Aslan (2008) concluded that the drama technique has a supportive effect on cooperative behavior in children. In addition, creative drama activities have positive effects on the development of communication skills (Arslan, Erbay & Saygın, 2010; Bayrakçı, 2007; Binici, 2013; Dere, 2019; Görgülü, 2009; Kahriman, 2014). There is no publication in the national literature examining the effects of drama on analytical thinking, innovative thinking, and entrepreneurship.

Recommendations
1. To enhance the transferability of the research, it is recommended to diversify the context by examining various application groups and educational levels with similar objectives.
2. Given the interdisciplinary nature of the research, it is suggested to expand the research structure by incorporating knowledge and skills from diverse disciplines such as Social Studies, Turkish, or Music to the practice.
3. In light of the research's implications for knowledge and skills across multiple fields, it is advisable to implement interdisciplinary case studies.
4. The research design can be adapted based on the specific aims and questions being addressed, thereby yielding a range of outcomes.
5. The research can be replicated by employing various research designs while adhering to the principles of qualitative research.
6. Given the interdisciplinary nature of the research, new research proposals focusing on diverse themes can be developed to assess the skills of specified grade levels.

Human Studies: All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

Data Availability: All the data are included in the content of the paper.

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A Study on Social Media Addiction

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Abstract

This study aimed to investigate the level of social media addiction among university students. The sample group comprised a total of 238 participants, 56.7% of whom are female and 43.3% of whom are male, enrolled at Istanbul University-Cerrahpasa Faculty of Sports Sciences. The data were collected using a personal information form and the 5-point Likert type "Social Media Addiction Scale" developed by Tutgun-Ünal and Deniz (2015), including 41 items and four sub-dimensions. Descriptive statistical methods, including percentage and frequency, were employed in the data analysis. The Kolmogorov-Smirnov test was carried out to check whether the data were normally distributed, suggesting a normal distribution. Independent sample t-test for bivariate data and one-way ANOVA test for more than two variables were also performed. The research findings indicated a significant difference between the "Occupation" sub-dimension based on the age of the participants, while no significant difference was observed between gender, grade level, and the level of daily social media use. In this context, social media addiction in young individuals varies according to the socio-demographic characteristics of the individual. As a result, social media addiction can be reduced by determining the demographic characteristics of young individuals.

Keywords: Internet, university students, social media, social media addiction

Introduction

Today, the Internet has become a valuable tool that enriches our daily lives. It has become an integral part of human life because it has revolutionized how we save time and obtain information. Individuals have become able to

perform tasks with minimal effort and cost through the Internet. It is evident that the Internet possesses numerous advantageous attributes for the whole society. However, aside from numerous positive attributes, it has highlighted a new addiction phenomenon (Çiftçi, 2018). Individuals increasingly communicate through virtual relationships in the digital world rather than face-to-face (Ayğar & Uzun, 2018).

According to the Turkish Language Association (2023), dependency means "being reliant on the will, power, and assistance of something else, therefore having no independence and excessively being dependent on something materially or spiritually. "Dependency refers to the state of being dependent/reliant."

Social media usage is on the rise. For instance, 68% and 73% of the adult population in the USA regularly use Facebook and YouTube applications, respectively (Sun & Zhang, 2021). Increased social media use causes individuals to remain up-to-date and connected to social media to follow their posts in their networks (Karadağ & Akçinar, 2019). Social media, which makes life easier in many ways, can lead to social media addiction when used excessively and unconsciously. Behaviors that compel a person to engage excessively in social media addiction can be considered addiction (Balcı & Baloğlu, 2018).

Social media can meet multiple needs of individuals, although the intentions to use social media vary. Social media is not utilized only to communicate with friends and family but also to seek solitude, be alone or to socialize, be approved, followed, or liked (Özgenel et al. 2019).

Social media addiction can be defined as the excessive use and preoccupation with social media sites, leading to reduced motivation to engage in social activities, deterioration of relationships, and harmful impacts on mental health (Demirci, 2019). Before the Internet and social media became widespread, the virtual transfer of needs such as communication, self-expression, and entertainment triggered addiction to social media and led individuals to withdraw from social life, and subsequently mental health problems (Çömlekçi & Başol, 2019). Excessive use social media can be considered a form of internet addiction. Individuals with social media addiction often display an excessive concern towards it and act with an uncontrollable urge to log in and use social media (Hou et al. 2019). Moreover, the widespread use of mobile devices and the ability to access social media tools anytime and anywhere have led to an increase in social media addiction. Considering the relevant findings on social media addiction in the literature, it becomes evident that adolescents are at a higher risk of developing addiction symptoms (Dalvi-Esfahani et al. 2019).

As a result of social media addiction, individuals exert enough effort and time that can adversely impact their mental health. They dwell excessively on

the amount of time they spend on social networks. The motivations they develop to use social media platforms lead to anxiety (Dağlı, 2022). It is believed that it may inhibit academic performance and socialization among university students. In this regard, this study aimed to address the following sub-problems:

- o Are there significant gender differences in social media addiction among university students?
- o Are there significant age-related differences in social media addiction among university students?
- o Are there significant differences in social media addiction among university students depending on their grade level?
- o Is there a significant difference in social media addiction among university students based on the daily frequency of social media use?

Methods

This study aimed to investigate the social media addiction levels among university students. The sample was selected using the purposive sampling method, one of the non-random sampling methods. The purposive sampling method allows in-depth research by selecting informative scenarios based on the research purpose (Başaran, 2017). Individuals studying at university are people who actively spend their free time in social life. Students who are interested in any branch are expected to have a low level of dependence on technological devices. Accordingly, it is aimed to select individuals studying at the faculty of sports sciences and to determine whether social media addiction varies according to variables.

The study population comprised the Faculty of Sports Sciences students, and the sample involved 238 voluntary participants, of whom 56.7% are female and 43.3% are male, studying at Istanbul University-Cerrahpasa Faculty of Sports Sciences.

Data Collection Tools

The data were collected using a personal information form and the "Social Media Addiction Scale."

Personal Information Form

In the first part of the study, a personal information form was employed to ascertain the gender, age, grade level, and frequency of daily social media use of the participants.

Social Media Addiction Scale

In the second part of the study, the "Social Media Addiction Scale" developed by Tutgun-Ünal and Deniz (2015) was employed to determine the

social media addiction levels among the participants. The 5-point Likert-type instrument has 41 items and four sub-dimensions: "1- Occupation", "2- Mood Modification", "3- Relapse" and "4- Conflict". The internal reliability coefficients of the sub-dimensions are as follows: Occupation (.91), Mood Modification (.89), Relapse (.88), and Conflict (.91).

Data Analysis

The data were analyzed using the SPSS 25 software package. Descriptive statistical methods, including frequency and percentage, were employed to summarize the personal information. Kolmogorov-Smirnov test was performed to assess the normality of the data distribution, which revealed a normal distribution ($p>0.05$). Subsequently, the independent sample t-test was applied for analyzing bivariate data and the One-way ANOVA for the data involving more than two variables.

Results

Table 1. Participants' demographic characteristics

Variable		n	%
Gender	Female	135	56.7
	Male	103	43.3
Age	18-20 years old	73	30.7
	21-23 years old	94	39.5
	24 years and over	71	29.8
Grade Level	1st grade	64	26.9
	2nd grade	46	19.3
	3rd grade	57	23.9
	4th grade	71	29.8
Daily Social Media Use	1-2 hours	54	22.7
	3-4 hours	83	34.9
	5-6 hours	49	20.6
	7 hours and over	52	21.8
Total		**238**	**100**

Table 1 shows the distribution of participants based on their demographic characteristics. Accordingly, 56.7% of the participants are "female," 39.5% fall in the "21-23 age" category, 29.8% are "4th graders", and 34.9% report a social media usage frequency of "3-4 hours".\

Table 2. Social media addiction levels based on gender

Sub-dimension	Gender	N	Avg.	Sd	T	p
Occupation	Female	135	2.79	.86	.420	.408
	Male	103	2.74	.91		
Mood Modification	Female	135	2.69	.99	1.164	.169
	Male	103	2.53	1.07		
	Female	135	2.08	.96	.519	.464

Relapse	Male	103	2.02	.93		
	Female	135	1.79	.72	-.179	.773
Conflict	Male	103	1.80	.70		

As seen in Table 2, an independent sample t-test was conducted to assess whether there was a statistically significant difference between the social media addiction levels based on their gender. The analysis revealed no statistically significant difference between gender and social media addiction scale sub-dimensions ($p>0.05$).

Table 3. Social media addiction levels based on age

Sub-dimensions	Age	N	Avg.	Sd	F	p
Occupation	18-20 years old	73	2.98	.89	5.398	**.005**
	21-23 years old	94	2.79	.84		
	24 years and over	71	2.51	.86		
Mood Modification	18-20 years old	73	2.69	1.02	1.220	.297
	21-23 years old	94	2.69	.99		
	24 years and over	71	2.46	1.08		
Relapse	18-20 years old	73	2.24	1.08	2.525	.082
	21-23 years old	94	2.02	.82		
	24 years and over	71	1.90	.93		
Conflict	18-20 years old	73	1.80	.65	.878	.417
	21-23 years old	94	1.85	.76		
	24 years and over	71	1.71	.69		

In Table 3, a one-way ANOVA test was performed to check whether there was a statistically significant difference between participants' social media addiction levels based on their ages. The results indicated a statistically significant difference between age and "occupation" sub-dimension ($f= 5.398$; $p<0.05$).

Table 4. Social media addiction levels based on grade level

Sub-Dimension	Grade	N	Avg.	Sd	F	p
Occupation	1st grade	64	2.80	.93	.072	.975
	2nd grade	46	2.80	.92		
	3rd grade	57	2.75	.86		
	4th grade	71	2.74	.83		
Mood Modification	1st grade	64	2.60	1.05	.070	.976
	2nd grade	46	2.67	1.13		
	3rd grade	57	2.58	1.01		
	4th grade	71	2.63	.98		

Relapse	1st grade	64	2.10	1.04	1.095	.352
	2nd grade	46	2.24	1.19		
	3rd grade	57	1.95	.77		
	4th grade	71	1.96	.79		
Conflict	1st grade	64	1.80	.66	.065	.978
	2nd grade	46	1.77	.87		
	3rd grade	57	1.82	.68		
	4th grade	71	1.77	.66		

In Table 4, a one-way ANOVA test was performed to assess whether there is a statistically significant difference between participants' social media addiction levels based on their grade levels. The analysis revealed no statistically significant difference between participants' grade levels and the social media addiction scale's sub-dimensions ($p>0.05$).

Table 5. Social media addiction levels based on daily social media use

Sub-Dimension	Daily SM Use	N	Avg.	Sd	F	p
Occupation	1-2 hours	54	2.74	.85	.150	.929
	3-4 hours	83	2.81	.88		
	5-6 hours	49	2.72	.83		
	7 hours and over	52	2.78	.97		
Mood modification	1-2 hours	54	2.50	1.05	.595	.619
	3-4 hours	83	2.59	1.01		
	5-6 hours	49	2.75	1.03		
	7 hours and over	52	2.68	1.06		
Relapse	1-2 hours	54	2.10	.99	.268	.849
	3-4 hours	83	2.09	1.03		
	5-6 hours	49	2.04	.84		
	7 hours and over	52	1.96	.86		
Conflict	1-2 hours	54	1.76	.66	1.696	.169
	3-4 hours	83	1.68	.62		
	5-6 hours	49	1.96	.80		
	7 hours and over	52	1.84	.77		

SM: Social media

Table 5 shows the result of a one-way ANOVA test conducted to determine whether there is a statistically significant difference between participants' social media addiction levels based on their daily social media use. Accordingly, there was no statistically significant difference between the frequency of daily social media use and the social media addiction scale's sub-dimensions ($p>0.05$).

Discussion

In this study, which examined social media addiction levels among university students, participants' social media addiction levels varied based on socio-demographic characteristics.

Social media is an online platform where people interact and share data and content using internet communication channels. Social media applications can manifest as forums, networks, wikis, and web applications (Aksoy, 2018). Spending excessive time on social media applications indicates a case of social media addiction. Besides, experiencing discomfort or a sense of incompleteness if social media is not accessed could also indicate social media addiction.

The concept of social media addiction is characterized by spending more time than usual on social media platforms. This definition also refers to experiencing discomfort or incompleteness when not using social media (İliş & Gülbahçe, 2019).

According to the analysis results in Table 2, there was a statistically significant difference between participants' social media addiction levels based on their gender (p>0.05). In the literature, Çiftçi (2018) observed a significant difference in the "Relapse" and "Conflict" sub-dimensions among university students based on gender. In a similar study by Deniz and Gürültü (2018) investigating the social media addiction levels among high school students, a significant difference was observed in the "Occupation" sub-dimension. In a study by Yayman (2019) on social media addiction in adolescents, social media addiction varied based on gender. However, Aktan (2018) investigated social media addiction among university students and found no significant difference between social media addiction levels and gender. Our results reveal both similarities and differences when compared to previous research findings in the relevant literature.

According to Table 3, the one-way ANOVA test showed a significant difference between age and "Occupation" sub-dimension in the social media addiction levels (p<0.05). The scores of the participants aged 18-20 were higher than those in the other age group. In a study conducted by Özdemir (2019) in which the social media addiction levels were examined among university students, a statistically significant difference was found between age and "Mood modification" and "Conflict" sub-dimensions. Conversely, Doğan (2021) observed no significant difference between age and social media addiction levels among university students. Similarly, Özgür Güler et al. (2019) found no significant difference between social media addiction levels and age among university students. As understood, our findings share similarities and differences with the findings in the literature.

According to the analysis results presented in Table 4, there was no significant difference between grade level and social media addiction levels

among university students (p>0.05). In a similar study, Çiftçi (2018) observed significant differences between social media addiction and grade level in the "Occupation," "Relapse," and "Conflict" sub-dimensions, while Özdemir (2019) found no significant difference between the grade variable and the social media addiction scale's sub-dimensions. In their study on social media addiction among university students, Demircan et al. (2022) found no significant correlation between grade level and social media addiction. In the literature, we see both similar and different results in this regard.

Table 5 presents no significant difference between the social media addiction levels among participants based on their daily social media use. In a study by Bilgilier (2018) on social media use and addiction levels, a statistically significant difference was observed between daily social media use and social media addiction levels. Similarly, Bozkurt and Bozkurt (2022) found a significant difference between the time spent on daily social media and social media addiction. Ekşi et al. (2019) also measured a significant correlation between social media addiction and daily social media use. In a study by Akbaş Coşar and Gedik (2021), a significant difference was found between social media addiction and daily social media usage frequency. The previous findings in the literature differ from our research findings.

When the research results were examined, a significant difference was found in social media addiction according to age. Age is important in studies conducted on university students. It is thought that social media use decreases as age increases. Social media addiction is especially higher among young individuals. Özdemir (2019), stating that the use of the internet will be more among young people, stated that it also affects the increase in social media addiction in parallel.

Social media is a useful area nowadays. However, social media addiction also increases technology addiction. By reducing social media addiction, young individuals can also enable them to do activities that will improve them physically and socially in their free time. However, doing physical activity allows the individual to have a healthier body. If the situation of young individuals with social media addiction is evaluated and studies are increased, we can support individuals to be healthier.

When evaluating the research findings, a significant difference was found between the age variable and the "Occupation" sub-dimension of the social media addiction scale. However, no significant difference was found between the social media addiction levels based on gender, grade level, and daily social media use.

Conclusion

This study was conducted on students enrolled in the Faculty of Sport Sciences at a university in Istanbul. Future studies can focus on students from

different provinces or departments. Social media addiction is associated with communication skills, loneliness, and leisure activities. Future studies can explore the interrelations among those concepts. The sample group can be enlarged, and qualitative research methods can support the study.

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Teachers' Job Satisfaction and Perceptions of Online Courses during Covid-19: A Comparative Study among Israel, Jordan and Lebanon

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Abstract
        This paper is a comparative study of teacher job satisfaction in Israel, Jordan, and Lebanon. This study will examine the extent to which demography, teacher satisfaction in online classes, and teacher-student interaction, affect their job satisfaction. The study will also examine the challenges that confront teachers in the process of online learning during the Covid-19pandemic. The study adopted a quantitative approach. To achieve the objectives of this study, the author utilized responses from 431 teachers working across Israel, Jordan, and Lebanon. The study revealed that the perception of teachers and teacher-student interaction in online classes influenced the job satisfaction of teachers. The findings revealed that teacher job satisfaction in (Israel) and (Jordan and Lebanon) were independent of demographic attributes. The online classes also came along with their challenges such as, attitude of students toward learning via online classes, to technical problems affecting the speed and pace of learning in online classes which all the countries' teachers ranked high.

Keywords: Job satisfaction, Teachers, Students, Interaction, Challenges, COVID -19

Introduction
        In the recent times of Covid-19, the educational world has witnessed the digital transformation of knowledge which has enhanced both conventional and distance learning. Virtual learning uses a web-based technology that has been used to make learning enjoyable and accessible to a lot of people distantly, it also makes available a variety of tools to enhance learning. Easy accessibility, flexibility, profitability, and reduction of cost are

among the magnificent benefits provided by the e-learning process. One can access the teaching from anywhere and at flexible times. The requirement of physical attendance is not necessary. The infinite resources and unlimited topics are accessible even   across borders. The updated information and new concepts are easily brought to knowledge (Alsulimani & Kaabi, 2018; Sokal et al., 2021).

E-learning or distance learning is often considered to be a lonely concept of learning, where no physical attendance is essential. Thus, interaction with the teachers is lacking (Kulikowski, Przytuła & Sułkowski, 2021). Moreover, some teachers and students also feel uncomfortable interacting virtually. However, unfamiliarity with a computer makes teachers and students anxious, oftentimes. To be good at e-learning or virtual learning, one must have a good command of virtual programs and a real passion for learning. Teachers, on the other hand, should provide an interesting way for the students to keep engaged in online classes. Commitment and experience are the two crucial aspects of online education (Goh et al., 2020; Sokal, et. al., 2020).

However, teachers also found it difficult to keep students engaged in online classes of one hour or so to see if everyone is present or not, or whether they are interested in the topic, or are responding to the topic being taught. Some may have difficulty accessing the internet. Checking the papers online is also one of the difficulties faced by teachers (Chowdhury et al., 2020).

Online learning has its advantages and disadvantages. It is more versatile than the traditional method of learning. It is much easier for students; they do not need to visit the teachers for interaction, as it can be done online. The online process nevertheless, has inconveniences. It is difficult for students to understand the resources available for the research. Besides, during the learning process, the teachers have no chance to control the student's behavior (Sokal et al., 2020a).

The paper aims to investigate the teachers' job satisfaction during the Covid-19 period, the challenges encountered, and factors that influenced the learning process. And to compare Israeli, Jordanian, and Lebanese teachers.

Objectives of the study

To study the degree of job satisfaction among Israeli, Jordanian, and Lebanese teachers during the Covid-19 pandemic; and compare between them. To study the differences in job satisfaction among Israeli, Jordanian, and Lebanese teachers based on demographic features such as gender and years of experience during the Covid-19 pandemic.

To study the challenges that teachers confront (in the process of online learning) during the Covid-19 pandemic.

Literature Review

In the literature, the concept of online learning was first used to refer to learning patterns that make use of computer-based internet technology (Kuntarto, 2017). The advancement of online or virtual learning will be of great benefit to students as they consider ways to utilize self-regulation strategies (Delen & Liew, 2016). Several pieces of research have been carried out on online learning, and most of these studies concluded that it is an effective learning medium and should be applied to teaching (Wei & Chou, 2020).

Though technology indeed plays a dominant role in making processes easier and more effective, it has its limitations where the issue of internet use as a learning platform by students and teachers is concerned. As Purwanto et al. (2020) stated, the impact of the pandemic is deeply felt by students, parents, and teachers. The challenges posed by having been forced to shift to online learning and teaching almost overnight are associated with attendance and participation in online learning sessions using this platform. Physical classroom settings can provide prompt feedback to teachers and students about the importance and quality of the lesson, the delivery, and the experience. This critical element in education is absent in the online world (Purwanto et al., 2020).

Teachers and students are partners in the learning environment, and the perspective of the former is equally as important as the latter. If teachers, as providers of education, are discontented and find the online mode unsatisfactory, then the educational base itself becomes weaker. The enforced rapid introduction of online classes has been challenging for teachers (as well as students), many of whom are struggling to adjust to this method of teaching. Mai and Masha (2020) assert that the transition from the conventional mode of education to the online platform has resulted in significant challenges for the role of teachers in providing educational services. The comfort of teachers with online class structure, relationship with students, the course content, technical support, and overall experience with online class delivery not only influence the general teaching and learning experience but also is a determinant of the outcome of the online method of learning (Sokal et al., 2020b; Karalar,H., Sidekli, S., 2021).

Despite its many challenges, online learning will continue to be implemented during the present Covid-19 era and there is no reason to expect that once the pandemic is over, the implementation will cease and the challenges will disappear. To enhance the benefits and limit present and future problems, it is important to examine in detail how online learning is being executed .

The advent of the Covid-19 pandemic forced educators around the world to move to the use of a distance teaching strategy within a matter of a

few days. This situation has also caused and exposed a significant gap in teachers' preparation and training to meet emergency distance teaching, as well as the attendant provision of technology services critical for ensuring that the learning exercise continues as seamlessly as possible for students locked in their homes. Many teachers have stated that they would not have opted for online learning if the pandemic has not occurred. The teacher considers it a daunting task to engage in online classes because of lockdown restrictions, which may mean that their families are at home, and when their homes are small, finding a quiet place in which to teach becomes a major challenge. If the teacher has small kids who need attention, it becomes an even more difficult task for them to fulfill (Trusrt et al., 2020).

Early evidence has demonstrated that the pandemic has worsened the quality of education (Bacher-Hicks et al., 2020; Chetty et al., 2020; Kuhfeld et al., 2020). Teachers and other educational instructors are being challenged with work overload (Hodges et al., 2020), which has a negative impact on their teaching and results in their having a reduced sense of self-efficacy. It has also been found that similar factors that determine satisfaction and performance during in-person education seem to apply online, such as perceived relevance, self-efficacy, and the quantity and quality of content, systems, and student–instructor interactions (Mayer, 2019; Noetel et al., 2018).

Apart from this, the pandemic has also caused serious transformation for schools and practicing teachers. To contain these issues, schools must provide the needed support that educators require to succeed in the current status quo. Teachers mustn't work alone. Efforts to ensure that temporary and lasting change in schools must address the organizational conditions that make it possible for teachers to work and ensure that students' learning is made possible (Gross & Opalka, 2020).

One challenge for teachers in distance teaching is they cannot give the same feeling of community as the physical class can offer, though online classes are more social in which students communicate effectively. Teachers are having to learn how to reach their students who are on the other end of a distant internet link (Sobko, Unadkat, Adams & Hull, 2020).

Sometimes students leave the online session without any tangible reason. Other times students lack of interest in an online session. In parallel to the challenges of day-to-day teaching through the various platforms available (webinars, Zoom, etc.), giving and taking exams is posing additional hurdles. Cheating online during exams sessions is easier online, (Hilmi and Hamzah 2020).

When teachers and their students are situated in the same classroom, learning and teaching activities are carried out in a building where usually the process' supporting facilities were also located. Learning through e-learning is very different. Teachers and students are not meeting face-to-face directly;

rather, they utilize a variety of electronic devices to establish communication in different places. For some people, the change from studying in a classroom to distance learning is not easy (Nambiar, 2020).

Today, not only teachers but super teachers are needed for education. A super teacher has a unique idea of teaching and is reliable for the students. One who can help students with their problem solving, but yet balances their own life when opposing demands collide. Only a super teacher can solve problems and provide the right guidance to their students. Successful teacher does not only impart knowledge to their learner. He or she nurtures their students, helping to build a better society through its younger generation and guiding it in the right direction (Fauzi et al., 2020).

Job Satisfaction

According to MBA school team, job satisfaction is the degree to which an employee feels self-motivated, satisfied and pleased with their present employment. This occurs when an employee has a sense of job security, with a clear career growth and a balanced and comfortable work life. As noted by Harper Collins, the term job satisfaction is the extent to which an employee feels pleasure from carrying out task associated to his/ her job. Simon (2015) stressed that, the level of job satisfaction (1-5) is necessary for the growth in the educational sector all over the world. Kapoor (2018) argues that the job satisfaction of employees is determined by the presence of pleasure related to their job and the absence of related dissatisfactions.

Research Methodology
Research Instrument

A quantitative research approach was used for this study (Nambiar, 2020) to achieve the set objectives. A survey was carried out for the collection of data. The survey consists of 4 demographic questions and 26 questions, and 4 items were adopted from the (Pepe, 2011) questionnaire "Measuring Teacher Job Satisfaction.

The questionnaire is in two parts: Demographic data {Gender, Experience, Academic qualification, School type, Country} and main study {Teacher's perception of online classes; teachers-students interaction in online classes; challenges in online classes; teachers' satisfaction in online classes}.

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Study sample:

       The sample of the study contains 431 teachers from Israel, Lebanon and Jordan, it was selected randomly according to the distribution in table 1

Table 1. Demographic attributes of the study sample

Item	Level	Israel		Jordan		Lebanon	
		Frequency	**%**	**Frequency**	**%**	**Frequency**	**%**
Gender	Male	31	23.3%	47	31.3%	68	45.9%
	Female	102	76.7%	103	68.7%	80	54.1%
Experience	1-15 y	54	40.6%	95	63.3%	76	51.4%
	more than 15 y	79	59.4%	55	36.7%	72	48.6%
Academic qualification	BA	38	28.6%	116	77.3%	104	70.3%
	MA	95	71.4%	34	22.7%	44	29.7%
School type	Elementary school (1-6 classes)	92	69.2%	50	33.3%	54	36.5%
	High school (7-12) classes	41	30.8%	100	66.7%	94	63.5%
Total		**133**		**150**		**148**	

       Table (1) shows the distribution of the demographic sample of the 3 countries, Israel 133 teachers, males (23.3%), females (76.7%), years of experience 1-15 years (40.6%), more than 15 years, (59.4%), Academic qualification, B.A. (28.6%), M.A, (71.4%), Type of school, Elementary school, (69.2%), High school, (30.8%). Jordan 150 teachers, males (31.3%), females (68.7%), years of experience 1-15 years (63.3%), more than 15 years, (36.7%), Academic qualification, B.A. (77.3%), M.A, (22.7%), Type of school, Elementary school, (33.3%), High school (66,7%), Lebanon 148 teachers, males (45.9%), females (54.1%), years of experience 1-15 years (51.4%), more than 15 years, (48.6%), Academic qualification, B.A. (70.3%), M.A, (29.7%), Type of school, Elementary school, (36.5%), High school (63.5%).

Validity and Reliability of the Research Instruments
Table 2. Reliability of the study domains

The domain	Cronbach's Alpha
Teachers' perception of online classes	0.89
Teachers' students' interaction in online classes	0.88
Challenges in online classes	0.89
Teachers' satisfaction in online classes	0.81
All items	0.91

Table (2) shows the Cronbach alpha for the study domains (0.81-89) and all domains (.91).

Result and Analysis
The data collected were analyzed statistically, the result presented in tables and the discussion as it relates to "teacher job satisfaction"

Table 3. Means and Standard deviations for the study domains for Israeli teachers (n=133)

Rank	No.	Domains	Mean	Std. Deviation	Degree of Agreement
3	3	Challenges in online classes	3.56	.572	High
2	2	Teachers' students' interaction in online classes	3.49	.741	High
1	1	Teachers' perception of online classes	3.25	.499	Moderate
4	4	Teachers' satisfaction in online classes	2.98	.577	Moderate
All items			3.32	.384	Moderate

Table (3): shows that the means of job satisfaction dimension among teachers in Israel are ranged from (2.98) to (3.56) This value means that the teachers judge their job satisfaction with moderate level. Challenges in online classes dimension got the highest mean value of (3.56), And the lowest mean was for Teachers' satisfaction in online classes with mean value (2.98) which is considered as moderate level also we observed that the overall job satisfaction mean (of the Israel) is (3.32) which is moderate.

Table 4. Means and Standard deviations for the study domains for Jordanian teachers (n=150)

Rank	No.	Domains	Mean	Std. Deviation	Degree of Agreement
1	3	Challenges in online classes	3.69	.710	High
2	2	Teachers' students' interaction in online classes	3.61	1.044	High
3	4	Teachers' satisfaction in online classes	3.22	.728	Moderate
4	1	Teachers' perception of online classes	3.05	.670	Moderate
All items			3.39	.567	Moderate

Table (4): shows the teachers response on the level of job satisfaction was moderate (3.39), This value means that the teachers judge their involvement in this dimension at the moderate level, in which the highest mean for the item (Challenges in online classes) with mean value (3.69), and at the lowest mean the item (Teacher's perception of online classes) with mean value (3.05). This value is being judge as moderate.

Table 5. Means and Standard Deviations for the Study Domains for Lebanese Teachers (n=148)

Rank	No.	Domains	Mean	Std. Deviation	Degree of Agreement
1	4	Teachers' satisfaction in online classes	2.91	.558	Moderate
2	3	Challenges in online classes	2.82	.541	Moderate
3	1	Teachers' perception of online classes	2.65	.457	Moderate
4	2	Teachers' students' interaction in online classes	2.54	.752	Low
All items			2.73	.394	Moderate

Presented in **Table (5)** is the response of the Lebanese teachers on the level of teacher job satisfaction, which is moderate (2.73). This value means that the teachers judge their (Teachers' satisfaction in online classes) with mean value (2.91), and at the lowest mean the item (Teachers' students' interaction in online classes) with mean value (2.54). This value is being judge as moderate. The overall Mean job satisfaction of the Arabs (Jordan and Lebanon) was 3.06.

Table 6. Multivariate Analysis for Teachers' Satisfaction in Online Classes due to Study Variables

Source	Dependent Variable	ISRAEL					JORDAN					LEBANON				
		Type III Sum of Squares	df	Mean Square	F	Sig.	Type III Sum of Squares	df	Mean Square	F	Sig.	Type III Sum of Squares	df	Mean Square	F	Sig.
f Gender	Teachers' perception of online classes	.488	1	.488	1.963	.164	.022	1	.022	.051	.822	.040	1	.040	.207	.650
	Teachers' students' interaction in online classes	.933	1	.933	1.672	.198	.102	1	.102	.100	.753	.822	1	.822	1.494	.224
	Challenges in online classes	.599	1	.599	1.824	.179	.184	1	.184	.366	.546	.359	1	.359	1.235	.268
	Teachers' satisfaction in online classes	.003	1	.003	.009	.925	.000	1	.000	.000	.983	.195	1	.195	.616	.434
	All items	.388	1	.388	2.629	.107	.004	1	.004	.012	.914	.191	1	.191	1.269	.262
Exp.	Teachers' perception of online classes	.051	1	.051	.204	.652	1.689	1	1.689	3.807	.053	.726	1	.726	3.715	.056
	Teachers' students' interaction in online classes	.000	1	.000	.001	.979	.807	1	.807	.793	.375	.137	1	.137	.249	.619
	Challenges in online classes	.510	1	.510	1.554	.215	.857	1	.857	1.705	.194	.054	1	.054	.186	.667
	Teachers' satisfaction in online classes	1.196	1	1.196	3.630	.059	3.930	1	3.930	7.919	.006	.016	1	.016	.050	.823
	All items	.021	1	.021	.145	.704	.685	1	.685	2.120	.148	.044	1	.044	.294	.588

acad	Teachers' perception of online classes	.314	1	.314	1.264	.263	1.036	1	1.036	2.335	.129	.140	1	.140	.716	.399
	Teachers' students' interaction in online classes	.001	1	.001	.001	.975	.789	1	.789	.775	.380	2.671	1	2.671	4.857	.029
	Challenges in online classes	.033	1	.033	.102	.750	1.000	1	1.000	1.990	.161	.942	1	.942	3.239	.074
	Teachers' satisfaction in online classes	.073	1	.073	.221	.639	.096	1	.096	.193	.661	.231	1	.231	.728	.395
	All items	.013	1	.013	.086	.770	.087	1	.087	.270	.604	.748	1	.748	4.981	.027
School	Teachers' perception of online classes	.008	1	.008	.033	.855	.008	1	.008	.019	.892	1.887	1	1.887	9.654	.002
	Teachers' students' interaction in online classes	.200	1	.200	.358	.550	11.958	1	11.958	11.749	.001	.305	1	.305	.554	.458
	Challenges in online classes	.465	1	.465	1.416	.236	.326	1	.326	.649	.422	.085	1	.085	.291	.590
	Teachers' satisfaction in online classes	.148	1	.148	.449	.504	1.527	1	1.527	3.078	.081	.006	1	.006	.020	.887
	All items	.044	1	.044	.296	.588	.520	1	.520	1.609	.207	.285	1	.285	1.901	.170
Error	Teachers' perception of online classes	31.842	128	.249			64.317	145	.444			27.958	143	.196		
	Teachers' students' interaction in online classes	71.387	128	.558			147.586	145	1.018			78.647	143	.550		

	Challenges in online classes	42.049	128	.329			72.881	145	.503			41.595	143	.291		
	Teachers' satisfaction in online classes	42.179	128	.330			71.960	145	.496			45.285	143	.317		
	All items	18.911	128	.148			46.832	145	.323			21.472	143	.150		
Total	Teachers' perception of online classes	1439.250	133				1462.344	150				1070.953	148			
	Teachers' students' interaction in online classes	1688.400	133				2112.240	150				1039.480	148			
	Challenges in online classes	1731.609	133				2112.859	150				1215.891	148			
	Teachers' satisfaction in online classes	1226.520	133				1630.400	150				1298.520	148			
	All items	1485.960	133				1771.075	150				1125.389	148			

The Table 6 gives insight into how different variables are associated with teachers' satisfaction in online classes across the three countries - Israel, Jordan and Lebanon. From the result presented in Table 6, the teachers' gender has no statistically significant impact on their perception of online classes.

Israel

The presented multivariate analysis table 6 reveals that the p-values associated with each independent variable are all greater than 0.05. This indicates that the observed differences in 'teachers' perception of online classes' attributed to each variable, including gender, experience, academic qualification, and school type are not statistically significant at the significance level of 0.05. In other words, the differences in the dependent variables (teachers' perception of online classes)' scores between different levels or groups of these variables could plausibly be due to random variation rather than actual effects. Also, a similar observation was made in the other dependent variables (teacher-students' interaction in online classes, challenges in online classes, and teachers' satisfaction in online classes) attributable to each of the dependent variables; as they were statistically insignificant (p >0.05).

Jordan

With respect to Jordan, the presented multivariate analysis reveals that the p-values associated with the independent variable – gender and academic qualification, are all greater than 0.05. This indicates that the observed differences in the dependent variables (teachers' perception of online classes, teacher-students' interaction in online classes, challenges in online classes, and teachers' satisfaction in online classes) attributable to each variable, including gender and academic qualification are not statistically significant at the significance level of 0.05.

Additionally, the observed differences in 'teachers' perception of online classes. (p = 0. 053), teacher-students' interaction in online classes (p = 0.375) and challenges in online classes (p = 0.194) attributed to teachers' experience are not statistically significant (p > 0.05). However, it was indicated that the observed difference in teachers' satisfaction in online classes (p = 0.006)' attributed to experience is statistically significant (p < 0.05). Furthermore, the observed differences in 'teachers' perception of online classes (p = 0. 892), challenges in online classes (p = 0.422), and teachers' satisfaction in online classes (p = 0.081) attributed to school type are not statistically significant (p > 0.05). However, it was indicated that the observed difference in teacher-students' interaction in online classes (p = 0.001) attributed to school type is statistically significant (p < 0.05).

Lebanon

With regards to Lebanon, the presented multivariate analysis reveals that the p-values associated with the independent variable – gender and experience, are all greater than 0.05. This indicates that the observed differences in the dependent variables (teachers' perception of online classes, teacher-students' interaction in online classes, challenges in online classes, and teachers' satisfaction in online classes) attributable to each variable, including gender and experience are not statistically significant at the significance level of 0.05.

Furthermore, the observed differences in 'teachers' perception of online classes (p = 0. 588), challenges in online classes (p = 0.074), and teachers' satisfaction in online classes (p = 0.395) attributed to academic performance are not statistically significant (p > 0.05). However, it was indicated that the observed difference in teacher-students' interaction in online classes (p = 0.029) attributed to academic performance is statistically significant (p < 0.05).

The observed difference in 'teachers' perception of online classes (p = 0.002)' attributed to school type is statistically significant (p < 0.05). Conversely, the observed differences in teachers' satisfaction in online classes. (p = 0. 887), teacher-students' interaction in online classes (p = 0.458) and challenges in online classes (p = 0.490) attributed to school type are not statistically significant (p > 0.05).

Comparison between Israel, Jordan and Lebanon

Multivariate analysis across the three countries shows non-significant gender-related differences in teachers' online class perceptions, their interactions with students, challenges, and satisfaction, as p-values for gender exceed 0.05. In Jordan, the observed differences in teachers' satisfaction in online classes (p = 0.006), attributed to experience are statistically significant (p < 0.05). Whereas in Israel (p = 0.059) and Lebanon (p = 0.823), the observed difference in teachers' satisfaction in online classes attributed to experience is not statistically significant (p > 0.05). The observed differences in teachers-students interaction in online classes (p = 0.029), attributed to academic qualification are statistically significant (p < 0.05) in Lebanon. Contrary to the observed difference in Lebanon, the result from Israel (p = 0.975) and Jordan (p = 0.380) indicated that the observed difference in teachers' satisfaction in online classes attributed to experience is not statistically significant (p > 0.05). Statistically significant differences were observed in teachers' perception of online classes (p = 0.002) and teacher-students interaction in online classes (p = 0.001) both of which were attributed to school type, in Lebanon and Jordan respectively. However, no significant differences were observed in Israel

Discussion

The study aimed to ascertain the degree of job satisfaction among Israeli, Jordanian, and Lebanese teachers during the COVID-19 pandemic and compare the. The findings show a higher job satisfaction among teachers in Jordan (3.39), this was followed by teachers in Israel (3.32) and then teachers in Lebanon (2.73). Although Israeli teachers generally expressed higher levels of job satisfaction than their Arabic colleagues, the differences were not statistically significant. It may be that although the educated Arab male teachers, who make up about 39% of the Jordanian, and Lebanese teachers in the survey, went unexcitedly into education, they established another basis of job satisfaction in their place of work (Bogler, 2005). The result revealed that Israeli, Jordanian, and Lebanese encounter challenges in online classes (Izhar, Na & Na, 2021; González-Sanmamed, Sangrà, & Muñoz-Carril, 2017). A high level of teacher-student interaction in online classes was observed. All three countries – Israel, Jordan, and Lebanon showed a moderate degree of job satisfaction among teachers alongside teachers' perception of online classes. According to Bogler (2005:29), "The male Arab teachers' satisfaction may, therefore, stem from maintaining relationships with colleagues and from the interaction with students, even in a seemingly frustrating situation or one that was frustrating a priori. It should be noted that all the teachers (3 countries), viewed internal conditions of work as most contributing to satisfaction and viewed the physical conditions of work as least contributing to satisfaction. **"**

Teachers' perception of online classes
Israel

In Israel, the study revealed high-quality relationships between teachers, coupled with a high degree to which teachers are encouraged and supported by co-workers in their workplace; it was highly acknowledged that poor computer skills make it difficult for teachers to effectively use the online teaching platform. Hence, there is a need for efficient integration of technology into education and possibly information technologists could work in partnership with teachers to enhance their use of computers (Shi & Bichelmeyer, 2007). Other variables such as a decrease in job satisfaction when taking online classes, the degree to which students act in a disciplined manner that is good and satisfactory, the degree of support provided by parents to the school and its programs are good and satisfactory, online classes are more convenient and comfortable than face to face classes and, online classes are more effective than face to face classes were all moderately agreed on.

Jordan

In Jordan, the case was almost similar to that of Israel. The teachers judge their involvement in this dimension at the moderate level, in which they

reported having high-quality relationships with their co-workers; this was coupled with the high degree to which co-workers encourage and support one another. It was highly acknowledged that poor computer skills make it difficult for teachers to effectively use the online teaching platform. Teachers reported a satisfactory level of discipline among students, as well as the support provided by the parents of students. As reported by the teachers, online classes were neither as convenient nor effective when compared to traditional face-to-face classes. This was relatable to the study carried out by Rahayu and Wirza (2020) who reported that teaching online is neither more comfortable nor more convenient. Contrary to the report from the teachers, the author thinks that the reverse is the case in terms of convenience as students learn at their own pace at any time anywhere. Teaching online may not be convenient but certainly not learning online, as it saves a lot of time, and learning can be done anytime and anywhere. Moreover, online classes may not be as effective as conventional classes, as their no physical interaction between teachers and students, and in most cases, online students are more likely to withdraw from school than a physical student (Garratt-Reed, Roberts & Heritage, 2016; Francis, Wormington & Hulleman, 2019).

Lebanon

Though teachers reported poor job satisfaction when taking online classes, they acknowledged that they had very good relationships with their colleagues. Notwithstanding the level of job satisfaction, one factor that generally boosts the morale of teachers is a quality relationship with their co-workers (Tabancali, 2016). This is coupled with the willingness on the part of students to learn alongside the support of their parents to schools and their programs. This is in agreement with Buckman and Pittman (2021) whose findings provide evidence of student discipline's impact on teachers' overall job satisfaction. The teachers (just like those in Jordan) thought that online classes are not as convenient and comfortable as a conventional (face-to-face) class. The teachers generally had a moderate perception of online classes.

Teacher-student interaction in online classes

The relationship between teachers and students (that is, their interaction) was high (in Israel and Jordan) which in turn, is a good factor that favors teacher job satisfaction. This is consistent with O'Shea (2021:290) who reported that "teacher-student relations presented the largest effect on teacher job satisfaction". A lack of teacher-student interaction as well as teacher guidance could cause dissatisfaction among students (Zhu, 2012). This is so, as a healthy teacher-student relationship would enhance students' learning and performance (Bevilacqua et al., 2019)

This was generally seen in the ability of students to learn from anywhere, anytime, and at their own pace; safety and secure way to learning; the degree of poor communication between the teacher and students in online classes is less than the face-to-face classes, as teachers focus on their strength; though it is difficult to get students involved in the online classes, in other words, they could be easily distracted, as online learning requires self-discipline on the part of the students. There is an interaction between the teacher and the student in online classes, especially during group lessons. However, on evaluation of online classes, in terms of interaction with their professors, students reported they had fewer opportunities (Bowers & Kumar, 2015).

However, in Lebanon, teacher-students interaction was reportedly low. This was due to the low degree of communication between teachers and students in the online class and; difficulty in getting students involved in the online classes.

Challenges that confront teachers in online classes

Teachers in all three countries reported challenges in online classes. These challenges ranged from the attitude of students toward learning via online classes, to technical problems affecting the speed and pace of learning in online classes (Habibu, Abdullah-Al-mamuun & Clement, 2012; Venkataram, 2020). This could also be a result of. The obviously high challenges include: a lack of seriousness among students; making excuses for absenteeism; lack of interest on the part of students; the need for employment of innovative methods of teaching; difficulty in controlling the interaction between groups during the online classes.

Teachers' satisfaction with online classes

In the three countries – Israel, Jordan, and Lebanon, teachers judge their satisfaction in online classes at a moderate level; in which teachers reported (moderately) that teaching online has increased their self-confidence, and at the same time it reduces teacher anxiety, and it is flexible (Khan et al., 2020). They reported online classes to be fun and interactive as compared to face-to-face classes.

Demographic variables

Another important outcome is that demographic variables (gender, years of experience, academic qualification, and school type) did not satisfactorily elucidate the differences in teacher satisfaction (Kremer-Hayon & Goldstein, 1990). The findings revealed that for each of the four domains of teacher job satisfaction utilized, there was no significant difference observed between the demographic features (gender, experience, academic

qualification, and school type) and job satisfaction of teachers. Several studies however, reported the possibilities of demographic factors playing a role in the level of job satisfaction (Bender, Donohue & Heywood, 2005; Clark, Oswald & Warr, 1995; Scott & Dinham, 2001) It was not surprising that the result showed no effect of gender on job satisfaction (Scott, Cox & Dinham, 1998; Shamma & Badarny, 2019; McCann, 2002) notwithstanding the reported differences that existed both in favor of males (Crossman & Harris, 2006; Hill, 1994) and females (Bogler, 2005).

Conclusion

The perception of teachers, their satisfaction with online class, their interaction with students, and the challenges in online classes all constitutes the factors investigated for this study. Several factors can influence teacher job satisfaction. This includes a quality relationship with co-workers, superior computer skills or collaboration with information technologists, discipline on the part of students, support from the parents of students, teacher students' relationships, and convenience of online classes, among others. The findings revealed that teacher job satisfaction in (Israel) and (Jordan and Lebanon) were independent of demographic attributes. Both Jewish and Arab teachers ranked teacher-student interaction in online classes as high; their satisfaction with online classes and perception of online classes as moderate. The online classes also came along with their challenges, which all the teachers ranked high. Here we can add and conclude that the uncertainty that the corona posed change mind for all the partners (Teachers, Parent, Students), and the realize the fact that they should work and support each other in order to overcome this unexpected pandemic, we can see that the collaborative work make its effect and one of the important things that we can see the relationships between the partners became more strength and the need to each other is very essential, in all the sample it was the same despite the cultural differences that's because all were in the same boat or to deal or to vanish.

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