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Aim & Scope

Sakarya University Journal of Education (SUJE) aims to be a scientific source of reference in which academicians studying on educational sciences and teacher training field can publish their studies, and also they have access to related studies. The main aim of the journal is to increase and disseminate the literature in educational sciences and teacher training field.

Sakarya University Journal of Education (SUJE) is an international peer-reviewed and scientific journal which is published triannually. SUJE publishes high quality original research articles (quantitative, qualitative) which contribute to educational sciences and teacher training field. The publication language of the journal is English and Turkish.

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Examination of Mechanical Writing Skills of Primary School Students

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Abstract

The foundations of writing, one of the four basic language skills, are laid in the primary school years and this skill is formally acquired during the first literacy teaching process in the 1st grade of primary school. Analyzing the writing skills of primary school students is essential for detecting weaknesses in their writing abilities, preventing potential writing difficulties in subsequent years, and designing intervention programs to enhance their writing competencies. In this context, this study aimed to examine the writing skills of primary school 1st through 4th grade students in terms of mechanics. The students' notebook writings were assessed based on the following criteria: the size and shape of the letters, the alignment and order of the writing, the spacing between words and letters, the layout and neatness of the paper, the quantity and quality of the writing on the page and in the notebook, and the expression and meaningful coherence of the writing. The sample of the study, which was conducted with a descriptive survey using quantitative methods, consisted of a total of 807 primary school students studying in districts of different socioeconomic levels in Istanbul and the students' writing notebooks. The "Writing Achievement Assessment Form," which was prepared by the researchers and revised following the opinion of a classroom education specialist, was used as a data collection tool in the study. As a result of the study, it was determined that the writing skills of primary school students were at different levels in terms of mechanics. In addition, it was observed that the deficiencies in students' mechanical writing skills were included in different criteria items. Based on the results obtained, the researchers have made suggestions to contribute to the field.

Keywords

Primary school, mechanical writing skills, quantitative research.

Ethics Committee Approval: Ethics committee permission for this study was obtained from Sakarya University Social and Human Sciences Research Ethics Committee with the decision dated 06.10.2021 and numbered 38-9.

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INTRODUCTION

Writing is a functional and versatile language skill that enables individuals to communicate many varied emotions and thoughts that they generate in their minds. Writing skills are fundamental for children to acquire in the first years of primary school, which is the initial stage of their educational journey. Despite the increasing use of computers and keyboards in today's technological age, handwriting remains a vital and powerful tool for students to demonstrate their learning outcomes (Chien, Brown, & McDonald, 2010). Handwriting is also a significant means of communication. Writing that fails to meet various criteria in terms of form and legibility creates a communication barrier not only for readers but also for writers (Bletz & Blöte, 1993). Writing is a skill that has different dimensions in terms of content and mechanics. It can be stated that writers who are not at a sufficient level in terms of form and legibility experience various difficulties in the mechanical dimension of writing. The quality of writing depends on both the mechanical and the content dimensions of writing, which are equally significant.

Writing, which begins in the preschool period with the ability to draw and copy various letters and the first motor movements of handwriting, has a developmental nature. The main objective of writing is to convey thoughts and meanings accurately (Ranweiller, 2004). According to another definition, writing is the transfer of experiences, feelings, thoughts, dreams, and impressions about any subject by following the basic rules of language (Göçer, 2010). In addition to having a developmental structure, writing is characterized as a complex and multicomponent skill in that it is influenced by many different factors, both internal and external (Kaiser, 2009). While individuals' fine motor functions, visual perception skills, hand-eye coordination, attention, and visual-motor integration are among the intrinsic factors affecting their writing skills (Feder & Majnemer, 2007; Kaiser, 2009; Saydam & Baştuğ, 2021), all kinds of components from the external environment are among the extrinsic factors. In addition, the multicomponent structure of writing requires multiple skills to work in coordination with the lower- and higher-level processes that it is divided into. Berninger et al. (1997) state that the creation of symbols representing letters in memory, accessing and retrieving these symbols from memory, and motor production of writing are the low-level processes of writing; planning, using language at the sentence and text level, and revising the written text, as well as the use of revision strategies, are the high-level processes of writing (as cited in Press, Hinojosa & Roston, 2009).

Writing is a multifaceted activity that requires the integration of mental, affective, and mechanical dimensions, and the coordination of these dimensions determines the quality of writing. Good motor control in the writing process plays an essential role in the mechanical production of writing (line and margins, size of letters, shape of letters, line tracking, spacing between words, and spacing between letters) (Kuşdemir, Katrancı & Arslan, 2018; Volman, Van Schendel & Jogmans, 2006). Volman, Van Schendel and Jogmans (2006) reported that the handwriting quality of primary school students with different levels of fine motor skills differed from each other. Case-Smith, Holland and Bishop (2011) state that individuals who have difficulties in the mechanical dimension of writing and spend more time than they should in the motor production of writing lose the meaning in writing, a situation that prevents the effective expression of ideas and may negatively affect the individual's overall academic success. Acquisition of mechanical writing skills is a prerequisite for increasing the quality of writing content.

In addition to the effect of mental and affective factors on the production quality of writing in the mechanical sense, various events and situations such as the COVID-19 pandemic that occurred around

the world can also play a role in the acquisition of academic skills of individuals. COVID-19, which was declared a global pandemic by the World Health Organization (WHO, 2020), has caused various disruptions in daily life as well as in education and training activities despite distance education studies (Koç, 2021). Especially in the first years of the primary school period, when mechanical writing activities are intensive, situations may arise where on-site and immediate feedback is required. This circumstance reinforced the value of engaging in writing in a physical learning setting and showed that writing activities could not be performed adequately on the screen, causing students to regress even further in a skill in which they already had various difficulties. The prediction that distance education processes may negatively affect writing skills particularly is the basis for the realization of this study. Assessing the mechanical writing skills of primary school students (grades 1–4) through their Turkish notebooks is essential for identifying their current writing level and existing writing challenges and for preventing potential difficulties that they may face in writing. Turkish course notebooks, which are tangible indicators of learning about writing in the context of the course, where the foundations of writing skills that are crucial for other disciplines are laid, are necessary for examining the students' writing abilities. The aim of this study was to examine the writing skills of primary school students in grades 1–4 in terms of mechanics (writing size, writing on lines, the way letters are written, writing layout, spacing between words, paper layout, spacing between letters, writing neatness, the amount of writing on the page, expression meaningfulness, and the amount of writing in the notebook). Based on this aim, the research problem was formulated as follows:

- What is the level of mechanical writing skills of primary school students (grades 1–4)?

METHOD

In this section, the research design, study group, data collection tool, process, and data analysis are given.

Research Model

This study, which looked at the mechanics of primary school students' writing, was carried out using the survey model, a quantitative research technique. Survey research involves studies conducted on large samples to determine the skills or attitudes of participants regarding a subject or event by examining them (Büyüköztürk, et al., 2018).

Study Group

The population of the study consisted of the province of Istanbul and the sample consisted of primary schools in the province of Istanbul, which were selected with the convenience sampling method due to the pandemic. In the study, the Turkish lesson notebooks of a total of 807 primary school 1st–4th grade students studying in primary schools of different socioeconomic levels in Istanbul were collected. Each researcher selected one school from four different districts in Istanbul where they could easily collect data and carried out the notebook collection process in four schools in total. The distribution of primary school students according to their grade levels is given in Table 1.

Table 1

Distribution of the Students in the Study Group by Grade Level

Grade Level	Frequency (f)	Percent (%)
1st grade	257	31.84
2nd grade	99	12.26
3rd grade	224	27.75
4th grade	227	28.12

Table 1 shows that 257 (31.84%) of the primary school students in the study group were in 1st grade, 99 (12.26%) were in 2nd grade, 224 (27.75%) were in 3rd grade, and 227 (28.12%) were in 4th grade. When the percentage and frequency values were analyzed, it was evident that the study group included mostly 1st grade students. The number of notebooks for the 2nd grade was significantly lower than the other grade levels. This could be attributed to the higher absenteeism of the 2nd grade students during the pandemic.

Data Collection Tool

In order to determine the students' mechanical writing skills, the study used the "Writing Achievement Assessment Form," which was prepared by the researchers and finalized after being edited according to the opinion of a classroom education field expert. The methodology for evaluating students' mechanical writing abilities included the Writing Achievement Assessment Form in terms of the criteria of "writing size, writing on the lines, the way the letters are written, writing layout, spacing between words, paper layout, spacing between letters, writing neatness, the amount of writing on the page, expression meaningfulness, and the amount of writing in the notebook." The evaluation of the writing in the students' Turkish lesson writing notebooks was carried out by comparing them with the criteria in the Writing Achievement Assessment Form. The Writing Achievement Assessment Form was prepared based on the criteria in Baştuğ and Şenel's (2021, p. 58) "First Literacy Teaching Process Writing Skills Class Tracking Chart". It was reorganized by the researchers and finalized with the addition of the dimensions of text clarity, spacing between letters, amount of writing on the page, expression meaningfulness, and amount of writing in the notebook. The items of text size, writing on the lines, the way the letters are written, writing layout (the positioning of the writing on the notebook page), spacing between words, paper layout, spacing between letters, and neatness of writing were scored "1-0." The amount of writing on the page was determined by considering the size of the page and the amount of writing as "0-1-2-3-4"; the meaningfulness of expression (the general meaningfulness of the writing produced by the student in the context of the sentence) was determined as "0-1-2-3-4"; and the amount of writing in the notebook was determined by proportioning the total number of pages written to the total number of pages in the notebook. Appropriate data for the relevant criterion item was scored as 1 and those that were not scored as 0. (For example, if a student's writing size was appropriate for their grade level, it was scored as 1; if it was smaller or larger than their grade level, it was scored as 0.) The descriptive statistics of the criteria items in the evaluation form were calculated based on the data collected.

Data Collection Process

To examine the students' Turkish notebooks, the study obtained a survey and research permission from the Istanbul Provincial Directorate of National Education (No. E-59090411-20-30378995, dated 31.08.2021) and an ethics committee permission from Sakarya University Social and Human Sciences Ethics Committee (No. E-61923333-050.99-69597, dated 16.10.2021). After obtaining the necessary permissions, the classroom teachers working at the 1st–4th grade levels in the primary schools included in the scope of the research were informed about the research topic, and the students' Turkish lesson notebooks were collected. Afterward, all notebooks were categorized and brought together according to grade levels.

Data Analysis

The analysis of the data obtained within the scope of the research was carried out using the SPSS 22.0 program. In the analysis of the data, the scores of the writing notebooks, which were evaluated together by all the researchers through the Writing Achievement Assessment Form, were grouped according to grade level and input into the Excel program. Descriptive statistics were obtained for the data transferred to the SPSS 22.0 program for each item in the evaluation form, tabulated, and presented in the findings section.

FINDINGS

This section presents the findings obtained from the research.

Table 2

Findings Related to the Writing Achievement Assessment Form

Criteria/Grade Levels	1st grade	2nd grade	3rd grade	4th grade
Font size	0.75	0.81	0.78	0.38
Writing on lines	0.61	0.74	0.42	0.88
How the letters are written	0.63	0.66	0.15	0.74
Text layout	0.71	0.68	0.46	0.14
Clarity between words	0.82	0.61	0.29	0.21
Paper layout	0.56	0.53	0.49	0.14
Text neatness	0.67	0.59	0.64	0.60
Space between letters	0.81	0.74	0.35	0.63

Amount of text on a page	0.74	0.66	0.55	0.63
Expression meaningfulness*	0.99*	0.67*	0.80*	0.94*
Amount of writing in the notebook	0.46	0.31	0.27	0.21

*When evaluating the criterion of expression meaningfulness, notebooks that did not contain students' own expressions were not evaluated. The student's dictation and text written by looking at the source were not taken into consideration, and the original expressions produced by the student were examined instead. In some notebooks, there were no originally created works. In the notebooks where this occurred, expression meaningfulness was not scored. Here, "meaningfulness of expression" refers to whether the student's expressions make up a coherent whole. For example, writing "I came to school today" constitutes a meaningful expression on its own, whereas the expression "I came to schl today" does not meet the criterion of expression meaningfulness since it is not a coherent whole.

When the findings related to the criterion of students' writing size are analyzed in Table 1, it is clear that 4th grade students have the lowest average score (0.38) and 1st grade students have the highest average score (0.75). When the findings related to the criterion of writing on lines are examined, it is obvious that 3rd grade students have the lowest average score (0.42) and 4th grade students have the highest average score (0.88). Regarding the findings related to the way of writing letters, it is noted that 3rd grade students have the lowest average score (0.15) and 4th grade students have the highest average score (0.75). When the findings related to the writing order criterion are analyzed, it is observed that 4th grade students have the lowest average score (0.14) and 1st grade students have the highest average score (0.71).

Figure 1

1st Grade Level Notebook Example-1

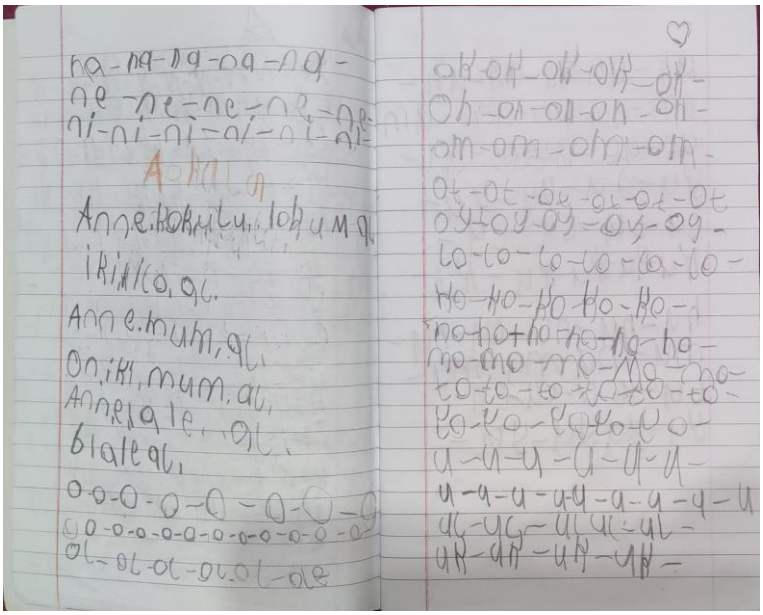
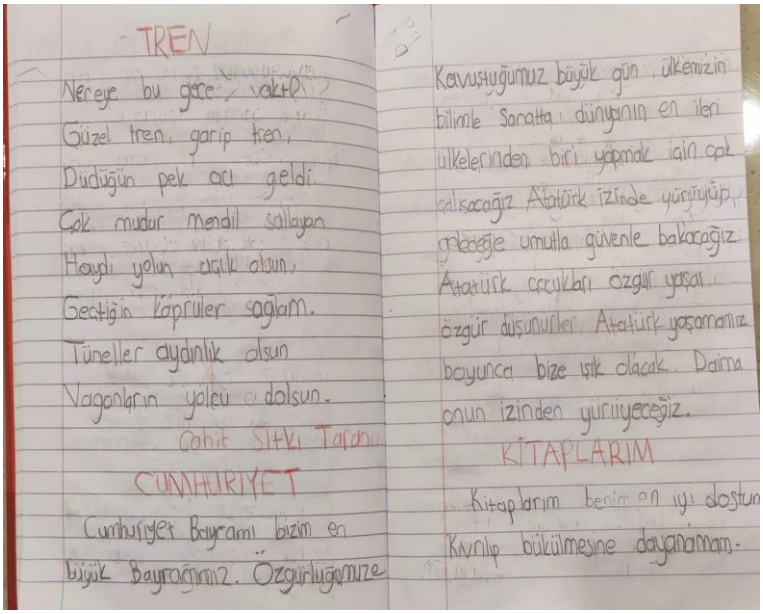


Figure 2

1st Grade Level Notebook Example-2



When the findings related to the criterion of clarity between words are analyzed, it is evident that 4th grade students have the lowest average score (0.21) and 1st grade students have the highest average score (0.82). When the student notebooks related to the paper layout criterion are examined, it is seen that 4th grade students have the lowest average score (0.14) and 1st grade students have the highest average score (0.56). When the findings related to the criterion of text neatness are analyzed, it is clear that 2nd grade students have the lowest average score (0.59) and 1st grade students have the highest average score (0.67). When the findings related to the criterion of the amount of text on the page are examined, it is seen that 3rd grade students have the lowest average score (0.55) and 1st grade students have the highest average score (0.74).

Figure 3

2nd Grade Level Notebook Example-1

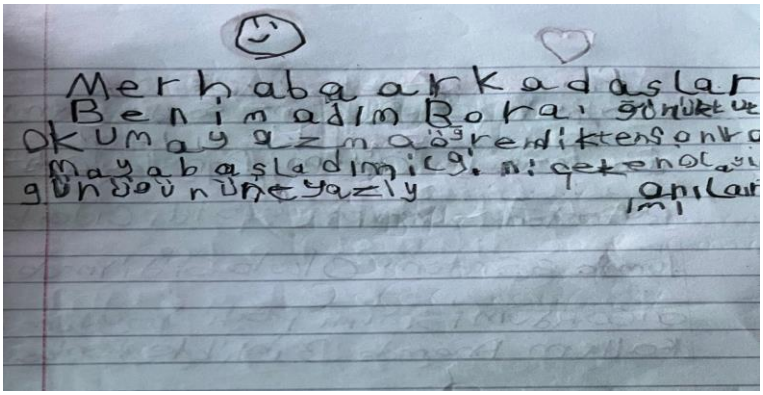
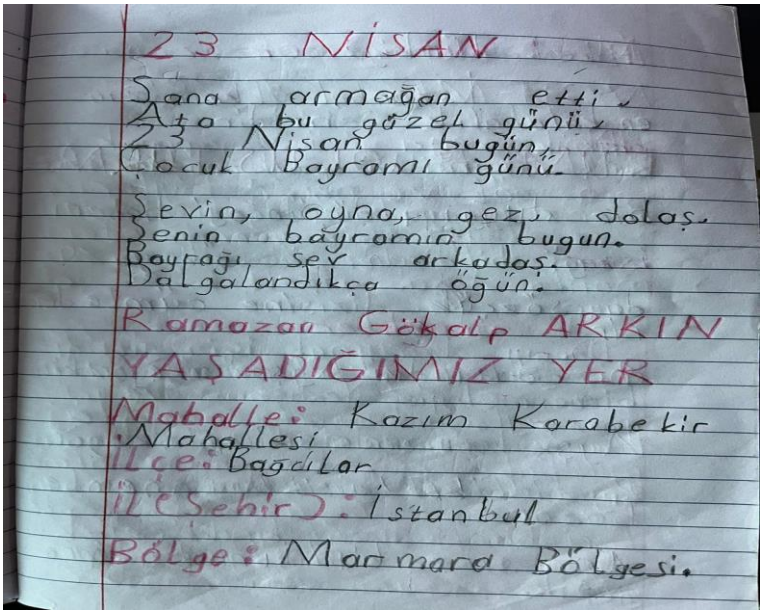


Figure 4

2nd Grade Level Notebook Example-2



For the findings related to the criterion of the amount of text on the page, it is noted that 3rd grade students have the lowest average score (0.55) and 1st grade students have the highest average score (0.74). Additionally, the findings related to the criterion of expression meaningfulness show that 1st grade students have the lowest average score (0.33) and 3rd grade students have the highest average score (0.61). When the findings related to the criterion of the amount of writing in the notebook are examined, 4th grade students have the lowest average score (0.21) and 1st grade students have the highest average score (0.46). It is seen that the amount of writing in the notebook decreases regularly from the 1st grade onward.

Figure 5

3rd Grade Level Notebook Sample-1

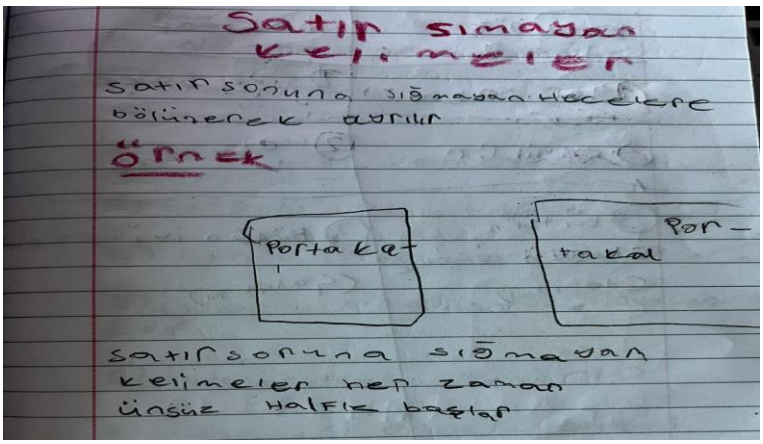


Figure 6

3rd Grade Level Notebook Sample-2

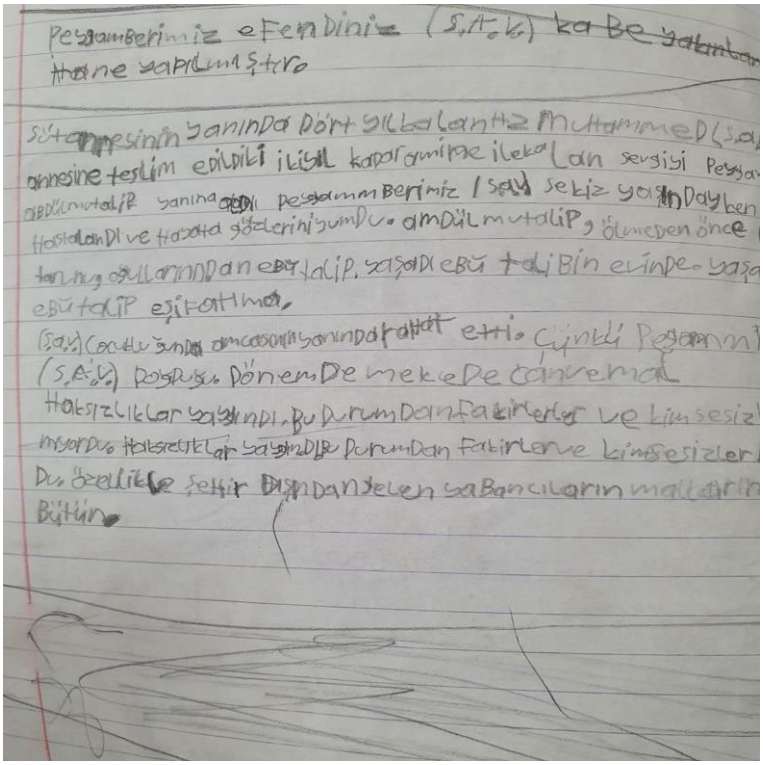


Figure 7

4th Grade Level Notebook Example-1

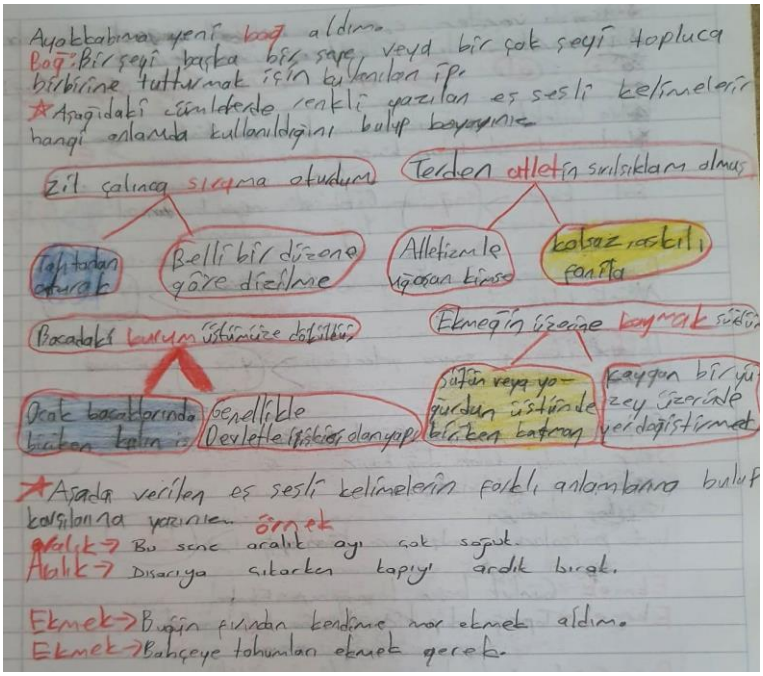
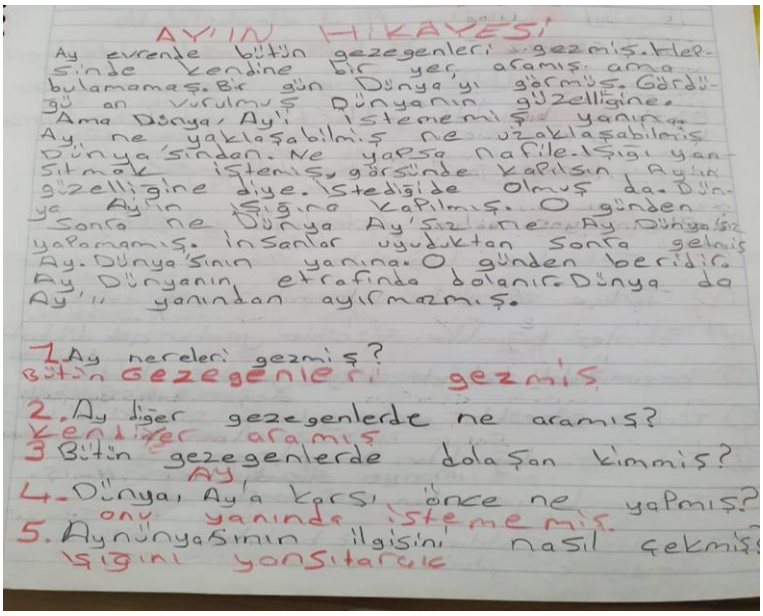


Figure 8

4th Grade Level Notebook Example-2



When the distribution of the scores related to the criteria in the Writing Achievement Assessment Form according to the grade levels is analyzed, it is seen that 3rd and 4th grade students have the lowest average scores in nine criteria, while 1st and 2nd grade students have the highest average scores in nine criteria. It is seen that students' writing skills should improve as the grade level progresses, but they seem to regress. This situation shows that the studies on writing education in schools should be concentrated on the 1st and 2nd grades and the reasons for the deterioration in writing order should be determined.

CONCLUSIONS, DISCUSSIONS, AND RECOMMENDATIONS

This study investigated the mechanical writing skills of primary school students and found a noticeable decrease in their mechanical writing achievement scores as they progressed to higher grade levels. The 1st grade level had the highest averages, while the 4th grade level had the lowest averages. This indicates that the students' writing skills deteriorated as they advanced to upper levels. The study collected the data during the pandemic, which was an extraordinary time, and suggested that the impact of distance education on writing skills could not be overlooked. It is thought that because the 1st grade level is a special stage for writing skills and that students carried out the process with parental support in front of the screen during the pandemic may have positively affected their writing skills. Feedback is also vital, especially for writing skills, and it improves writing effectiveness through corrections. However, a study found that teachers agreed that distance education, which they considered beneficial for teaching grammar and enhancing listening skills during the pandemic, was insufficient for developing skills that involved psychomotor processes such as reading and writing, and especially speaking skills (Günaydın, 2021). The mechanical dimension of writing, in particular, requires

individual observation and follow-up because it includes physical elements (Kuşdemir, Katrancı, & Arslani, 2018).

Sarıkaya (2021) examined writing skills in the distance education process and reported that writing activities were neglected during the pandemic and postponed to the next semester when face-to-face education was expected to resume. The study also found that student motivation was low in this process, there were challenges in managing the classroom environment, and students' writings did not receive adequate feedback and corrections. The existence of unusual conditions and situations is regarded as one of the significant factors that adversely affect the students' writing skills.

In the study conducted by Yıldız, Yıldırım, and Ateş (2009), "The Suitability of Classroom Teachers' Writing on the Classroom Board in Terms of Legibility in Modeling" was examined. The importance of teachers being good models for students in gaining writing skills was underlined. However, in the distance education process, even the physical environment, where teachers can be a model, could not be created. This situation is seen as one of the negativities affecting students' writing skills. At the same time, it is seen in the study that the scores of criteria such as writing order, writing neatness, the way the letters are written, and the size of the letters decrease toward the upper levels. It is thought that the change in writing notebooks that occurred after the completion of literacy education also led to the decline in these skills of the students. While students mostly use grid-lined notebooks in the first literacy process, they start to use lined notebooks toward the upper levels. It is observed that students' conformity to the writing criteria and ability to write more legibly are enhanced when they use guide-lined notebooks. Similarly, this study revealed that more than half of the 3rd grade students' writing was not legible (Yıldız & Ateş, 2010). It is thought that there may be a deterioration in writing skills toward the upper grades during the transition from the grid-lined notebook, which standardizes the mechanical writing process, to the lined notebook.

One of the results obtained from the study is that the criterion of expression meaningfulness increases from the 1st grade to the 4th grade. According to the data obtained, it can be said that dictation and writing by looking practices are intensively practiced in writing studies, especially in the 1st grade. Similarly, the study conducted by Tok and Erdoğan (2017) revealed that the written expression skills of 2nd and 3rd grade students were at a moderate level, while 4th grade students were at a good level. It is thought that expression meaningfulness has a higher average at the 4th grade level because students focus more on the mechanical writing and physical dimensions of writing, especially at the first levels. As qualified writing cannot be expected without acquiring the mechanical dimension of writing, the student who becomes automatic in mechanical writing will be able to devote most of their effort to the content and quality of writing (Graham, 2010). Similar to how fluent reading is a requirement for comprehension and reading comprehension is the ultimate objective of reading skill, mechanical writing is considered as the key to fluent writing as a requirement for qualified writing.

Writing, which is one of the basic skill areas of the Turkish course, is inseparable from reading, speaking, and listening as a means of self-expression. For this reason, as revealed in the study, it would be appropriate to identify the problems in mechanical writing skills for students to develop qualified writing works and use writing as one of the ways of self-expression. After these problems have been identified, it is thought that intervention programs related to the skills that students need can be developed and studies can be conducted on these programs. In addition, teachers can carry out planned writing activities in classroom environments for the criterion items (font size, font layout, expression meaningfulness, etc.) that students have problems with in the mechanical writing process.

The argument that the time allotted for writing skills is cut short before the writing abilities are fully mastered is raised by the decline in success scores in the criterion as the grade level increases. In addition, students can be given more opportunities to create meaningful and original works gradually in addition to dictation and writing by looking.

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How Screen Readers Impact the Academic Work of College and Graduate Students with Visual Impairments

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Abstract

This study explored the effectiveness of screen readers on the academic life of higher education students with visual impairments, including reading, writing, access to the internet, exams, and general information for their courses. This study was designed as a qualitative study and applied a phenomenological approach in order to discuss the experiences of higher education students who use screen readers as assistive technology. One college student and six graduate students with visual impairments were interviewed in the United States. The findings revealed that higher education students with visual impairments benefitted from screen readers; however, they also noted some limitations: difficulties in accessing printed classroom materials, inaccessible digital content, and time lost due to technical issues. Students with visual impairments should be offered accessible documents such as electronic versions of classroom materials, accessible PDFs and websites, and software compatible with JAWS. Universities should provide accessibility training for lecturers who want to better serve students with visual impairments. University information technology services need to train their technical services staff about screen readers to provide 24/7 professional services for students with visual impairments.

Keywords

Visual impairments, screen readers, graduate students, academic work, daily life.

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INTRODUCTION

Rapid technological innovations in the "digital age" need to be considered when discussing the use of technology for educational purposes (Silman et al., 2017). Notably, computer-based practices are becoming increasingly popular since they shorten learning periods for students, increase student motivation, and support students' learning processes (Goker et al., 2016). Hasselbring and Glaser (2000) indicated that new computer-based technology allows rapid access to information, communication, and culture for students with disabilities. Both the Marrakesh Treaty and the United Nations Convention on the Rights of Persons with Disabilities (UNCRPD) underline the importance of using screen readers for individuals with visual impairments (VI). The international Marrakesh Treaty, adopted in 2013 in Marrakesh, Morocco, aimed to improve access to published works for individuals with VI and print disabilities. The Marrakesh Treaty allows authorized entities such as libraries, educational institutions, and organizations serving individuals with VI to produce and distribute accessible format materials without seeking permission from copyright holders (Helfer et al., 2020). It encourages countries to share their accessible format materials across borders, thus expanding the availability of these materials globally. This aspect of the treaty is particularly important for individuals with VI in developing countries such as Turkey, where access to accessible materials may be limited. In addition, the UNCRPD, adopted in 2006, recognizes the right of individuals with disabilities to access information and communication technologies and promotes measures to ensure equitable access to digital content and printed materials. Therefore, the use of computer-based technology such as screen readers has significantly affected the lives of students with VI (D'Andrea, 2012). It is important to use screen readers effectively for further advancements and accessibility to ensure that all students with VI can fully benefit from these accessible materials.

Access to Classroom Materials

Students with VI are a small number within the larger postsecondary student population, but their numbers in college and graduate education appear to be growing (Galdi, 2007; Perez, 2013). These students are provided with accommodations by university disability services, such as textbooks in an alternate format (Braille, large print, and audio) and computer-based software programs (screen readers). Perez (2013) indicated that one of the problems faced by graduate students with VI was gaining access to the reading materials they needed for their courses. Especially for college and graduate students with VI, the materials are more accessible to them when they are available online (Joshi, 2006; Perez, 2013).

Types of Screen Readers

For individuals with VI, computer software programs that read written text on a computer screen aloud through a speech synthesizer are the most popular assistive technology (AT) tool for accessing information from computers (Lazar et al., 2007). The four commonly used screen readers are JAWS, NonVisual Desktop Access (NVDA), Window-Eyes, and VoiceOver (Calvo et al., 2014; Kayte et al., 2015). According to the Web Accessibility in Mind (WebAIM) survey (2019), among these, JAWS has been the most broadly used screen reader around the world, and many programs globally have adopted it. NVDA is an open-source and free screen reader for Windows. Similarly, Window-Eyes was developed by GW Micro for the Microsoft Windows operating system. VoiceOver is a screen reader built into the Apple operating systems.

Screen Reader Accessibility

Screen readers can give individuals with VI much more independence by allowing them greater access to all print materials and the ability to read documents. Therefore, screen readers enable students with VI to become active learners in the classroom by providing them with the same access to information as their sighted peers. Also, screen readers may improve reading and writing skills for students with VI by allowing them to re-read and edit previously written texts (Alves et al., 2009; Hasselbring & Glaser, 2000), which is especially helpful for college and graduate students.

It is imperative to ensure accessibility in higher education institutions, schools, and social and public services in order to encourage inclusivity and provide equal opportunities for all individuals, including those with disabilities. Staff members, faculty members, and service providers should receive comprehensive training on accessibility regulation and inclusive practices. Accessible websites, online platforms, and materials should be available to individuals with VI, as well as training and support for those who use screen readers. Therefore, continually evaluating and improving accessibility is essential, keeping in mind that accessibility is a journey that requires ongoing collaboration and commitment. Most of the screen reader-related literature has examined the accessibility of screen readers and discussed either access challenges or recommendations for improvements in accessibility (Cervone, 2013; Hill, 2013; Kayte et al., 2015; Southwell & Slater, 2013; Walker & Keenan, 2015). However, research on the use of screen readers by college and graduate students is needed to understand and address the challenges faced by students with VI in participating in academic activities and accessing educational materials (Delgado & Salmerón, 2021; Vandenhoek, 2013). The researcher found only a few studies that specifically discussed the use of screen readers for college and graduate students with VI (Argyropoulos et al, 2008; Corn & Wall, 2002; Galdi, 2007; Kelly, 2009), and found no qualitative studies that examine the use of screen readers for both academic and daily life. The goal of this qualitative study is to expand upon previous research by examining how screen readers impact college and graduate students in both academic and daily life.

The two research questions guiding this study are: 1) How do screen readers impact the academic life of college and graduate students with VI? 2) To what extent do screen readers impact the reading and writing of college and graduate students with VI?

METHOD

This study was designed as a qualitative study and applied a phenomenological approach in order to investigate the impact of AT on the academic lives of college and graduate students with VI. Phenomenology as a theoretical framework was developed to study individuals' experiences of phenomena (Creswell & Creswell, 2017; Moustakas, 1994). "The purposes of a phenomenological study are to understand and describe a given phenomenon in-depth and arrive at the essence of humans' lived experiences of that phenomenon" (Cilesiz, 2011, p. 495). As a method of research, phenomenology is becoming more popular, particularly in disciplines focused on human experience within a particular context (Cilesiz, 2011; Crotty, 1996; Crotty, 1998; Hayllar & Griffin, 2005; Palmer, et al., 2010).). In this study, the aim was to identify the experiences of higher education students regarding the use of screen readers. Therefore, the phenomenological approach is uniquely suited to research students' lived experiences with screen readers.

Participants

All seven participants were students with VI in a public university in the United States. Three students were studying for a master's degree, three students were studying for a Ph.D., and one student was studying for a bachelor's degree (Table 1). The participants were reached via email by the university disability resource center and snowball sampling. The author obtained information about students with VI who studied social sciences at the university from the university disability resource center. After their email addresses were obtained, the author sent an email with the information about the research and interview process. All social sciences students with VI who agreed to participate in the study were included. Also, all participants were asked to invite their friends with VI to the study and reach out to those students via email. Since social science students are expected to read and write a lot on the computer, the researcher interviewed students in social sciences to obtain more information about using screen readers in reading and writing. All participants needed to use braille as their primary literacy medium, be full-time students at the university, and use screen readers.

Table 1

Participant Demographic Information

Participants	Gender	Age	Grade	Primary Literacy Medium	Eye Condition	Nationality
Student Z	Female	33	Ph.D.	Braille	LCA*	Turkish
Student P	Male	32	Ph.D.	Braille	RP***	White American
Student T	Female	28	Ph.D.	Braille	RP***	Palestinian/ American
Student N	Female	30	Master	Braille	ROP**	African American
Student D	Female	48	Master	Braille	RP***	African American
Student A	Female	25	Master	Braille	ROP**	White American
Student I	Male	21	Bachelor	Braille	CG****	Asian/American

* Leber Congenital Amaurosis *** Retinitis Pigmentosa

** Retinopathy of Prematurity **** Congenital Glaucoma

Data Collection

The researcher employed a semi-structured interview to obtain in-depth information about how screen readers affect the lives of college and graduate students with VI (Creswell & Creswell, 2017). The interview form was sent out to two different experts who hold Ph.D. degrees in special education

in order to obtain their opinions. The experts analyzed the wording, structure, and overall appropriateness of the questions. They also recommended deleting one repetitive question and changing the order of two questions to ensure a more logical flow of topics. Once the experts had completed the review, the interview questions were revised and updated by eliminating the redundant question.

This study was reviewed and approved by the human subject committee of a university in the United States. After approval was obtained from the Institutional Review Board (IRB), an email outlining the research was sent to the university disability resource center listserv. Upon acceptance, participants were contacted by email with the interview information. All the interviews were conducted in a quiet library room on the university campus. After each participant signed the consent form, the researcher interviewed the students with open-ended questions, allowing them the freedom to talk about their experiences in depth, avoiding misunderstandings, encouraging cooperation and rapport, and eliciting unexpected answers (Robson, 2011). The students were provided with a set of 20 guiding questions about using screen readers and their responses were audio recorded. First, the interview gathered general information about the students and their current experiences, such as eye condition, age, and primary literacy medium. Next, the interview was conducted to inquire about the students' preferences, practices, and essential experiences with screen readers. Since the students were free to ask for clarification before answering open-ended questions, the validity of the reports increased substantially. For example, if the students did not understand a question, they could ask the researcher to repeat or rephrase the question before they answered it. Each interview lasted about 90 minutes and was recorded. All interviews were completed in one month.

Data Analysis

All audio-recorded interviews were transcribed verbatim during the interviews by using Dragon software. Dragon speech-to-text apps, also known as Dragon dictation apps, are software applications that utilize speech recognition technology to convert spoken words into written text. Dragon speech-to-text apps are available for various platforms, including desktop computers, smartphones, and tablets. During the interview, the researcher employed a dual approach to ensure accurate transcription and backup in case of any technical issues. She used her laptop with Dragon software for real-time transcription from speech to text. Additionally, she used her phone for voice recording. After all interviews were completed, the first step was revisiting and reading the data to identify patterns and recurring ideas. Later, the transcriptions were analyzed word by word and phrase by phrase to detect similar statements, sentences, and quotes by using color coding.

An inductive thematic analysis was used to identify themes. After initial coding, the researcher sought to identify and describe themes from the perspective of the students (Creswell, 2013) using open coding transcriptions to categorize similar statements into themes (Marshall & Rossman, 2016). The researcher used these significant statements and the associated themes that emerged to represent what the participants experienced regarding the screen readers. Accordingly, the data analysis involved synthesizing the important quotes, statements, and sentences relevant to each identified theme. This approach is consistent with the process of thematic analysis, where themes are identified based on the data obtained.

Themes were identified based on what occurred most frequently across interview transcripts. Lastly, the results of the open-coded transcriptions were categorized into six themes: access to classroom materials, using screen readers for writing and reading, using screen readers for daily life, advantages

of screen readers, disadvantages of screen readers, and inadequate knowledge about screen readers. These emerging themes were used to write a description of what the participants experienced regarding the phenomenon (Creswell, 2013). Important quotes, statements, and sentences were presented under each related theme in the results section. Figure 1 is a visual depiction of how the findings were coded.

Researcher bias and reactivity are the two main threats to validity (Maxwell, 2013). To eliminate any threats to the validity of the data analysis and conclusions, the researcher used two accepted strategies. One common strategy is member checking (Maxwell, 2013), considered to be the most critical technique for establishing credibility (Creswell, 2013). All participants were contacted via email to verify the findings after the analysis of the themes was completed. Participants were asked to read the transcripts and comment on whether they felt the synthesized results were the same as their experiences (Birt et al., 2016). They were also asked if they would like to change or add to the transcripts to improve the analyses. The researcher allowed two weeks to return the transcripts. All participants indicated that they agreed with the results and had no additional comments to add. This procedure provided an opportunity for the participants to comment on the findings regarding their accuracy.

Table 2

Template for coding themes

Themes (Emerging from participants' experiences)	Categories
Access to Classroom Materials (I use my personal computer with JAWS)	
Using Screen Readers for Writing and Reading (I am able to navigate the digital text)	• *Writing* (I am able to produce my academic work) • *Reading* (I can adjust my speed according to how fast it reads)
Using Screen Readers for Daily Life (I use maps on my phone to navigate independently)	
Advantages of Screen Readers (Screen reader makes my life more accessible)	
Disadvantages of Screen Readers (Multiple barriers make it difficult to use JAWS)	• *Inaccessible images* (If there is no alt text, JAWS is unable to interpret visual information)

	• *Incompatible PDF files, websites, and apps* (Designers do not really think about screen reader users) • *The voice of JAWS* (It is kind of robotic and annoying) • *Technical issues.* (It takes a long time for us to fix the problem)
Inadequate Knowledge of Screen Readers (TVIs did not have advanced experience in using JAWS)	

External audits were used as a second method of validation (Creswell, 2013). The external auditors assessed whether the data supported the findings, interpretations, and conclusions. The external auditors provided important feedback that can lead to stronger and better-articulated findings (Creswell, 2013). For the external audit of the data analysis, the researcher collaborated with two research assistants: One research assistant in the special education department, who is working on her Ph.D. at the same university, and another research assistant in a different university, who is working on his Ph.D. in the program for teaching students with VI. Since all audio-recorded interviews were transcribed with Dragon software, the auditors only looked at the transcripts and identified themes; they were otherwise unconnected with the study. The external auditors independently coded the same set of data and then discussed and resolved any discrepancies through online meetings. The coders compared their codes and ultimately reached a consensus on the appropriate codes for each finding. All three coders were able to achieve 100% agreement by the end of the meetings.

Ethical Principles

Ethics committee permission for this study was obtained from University of Arizona Committee of Research, Discovery and Innovation with the decision dated 15.04.2019 and numbered 1903481207.

FINDINGS

This qualitative study aimed to explore the lived experiences of college and graduate students with VI who use screen readers. All students reported that they used JAWS and VoiceOver in their academic and daily life. Only two students indicated that they sometimes used NVDA for their math tasks. According to the results, all students used VoiceOver and JAWS for different tasks. For example, JAWS was used by students for academic tasks such as reading and writing, using Microsoft Office (Word, Excel, and PowerPoint), taking exams, and using the internet. The students used VoiceOver in their social life (e.g., texting, communication, shopping, listening to music and books, navigation, maps, and games).

Access to Classroom Materials

Since JAWS allows students to access electronic versions of documents immediately, they always used personal computers with JAWS for accessing classroom materials. When asked about access to classroom materials, all students indicated that they mostly preferred to use digital text (e.g., PDF, Microsoft Word, PowerPoint, and Excel). Digital text is delivered on a computer, as an electronic version of a written text, and enables users with VI to access the information in audio format. Students specified that they felt more comfortable using digital text because JAWS allowed them to have the same access to information as their classmates. Student A said, "I use JAWS to access classroom materials because I'm able to do what I need to do." However, students indicated that faculty members were usually unaware of their needs and were unwilling to share electronic documents earlier than the course time. Students suggested that faculty should share the electronic versions of the documents at least one week before class in order to ensure that the material is accessible to students. All students stated that they were able to use JAWS with headphones in the classroom and participate in classroom activities independently. For example, student N highlighted that she was able to rapidly access information on the internet with JAWS when her class activities required it.

Using Screen Readers for Writing and Reading

All students indicated that they mainly used JAWS for their reading and writing. The students agreed that JAWS allowed them to engage in both writing and reading by providing access to content and auditory feedback. By using JAWS, students were able to navigate the digital text for either reading or editing existing electronic files (PDF, Word, PowerPoint, etc.,) without a mouse.

Writing

Students declared that JAWS provided them with the ability to freely navigate documents, such as PDF files, Microsoft Word documents, PowerPoint files, Excel spreadsheets, and internet pages, giving them opportunities to use the advanced features of a computer by using keyboard commands. Students stated they were able to review their writing (e.g., proofreading, editing, checking punctuation, deleting, inserting icons, and rearranging text fonts) by using JAWS. Student Z stated:

> *When I write, for formatting, I can use different JAWS features …. There are shortcuts that I can see if it's bolded or italicized. You can adjust your JAWS to just say the word that you typed wrong, and you can correct it [word]. In addition, you can see the comments and track changes on the documents.*

In addition, they said that JAWS provided opportunities for them to work with their peers at the same time. For example, student N indicated:

> *I use Google Docs, so think about if I cannot use it, I will be excluded from my classmates. Thanks to JAWS, I am able to read and write and produce my academic work, I can access information on the internet just like my sighted peers.*

Reading

Students noted that they had the opportunity to obtain any critical information from the reading text when they used JAWS. For instance, JAWS provided a way to read an electronic file character by character, word by word, line by line, and paragraph by paragraph as well as moving back and forward between paragraphs. Furthermore, the students stated that JAWS allowed them to make all sorts of annotations, such as adding text, commenting, highlighting, adding bookmarks, and more.

Additionally, the students were able to adjust JAWS settings according to their own needs, such as choosing different voices, adjusting the speed of the voice, and changing the level of the voice. Student D described her experience with JAWS:

> *For reading, I can adjust my speed according to how fast it reads. I can go back and forward between paragraphs, I can read it character by character, word by word, line by line, I can adjust it when reading without stopping. You can make it [JAWS] stop whenever you want.*

The students indicated that without screen readers, they would have not only slower access to text content but also less independence and success in learning.

Using Screen Readers for Daily Life

When students were asked how they used screen readers in their daily lives, they responded that they usually used VoiceOver for reading emails, texting, shopping, scanning printed information, playing games, and navigating around. All students stated that they mostly used VoiceOver in their daily tasks for both portability and free screen reader access. Most students stated that they had their phones with them all the time; thus, they were more independent in their social life. Student P described how she used VoiceOver in her daily life:

> *I have my phone on me all the time; I use VoiceOver for texting and checking my emails, reading my emails and my messages, going on social media, listening to music, and playing games. I have been able to find numerous applications in order to be independent in my life. For example, there are apps to identify colors and scan barcodes and printed documents. When I go shopping, I do not need sighted persons; I use the apps to read the price of items and recognize the color of items. Also, I use maps on my phone to navigate independently.*

Since VoiceOver allows individuals with VI to use their iPhones as much as their sighted peers, there is no doubt that VoiceOver provides many opportunities for individuals with VI such as communication, traveling, shopping, entertainment, and accessing the internet.

Advantages of Screen Readers

All students declared that screen readers prevented long wait times for accessing the content of classroom materials. Student T said, “generally, professors post class materials in electronic formats. I can get access to them with JAWS. Also, I access my books if they are available in electronic formats like on Bookshare or any other websites. Thanks to JAWS, I do not have to wait to get them in braille.” Moreover, students expressed their opinion that screen readers were a way to open the door to university for them. Student Z stated:

> *I couldn't be here in my life and education and career or anything like that without having accessible software [screen readers]. JAWS gives us a life of progress and gives us a way to live. Life is a word that has a lot of meanings. One [meaning] is to have a better job, and for the student to do all that, and be included in society… If I didn't use JAWS and VoiceOver, I don't think I would be able to do the things that I am doing today and live independently. For example, I wouldn't be here today as an educated woman and independent woman who is traveling by herself.*

The students described screen readers as being user-friendly and a bridge to an independent life. When asked about how satisfied they were with screen readers, all students rated themselves as “very satisfied”. All students expressed that they were pleased to use JAWS because they did not need to

carry a device other than their computers. They added that using a mainstream device made them feel more comfortable. Student D said, “I didn't want to seem different”. Student P noted that “I personally prefer not to use so many different things [AT devices] for so many purposes if I can get it done on my iPhone; I don't need different things [AT devices] like a barcode reader”. Student T, who is an international student, said, “I do not know braille in English, screen readers help me to adapt easily. I did not have to learn braille in English thanks to the screen reader.”

Disadvantages of Screen Readers

All students noted that multiple barriers made it difficult to use JAWS, such as inaccessible images; incompatible PDF files, websites, and apps; the voice of JAWS; and technical issues.

Inaccessible Images

The students identified one of the disadvantages of using JAWS for reading images. All students agreed that if there is no alt text, JAWS is unable to interpret visual information such as pictures, drawings, and maps.

Incompatible PDF Files, Websites, and Apps

All students stated that sometimes websites, apps, and PDF files are not created in an accessible format. They discussed that having inaccessible sources was another disadvantage of using JAWS. For example, students indicated that faculty members were usually unaware of this accessibility; therefore, they did not provide accessible classroom materials such as websites and PDFs. For this reason, students were not able to access sources to complete their classroom tasks.

Also, students stated that inaccessibility impacted their privacy and independence because they could not access the content by using screen readers. Student Z stated:

> *It is really frustrating when things are not accessible, because the designers do not really think about us as screen reader users. For example, my bank website was updated, and I can no longer instantly use it by myself, and most private information like your bank account, you wouldn't want to show it to somebody, you would want to do it by yourself. Inaccessibility impacts your privacy and dignity as well.*

However, the students indicated that accessibility was not a problem because of JAWS; it was a problem because of the websites and apps themselves. Therefore, all students suggested that companies should be aware of making their software, websites, and documents compatible with screen readers.

The Voice of JAWS

Some students mentioned that having a monotone voice was another disadvantage of JAWS. Student I described the JAWS voice as "robotic" and added that there are other options to use as voice synthesizers:

> *I initially thought that JAWS is really annoying, but now what I have on my computer is not the traditional voice. I downloaded one of the other synthesizers because personally, I don't like using the regular voice of JAWS. I don't find its voice emotional; it is kind of robotic and annoying.*

Technical Issues

Screen reader users sometimes face difficulties with technical issues. All students remarked that when they experienced a technical issue with JAWS, it may take a very long time to fix it. For example, some students indicated that the laptop might shut down, freeze, or stop talking while they were working with it. In this case, all students expressed that they first restarted the laptop or rebooted the program with which they were working. If the technical issue was not solved, they searched online about the specific technical issue or accessed technical support such as Freedom Scientific, which provides technical services for JAWS, or the university's information technology service. Student P specified:

> *I call Freedom Scientific. I generally say that something has happened to my laptop. They walk me through it [solving the problem] or I just search for it on Google because they have tutorials, and they have some guidelines on the websites. If I cannot repair my laptop, I take it to the university computer technical service.*

Inadequate Knowledge of Screen Readers

None of the students indicated that they had obtained adequate training about screen readers. When the participants were asked how they learned to use screen readers, all students responded that the most helpful persons were teachers of students with VI (TVIs) and family. All students agreed that TVIs introduced JAWS and encouraged them to use it. However, none of the students agreed that TVIs or their families had adequate information about screen readers. The students stated that TVIs did not have advanced experience in using JAWS. Student T said:

> *In the beginning, it was her [TVI] but she had just started. I mean she had information to get me started and then I took it and built on it, and then my brother, if I needed anything my brother helped me. My family supported me in general, like encouraging me to use [JAWS]or helping me to use it, but they don't have the knowledge or understanding of JAWS.*

RESULTS, DISCUSSION AND RECOMMENDATIONS

In this study, the following research questions were answered: 1) How do screen readers impact the academic lives of college and graduate students with VI? 2) To what extent do screen readers impact the reading and writing of college and graduate students with VI? The findings revealed that screen readers have a great impact on being successful and independent for students with VI; however, inaccessibility negatively impacts their success, privacy, and independence (Napoli et al., 2021). Fichten et al. (2019) found that Canadian and Israeli higher education students with disabilities mainly prefer to use smartphones in the classroom to record lectures, view projected lecture PowerPoints, and use Google. In contrast to Israeli and Canadian higher education students, college and graduate students in the USA mainly use JAWS in the classroom in their academic lives for reading, writing, and classroom tasks, and VoiceOver (smartphone) in their daily lives for shopping, communication, traveling, entertainment, and reading novels. The findings show that college and graduate students with VI had only JAWS training because JAWS has been around longer. Also, JAWS works with the Windows operating system. Therefore, they prefer to use JAWS in their academic work. On the other hand, the biggest reason why students with VI use VoiceOver in everyday life may be its portability (Fichten et al., 2019).

The students emphasized that screen readers are a crucial tool for them to open the door to university because screen readers provide the same opportunities to these students as their sighted peers. For example, using a screen reader prevents a long wait time for printing braille materials by allowing students to access the internet and electronic versions of written information (Holt et al., 2019; Stone et al., 2019). Also, screen readers remove barriers between graduate students and the academic world by giving them access to almost all the opportunities provided by a computer. For example, all graduate students with VI can efficiently use advanced techniques for reading and writing with the keyboard. Students are able to read a word, a sentence, a paragraph, or a whole page, as well as move the cursor in the document freely. Likewise, they can review and add to their writing, such as proofreading, editing, copying, pasting, deleting, checking punctuation, and rearranging fonts by using JAWS. All students noted that changes and adjustments could easily be made to existing electronic files by using JAWS because there are many options available in JAWS to modify electronic files. Hence, when accessible documents are provided to students with VI, they are able not only to read and navigate documents but also to make all sorts of annotations, such as adding text, commenting, highlighting, creating shapes, attaching files, and more (Alves et al., 2009; Hasselbring & Glaser, 2000).

Outside of the classroom, the findings showed that screen readers promote greater independence for students with VI in their daily lives. The numerous smartphone apps are specifically designed to make students with VI more independent. Without screen readers like VoiceOver, students would not be able to use these apps because they would have to purchase different assistive technology devices for each task. The findings of this study confirm the early findings that smartphones are a cheap alternative to increase access to information, allow e-inclusion, and decrease the digital divide for individuals with VI (Leporini et al., 2012).

The findings revealed that college and graduate students with VI benefitted from screen readers; however, they also noted some limitations due to technical difficulties. According to the Americans with Disabilities Act (ADA), universities must ensure that their programs, services, websites, and physical facilities are accessible and make reasonable accommodations to support the needs of students with disabilities. Digital applications such as educational software, and online platforms, can play a significant role in supporting academic and social participation and early skills acquisition for students with VI by allowing the use of screen readers without the need for braille prints. However, students encounter some difficulties in accessing classroom materials, software, and websites. Difficulties in accessing classroom materials were also reported in a previous study (Galdi, 2007). The results of the current study revealed that even after more than a decade, difficulties in accessing classroom materials still exist as a barrier for these students. The lack of training on how to provide accessible documents to students in higher education is a valid concern. Therefore, providing accessibility workshops for faculty members may help them facilitate accessible classroom materials for their students with VI (Rachel et al., 2017).

Additionally, we know that computers may break down at any time; however, it is frustrating when the laptop's voice is shut down because screen reader users cannot figure out the technical issues without the voice. Therefore, technical issues requiring repair cause lost time for users with VI. In order to reduce this lost time for repairing computers with screen readers, the university information technology services need to train their technical services staff about screen readers to provide 24/7 professional services for students with VI.

The surprising finding is that college and graduate students use JAWS almost always as an assistive technology tool in their academic work. It was expected that students would use at least two different screen readers depending on their work. Using only one screen reader might be due to a lack of training about using screen readers provided for those students. The findings show that none of the students had obtained adequate training regarding screen readers. Although TVIs teach basic skills of JAWS and encourage students to use screen readers, all students agreed that TVIs did not have advanced skills with JAWS (Kirboyun, 2020). Previous research results show consistency with the current study. For instance, a study conducted in Turkey (Yılmaz, 2018) suggested that the teacher who is to teach using screen readers should have sufficient equipment, knowledge, skills, and attitudes. In addition, Yılmaz (2018) pointed out a common view expressed by both students and teachers about the need for an appropriate curriculum and materials while learning the use of screen readers. Also, Bayır, Keser, and Numanoğlu (2010) stated that an information technologies program for individuals with VI should be developed in order to use assistive technologies efficiently and make individuals with VI a member of the production team in this society as well as to contribute positively to both their personal development and social development (Şimşek et al., 2010). TVIs' lack of knowledge about screen readers may impact students' acquisition of screen reader skills. Therefore, providing pre- and in-service training for TVIs regarding screen readers may play an important role in improving students' screen reader-using skills.

The legal regulations, including the ADA, the Marrakech Treaty, and the UNCRPD collectively highlight the rights of individuals with visual impairments to use screen readers in educational contexts. Universities and colleges are therefore required to provide the necessary support and accommodations, including the provision of screen readers, to ensure equal access and opportunities for students with visual impairments. It is important for universities to comply with these regulations and work closely with their disability services offices to ensure that students with visual impairments receive the necessary support and accommodations, including the use of screen readers, to facilitate their academic success.

Conclusion

In summary, the findings show that screen readers have an essential impact on the independence and academic success of college and graduate students with VI. The findings indicate that students prefer to use JAWS as an assistive technology tool for accessing information for their academic courses, reading, and writing for various reasons. Firstly, students use JAWS because most of the classroom materials are available in electronic format. Secondly, JAWS provides faster access to classroom materials for students. Thirdly, JAWS offers these students the ability to navigate a document more quickly, easily, and efficiently, on a par with their sighted peers. Fourthly, JAWS removes barriers between students with VI and their classmates and professors by offering opportunities to work on the same document. Lastly, JAWS gives access to all the opportunities provided by a computer, and it does not require using additional or different devices as an assistive technology tool. Also, the findings show that students encounter barriers such as a lack of training about screen readers, inaccessible content, lack of knowledge about accessibility, and technical issues related to screen readers. Last but not least, university faculty members should be trained in providing accessible classroom materials, including accessible PDFs, screen reader-compatible websites, and digital classroom documents. The results show that no matter how many disadvantages there may be regarding the use of screen readers for students with VI, all students believed that screen readers are definitely useful assistive technology tools for removing barriers for individuals with VI in their academic and social lives.

Limitations

Firstly, the small number of participants is from a population of students at a single university whose views may not fully reflect the experiences of all higher education students with VI. In addition, only one undergraduate student with VI was included the study. Therefore, the results may not be generalizable to students with VI at other institutions. Secondly, all participants have different life stories until they reach university. Depending on the age at which they started using screen readers and had access to a computer or laptop, their perceptions about using screen readers may differ. Thirdly, the participants did not have sufficient time to meet on two separate dates to conduct the interview; thus, the researcher conducted the two parts of each interview on the same day for each participant. However, according to Seidman (2013), at least two interview series on two different days would provide more in-depth information. Finally, almost all of the participants primarily use JAWS and VoiceOver on iPhone. If the study included participants who use other screen readers (e.g., VoiceOver on Mac, NVDA), it may provide a basic summary of the experiences of each screen reader. Therefore, possible future extensions of the study should focus on examinations of other screen readers.

Recommendations for Education

Accessibility and use of screen readers are two essential issues for college and graduate students with VI. Therefore, students should be provided with accessible documents such as electronic versions of classroom materials, accessible PDFs and websites, and software compatible with screen readers. Universities should provide accessibility training for lecturers who want to better serve students with VI because faculty members have an essential role in delivering accessible documents to students with VI. Thus, the findings may help faculty members consider the needs of students with VI in creating accessible classroom materials for them. This study could also be useful for improving universities' information technology services. For example, the services may educate their technical services staff about screen readers to provide professional services for students with VI.

Recommendations for Future Research

1. The research may be replicated using a larger sample size of both college and graduate students with VI who use different screen readers.
2. Conducting the same research in developing countries such as Turkey may have an impact on the results due to differences in technology use and accessibility. Therefore, research may be replicated in other countries.
3. The participants in this study were students with VI who are students in the social sciences; future research may be conducted with students with VI who study in other areas such as science and engineering in order to evaluate the differences.
4. The participants in this study were students with VI who are students in the social sciences; future research may be conducted with students with VI who study in other areas such as science and engineering to evaluate the differences.
5. Future research should focus on how to educate family members of students with VI about using screen readers so that they might better support their children.

Since graduate students with VI specified that they did not obtain adequate training about screen readers, future research should address whether elementary and middle school students with VI receive sufficient training about screen readers.

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Designing Units with the UbD Framework to Teach English as a Foreign Language: Benefits and Challenges

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Abstract

This study aims to explore English language teachers' and English department heads' perspectives on the benefits and challenges of designing and delivering units using Understanding by Design (UbD) framework to teach English as a Foreign Language (EFL). UbD is a unit and curriculum design framework which aims for student understanding and its transfer into real life context through three stages: identifying the desired results, determining the assessment evidence, and planning learning activities. Data was collected through open-ended questionnaires from 39 English language teachers and five department heads, and semi-structured focus group interviews with seven teachers. The content and thematic analysis of the qualitative data revealed that the teachers who implemented UbD within the context of their school perceived it as a design process with benefits on students' academic achievement and English language skills through its focus on the development of understandings and transfer. The findings also uncovered perceived challenges caused by institutional, instructional, teacher related and learner related factors. Teachers also found UbD implementations challenging due to the characteristics of online education during the global pandemic. These findings suggest that although UbD is not commonly used at schools in the Turkish EFL context, it can be offered as an alternative unit design practice if teachers' professional knowledge of its underlying principles is increased with regular in-service trainings on its proper implementation.

Keywords

Understanding by Design (UbD), English curriculum design, unit design in EFL.

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INTRODUCTION

The field of education has undergone many changes over the past centuries. Unlike the past, the present day requires students to fully interact with the complexities of life (Bransford et al., 2000) since the world outside of schools requires many high order skills like critical and reflective thinking and problem solving, and communication and collaboration skills. Although the world has advanced in many ways, a lot of education is still reminiscent of the traditional approaches. Students still do not transfer what they learn at school to new situations to solve problems and tackle challenges (Bloom et al., 1956; Day & GoldStone, 2012). To solve this problem, Wiggins and McTighe (1998; 2005) offer a backward design framework for unit and curriculum design, UbD, which is based on the principles of ensuring student understanding and transfer of learning. The UbD framework has well-structured stages that set the objectives with the end results in mind, determine the evidence of learning, and plan the learning activities. Hence, it provides teachers with an effective plan for teaching. UbD bases its theoretical background on research from cognitive psychology and neurology as well as the works of Benjamin Bloom, John Dewey, Jerome Bruner, Ralph Tyler, and Hilda Taba (Wiggins & McTighe, 2011). It is a combination of progressive educational approaches and significant scientific findings that allow teachers to teach in a more structured and systematic way. Its three-stage design process for designing curriculum, assessment and instruction focuses on deep understanding of important ideas and concepts, and transfer of learning through backward design (Wiggins & McTighe, 2005). These stages are as follows:

Stage 1: Identify Desired Results

The best teaching starts with clear end goals in mind before the planning process starts (McTighe & Brown, 2020). Stage 1 determines what students should know and be able to do at the end of a unit to transfer their learning. It is the stage in which *enduring understandings* of the units, *essential questions* that lead students to think critically about the topic, and the required *knowledge* and *skills* that the students will need to show understanding of are framed. *Enduring understandings* are the big ideas that teachers want their students to leave the classroom with. They are the kind of understandings that are long lasting and are reinforced through application in real life situations. Enduring understandings are guided by *essential questions* which do not have clear cut answers and can be considered as the passages through which learners delve into the important concepts that might be unseen in the content and deepen their understanding. While enduring understandings and essential questions can be considered as open-ended exploration processes, the knowledge and skills framed in this stage form the basic elements that learners are expected to acquire.

Stage 2: Determine Acceptable Evidence

In Stage 2, teachers plan their assessments that are aligned with their desired goals in Stage 1. Teachers can use many types of evidence to test students' knowledge and skills such as observations, dialogues, vocabulary tests, unit quizzes and exams. In addition to these types of assessments, authentic performance tasks that require students to apply their learning to real life context to tackle challenges and problems can be utilized to test student understanding and transfer. UbD offers a performance task design tool, *G.R.A.S.P.S.,* to help teachers create authentic performance tasks considering the goal, role, audience, situation, product/performance & purpose, and standards and criteria for success (Wiggins & McTighe, 2005). Understandings and transfer can also be demonstrated through UbD's six facets of understanding. When learners truly understand, they can *explain* the reasons for events, concepts, incidents, phenomena or hypotheses; *interpret* by connecting things to one's own life,

reading between the lines rather than focusing on main events*; apply* their learning at school in various contexts in and outside of schools*; have perspective* looking from different points of view thinking critically*; empathize* by putting themselves in others' shoes, and notice hidden lives which can tell different stories that do not have a single ending*,* and *have self-knowledge* by noticing their capabilities, weaknesses, habits and their effect on one's life.

Stage 3: Plan Learning Experiences and Instruction

Stage 3 assists teachers in determining the learning activities built around the desired results and performance tasks. It enables teachers to double check whether the learning activities will lead to the desired results planned in Stage 1. It makes the teacher ask questions in the process of planning: What does a learning plan that aims for understanding look like? What do they need to learn to reach the desired results? The learning activities are aligned with other stages through the principles of *W.H.E.R.E.T.O.* which stands for enabling the students to understand *where* the unit is headed, *holding* their attention throughout, *equipping* them with tools and knowledge, and creating opportunities for them to *revise* their work, *evaluate* their progress, be *tailored* to reflect individual needs, and *be organized* to enhance deep understanding (Wiggins & McTighe, 2005, p.197-198).

The UbD framework with a language lens offers the same three-stage backward design in culturally and linguistically diverse classes with a specific focus on each student's language development (Heineke & McTighe, 2018). As students are exposed to authentic learning experiences through UbD and deepen their understanding, they automatically improve their language skills. During the process, UbD's stage 1 aims to teach the desired results and transfer goals by pinpointing the fact that students might have different linguistic knowledge and skills. Stage 2 emphasizes that even students with very low language proficiencies can achieve the desired results, hence a suitable assessment can be prepared. Stage 3 enables teachers to ensure that the learning activities are designed with students' different language backgrounds and abilities in mind. An example of a unit plan designed with UbD for a Turkish EFL classroom can be seen in Appendix A.

Studies on Understanding by Design

Throughout the literature, there is consistent evidence that curriculum design based on UbD principles has a positive impact on student learning (Brown, 2004; Gloria et al., 2019; Noble, 2011; Yurtseven et al., 2013), and teacher development and teachers' attitude toward curriculum design process in various disciplines (Boozer, 2014; Kelting-Gibson, 2005; Graff, 2011; Gulsvig, 2009; Yurtseven et al., 2013).

In a study conducted with 41 fifteen-year-old students in the context of a study-school established to prepare students to have necessary knowledge and skills through UbD based curriculum combined with Moodle and Blended Learning to compete on a global scale, Florian and Zimmerman (2015) found that UbD practices enabled the students in the study-school to outperform those in the United States in PISA scores in reading, mathematics, and science. The results also showed that implementation of UbD helped students to gain the necessary skills to compete in the global market economy. Burson (2011) conducted a study with 13 in-service primary school classroom teachers enrolled in Curriculum Analysis and Design course to explore their perspectives on the effectiveness of UbD in increasing positive classroom behavior after being taught how to apply UbD. The study showed that participants were comfortable using UbD in their lessons and they believed it had a positive impact on their students' motivation to participate in the lessons and on classroom behavior. The participants also stated that the UbD framework enabled their students to transfer their knowledge into real life.

Focusing on music teachers' perspectives on the implementation of UbD, Johnson et al. (2017) conducted a study with 300 members of the National Association for Music Education who trained music teachers in their undergraduate courses where the program was designed by UbD. The results indicated that there was a low level of understanding of the principles of UbD and teachers were confused about the term "framework''. However, teachers reported that UbD helped them to see the purpose of their teaching and that students showed a better and deeper understanding of the content. Uluçınar (2021) analyzed 12 studies on teachers' and students' experiences with UbD through a qualitative meta-synthesis process and found that teachers did not have enough experiences with UbD and sufficient pedagogical knowledge. The study also revealed some teachers' challenges such as the intensity of their workload and limited time. They also found it difficult to work with teachers who were unwilling to change and try new teaching methods. In addition, the findings showed that UbD had an effect on students' cognitive development in terms of motivation, understanding the purpose of the lesson, and developing deeper understandings.

Studies on UbD in EFL Settings

Studies on UbD are quite limited in number in EFL. A study conducted in a Colombian EFL context by Bolivar and Rodriguez (2017) focused on 26 tenth grade students' English-speaking skills in a speaking program designed according to UbD principles. The study showed that all the participants enjoyed learning English, improved their speaking skills, and found the lessons more meaningful than the traditionally designed lessons because they were able to connect the lessons to their own lives. The students were also able to show the six facets of understanding during authentic performance tasks. To investigate in-service EFL teachers' perspectives on implementing UbD, Anwaruddin (2013) organized three training workshops on UbD principles for the 21 EFL teachers in Dhaka, Bangladesh. The results revealed that the participants believed that they would be able to apply UbD in their EFL context. However, teachers were concerned about time management and finding enduring understandings related to their units in their skills-based program. Another study conducted by Yurtseven & Altun (2017) with 436 students and 10 teachers at the preparatory school of a state university in Türkiye investigated the impact of UbD on EFL teachers' professional development and students' English language achievement. The results showed that the students in the middle level group outperformed the other groups in their English achievement scores and that teachers benefited from it as well in terms of integrating more authentic use of language which was lacking in their coursebooks. Moreover, the teachers observed that students' motivation and participation had increased. The study also revealed teachers' challenges regarding time limitations and heavy workloads. In an experimental study conducted in an Iranian EFL setting, Hosseini et al. (2019) found that the writing classes designed with backward design improved the writing abilities of 100 EFL learners who were aged between 18 and 25 more than the classes with forward model design that starts with planning learning activities followed by assessments.

As mentioned earlier, the use of UbD framework remains relatively unexplored in the field of EFL, with this gap being particularly noticeable within the Turkish EFL context. Although UbD is not commonly integrated into the initial teacher education programs in our context, certain schools in Türkiye do use the UbD framework as their primary curriculum and unit design approach for K-12 teaching after training their teachers to effectively use it. Nevertheless, the central gap in the existing knowledge is the lack of understanding regarding how UbD is perceived and implemented by these teachers in the Turkish context of teaching. Therefore, this study aims to address this gap by investigating the perspectives of teachers and administrators, shedding light on both the benefits and challenges

associated with UbD implementations. Understanding the benefits and challenges of UbD has the potential to drive enhancements in teaching practices and curriculum designs. Besides, if the study shows that the UbD is perceived to be effective in improving teaching EFL, institutions may choose to invest more in training teachers and adopting this framework. Conversely, by identifying the perceived challenges faced during the implementation of UbD, our study may pave the way for solutions and the provisions of support to teachers. Hence, the study addresses the following the research questions:

1. How do English language teachers and English department heads perceive the

benefits of unit design with the UbD framework in the Turkish EFL context?

2. What are the challenges they face during its implementation?

3. How do they perceive the applicability of the UbD framework to online education during the pandemic?

METHOD

This qualitative study adopted a phenomenological approach to examine and describe the perceived benefits and challenges of UbD framework use. Qualitative description is "amenable to obtaining straight and largely unadorned (i.e. minimally theorized or otherwise transformed or spun) answers to questions of special relevance to practitioners and policy makers" (p. 337) by means of open-ended individual and/or focus group interviews (Sandelowski, 2000). Hence, the data was collected through open- ended questionnaires from 39 English teachers and five English department heads across K-12 levels from five different schools , and semi-structured focus group interviews conducted with seven teachers who responded to the questionnaire. The data was analyzed through content and thematic analysis.

Setting

The study was conducted in five private schools in Istanbul, all of which had been implementing the UbD framework to design units across all grade levels from K-12. At the time of data collection, four of these schools had been using UbD in all subjects as an official school policy for 6-10 years, while one school had adopted it for just one year. In this particular school, UbD was not an official school policy but served as an unofficial English department policy spanning K-12 levels. However, the primary school English department in that particular school had recently adopted UbD and was in the process of designing a new curriculum based on the framework's principles. All of these schools recognized UbD as a framework that prioritizes student understanding and integrated it into their educational policies as the foundation of their planning processes. Their mission and vision statements emphasize the preparation of students for 21st-century skills using innovative approaches to teaching and the cultivation of global citizenship as essential elements of their educational philosophy.

The amount of English instruction hours varied among students in different grades across the schools. Primary and middle school students received 6 to 8 hours of English instruction, while high school students received 2 to 14 hours of instruction weekly. Instructors in these schools typically had teaching loads from 20 to 25 hours per week, and classrooms held approximately 20 to 24 students each. Classes predominantly adopted a student-centered approach, fostering a high degree of interaction among students.

The unit design in each school was fundamentally similar. While some schools utilized coursebooks as part of their curriculum, supplemented by readers selected based on topics in the coursebooks, others developed their own units centered around specific themes. Although the design process within each school maintained consistency with the principles of UbD framework, it did vary based on students' English proficiency and the unique English curriculum for each grade level. UbD can be applied to any curriculum or program, as it provides a universal template for all courses. However, content specifics could differ depending on the distinct contexts in which it was implemented. For example, in primary schools, students might focus on learning colors, family members, or animals, whereas high school students might engage in writing persuasive essays. Both levels could design their units following UbD principles, but the content would significantly differ. Each school conducted training sessions on UbD at the start of the academic year and continued to offer these sessions at various intervals throughout the year based on their staff's specific needs.

Participants

Since the study investigates the perspectives on the use of a specific framework, criterion purposeful sampling was used for the selection of the participants (Crabtree & Miller, 1999). Criterion for sample selection was having a considerable knowledge of UbD and experience in unit design based on UbD principles at different grade levels. Thirty-nine English teachers and five heads of English departments whose unit design experience with UbD ranged from one to fifteen years at K-12 volunteered to participate in this study.

As Table 1 shows, 31 (79%) of the teachers were female and eight (20.5%) were male. Twenty (51%) teachers were native speakers of English and 19 (49%) were native speakers of Turkish. Twenty-nine (74%) held their BA degree in ELT and language related areas such as English Language and Literature while the others held BA degrees in different areas such as Psychology. Seventeen participants (43%) had an MA degree in education, 3 (17%) in English language education and English language literature while only one (2%) participant had a Ph.D. degree. Besides, 18 (46%) participants had a teaching certificate from the Turkish Ministry of National Education (MoNE) while 19 (48%) had a teaching certificate from other institutions (e.g., CELTA).

Table 1

Demographic features of teachers

		N= 39 (%)
Gender	Female	31 (79)
	Male	8 (20.5)
L1	English	20 (51)
	Turkish	19 (49)
Education	BA	29 (74)
	MA	17 (43)

	PhD	1 (2)
Teaching Certificate	MoNE	18 (46)
	Other	19 (48)

Besides, total years of teaching experience of the participating teachers since graduation ranged from two to 29. All teachers had in-service training on unit design in their schools.

Data was also collected from five English department heads, three females and two males, from three of the participating schools. Department heads' total years of teaching experience ranged from nine to 25 years. They also had one to seven years of experience in management at schools where they used UbD. Three of these department heads had master's degrees, while four had a teaching certificate either from MoNE or from other institutions. All the participants had training on unit design and the institutions they worked at provided training for new teachers.

Data Collection Procedure and Analysis

The study was conducted during the pandemic, Spring-Fall 2021, after getting permission from the school administrations and the Ministry of National Education. First, eight schools in which teachers are expected to use UbD framework were contacted and informed about the purpose of the study. Five of these schools granted permission to conduct the study within their context and encouraged their teachers and department heads to participate in our study. Second, to get the approval of the Ministry of Education, the proposal of the study including the data collection instruments was sent to the National Education Directorate in Istanbul. Last, upon the approval of the instruments by the Directorate, the data was collected from those who volunteered to participate in the study.

The data collection process was two-fold. First, two open ended questionnaires, one for teachers and one for department heads, were formed in order to collect their views, based on their experience, on the benefits and challenges of UbD framework use, and the applicability of its principles to design units for online education. The questionnaires included information about the purpose of the study, assurance of privacy, a consent letter, a section to collect demographic information (e.g. gender, education background, teaching experience, and UbD experience) and a section with open-ended questions on the perceived benefits and challenges of UbD implementations (e.g. What is the role of UbD in unit design?, To what extent do you think UbD principles can be applied in your current school context? What are the challenges that you face during the implementation of UbD framework?, How do you think UbD improves your students' English language skills?). Before the actual data collection, the questionnaires were piloted for their wording and clarity with an English teacher who had designed units with UbD in middle and high school settings. Next, due to the Covid-19 pandemic the questionnaires were sent electronically to the participants.

Second, after the administration of the questionnaires, focus group interviews were conducted with seven randomly selected EFL teachers teaching at primary, middle and high school levels at five participating schools to have more insight on the implementation of UbD framework in their context. Two focus groups were formed in a way to involve three and four teachers, and the interviews were scheduled at different times according to the availability of teachers. Group interview was preferred to individual interview, because the group synergy expands the contribution of participants and adds

more depth to the discussions (Crabtree & Miller, 1999). Besides, interviews enabled participants to elaborate more on their responses on the questionnaire. The interviews were made through Zoom and recorded for the purpose of analysis. Data collection procedure was completed in five months.

The data was analyzed through content and thematic analysis methods (Attride-Stirling, 2001; Miles & Huberman, 1994; Saldana, 2011). The former was used to analyze more specific questions (e.g. To what extent have you been able to implement UbD during online education?), while the latter for more general questions (e.g. Please describe your personal experiences and feelings about the implementation of the UbD framework for unit design in your grade level.). After multiple readings of answers, the recurrent organizing themes emerged, which were further reviewed, broken down into smaller units, coded and categorized. The analysis was conducted by two coders independently to ensure that the same meaning was inferred from the same data. A high level of consistency (95% agreement) was achieved between the coders. To achieve the trustworthiness of this study, we applied Lincoln and Guba's (1985) credibility, confirmability, dependability and transferability criteria. We bolstered credibility through the use of multiple data sources, established confirmability and dependibility by involving multiple coders, and enhanced transferability by providing contextual information about the setting of the study.

Ethical Principles

Ethics committee permission for this study was obtained from Yeditepe University Committie of social and humanities ethics committee commission with the decision dated 10.05.2021 and numbered 17/2021.

FINDINGS

Benefits of Unit Design with the UbD Framework

To investigate the role and the perceived benefits of the UbD framework, the participants were asked to elaborate on their experiences in designing units and implementing them at different grade levels. The analysis of their responses revealed 19 categories classified as benefits to students, teachers and language learning as shown in Table 2.

Thirty-three teachers and all the department heads believed that units designed with the UbD framework contributed to their students' overall success. Sixteen teachers said students were more aware of what was expected of them in a specific unit and the purpose of learning. When students understand and know what they must learn, there are no surprises for them in terms of the expected outcomes, which "helps them feel secure and gives them a target that is reachable…and the responsibility to plan their learning process and make up their weaknesses" (Teachers' Questionnaire, T13). Thirteen teachers stated that students were better able to apply their knowledge in different situations by transferring the skills they acquired in these units, because the units emphasized real world skills, which were more meaningful to students. As one teacher explained "What we actually want our students to be able to do in the real world is the starting point of our backward design" (Interview on December 20, 2021, T9). Focus on real world skills also enables students to develop a deeper understanding of big ideas and concepts as verbalized by seven teachers. Besides, teachers also believed UbD increased motivation for learning, and encouraged a reflective and questioning mindset leading to critical thinking as well as autonomous learning as pointed out by one of the department heads.

Table 2

Benefits of the UbD framework

	Teachers N=39	Dept. Heads N=5
Benefits to Students	33	5
Increased awareness of units and outcomes	16	1
Transferring skills	13	2
Deeper understanding	7	2
Critical thinking	6	1
Increased motivation	5	-
Reflective mindset	5	-
Being autonomous	-	1
Benefits to Teachers	30	5
Being more organized	20	3
Focusing on the outcome first	13	1
Focusing on student learning	7	2
Clear stage-planning	7	-
Monitoring student success	5	1
Reflecting regularly	-	1
Resource for teachers	1	-
Benefits to Language learning	28	-
Using English for real purposes	14	-
Meaningful learning	7	-
Becoming confident speakers	5	-
Active use of English	4	-
Going beyond technicalities of language	3	-

Table 2 also shows 30 teachers and all of the department heads believed that they benefited from UbD in the planning and organization of their lessons in a variety of ways. Twenty teachers believed they could better organize their teaching procedure with the UbD framework while 13 and seven stated its principles enabled teachers to have focus on the outcome first and on the student learning, respectively. One teacher explains “When teachers are planning lessons, they often focus on activities rather than targets of that lesson. UbD design directs you to focus on your target first and plan your unit accordingly” (Teachers’ Questionnaire, T1). Besides, UbD allowed teachers to monitor student success and served as a beneficial tool with clear stage-planning.

The findings also revealed that 28 of teachers perceived the benefits of the UbD framework as directly related to language learning. Teachers believed that units designed with UbD improved students’ English language skills as they provided meaningful learning experiences beyond the

technicalities of learning a language, which encouraged the active use of English for real purposes. Hence, students became confident speakers. One of the teachers explained:

I think the stages in UbD help English language skills because there is a focus on what students understand and what they are able to do… Essential questions and enduring understandings in UbD push teachers and learners to move beyond the nuts and bolts of language and push students to use their language skills in more realistic settings. (Teachers' Questionnaire, T4)

Challenges of Unit Design with the UbD Framework

The participants were also inquired about the main difficulties they experienced while designing and implementing units based on the UbD framework. The analysis of their responses revealed institutional, instructional, teacher-related and learner-related challenges shown in Table 3.

Table 3

Challenges of the UbD framework

	Teachers N=39	Dept. Heads N=5
Institutional Challenges	13	1
Limited planning time	6	1
Limited amount of training	4	-
Curricular expectations	2	-
Lack of school policy	1	-
Teaching load	1	-
Instructional Challenges	11	1
Designing authentic assessments	3	-
Confusing stages	3	-
Keeping track of purposeful teaching	3	1
Time taking implementation	2	-
Learner-Related Challenges	8	-
Low proficiency	5	-
Behaviorally challenging learners	2	-
Different classroom dynamics	1	3
Teacher-Related Challenges	5	3
Unwillingness to change	2	-
Different interpretations of UbD	2	-
Inexperience with UbD	1	

Thirteen teachers verbalized a variety of challenges caused by their workplace including limited time for planning, limited amount of training on UbD, institutional expectations regarding the coverage of curriculum, lack of school policy for the implementation of UbD across all levels and subjects, and their teaching load. They mostly complained about the fact that most of the time they did not have enough time to spend on UbD planning. As one of the teachers explained "lack of time

and having lots of hours and grade levels to teach make it difficult to think about the lesson plan and design it thoroughly" (Teachers' Questionnaire, T15). Teachers also believed that the effective implementation of UbD requires on-going in-service training and a school-wide policy promoting the use of UbD. This is because designing units based on its principles becomes a significant challenge when colleagues lack a comprehensive understanding of what UbD entails and how it should be implemented.

Eleven teachers experienced some challenges classified as instructional, which included difficulties in designing authentic assessment tasks, keeping track of purposeful teaching by aligning tasks with standards, following the UbD steps, and implementing the framework in limited time. Table 3 also shows, teachers faced some problems caused by students and teachers. The former included students' low level of proficiency in English, having behaviorally challenging students who are unwilling to participate in activities, and different classroom dynamics. During the interviews, one of the teachers (T4) indicated that it was easier to implement UbD with older and more proficient learners. Teacher-related difficulties, however, stemmed from teachers' resistance to change, the variety in their interpretations of UbD principles and their inexperience in UbD in general. A department head stated: "Some teachers are unsure how to implement the use of enduring questions and understandings. Their attitude seems to be, "Well, I have my own way and it's close enough." (Department Heads Questionnaire, DH5). This participant further commented that teachers did not always take time to understand and welcome innovative ideas like UbD because they took any attempt to better their practice as an "assumption that they are bad teachers".

The UbD Framework in Online Education

Since the data of the study was collected when the education at all levels was unprecedentedly transferred to the online platforms during the pandemic, the participants were also asked to evaluate the applicability of the UbD principles for distance education. Thirteen teachers and all department heads stated that they were fully able to apply UbD during online education while 11 teachers said they could partially implement it. One of the department heads explained "It is still education at the end of the day and the UbD is a framework that can be adjusted in any kind of teaching and learning" (Department Heads' Questionnaire, DH4).

Nine teachers mentioned that technology, especially web 2.0 tools that allowed students to write comments on their friends' ideas, facilitated the use of UbD in online education by making the process of learning more fun, attention-grabbing, and motivating for students, and the process of monitoring student learning more feasible for teachers. Teachers found the UbD principles easy to adapt to online activities but not to the implementation of larger projects (e.g. G.R.A.S.P.S). Besides, one of the teachers also admitted that during the mandatory online education they had more time to work on planning better units with UbD.

On the other hand, nine teachers confirmed that they were not able to adapt UbD at all to online education, which was a new learning curve for everyone. The main difficulty they encountered involved the online assessment of students based on the UbD principles in a reliable and consistent way. One teacher stated "It's been much, much harder. Determining the validity and reliability of an assessment is always difficult when students can cheat and there is less oversight on performance" (Teachers' Questionnaire, T28). Another teacher complained about the exam time being shortened as required by the Ministry of National Education during the pandemic, which made it even more difficult to assess student learning properly because, "a real-world skill cannot

be assessed within a forty-minute exam" (interview with T9). Besides, although they conventionally used essays for summative assessment, one of the high school teachers said "as the exams were no longer seventy minutes, we had to find a whole new type of assessment (to replace essay writing). We did multiple choice exams in English, which we never do. It was not really authentic, it was fake" (interview with T25). In addition to the lack of proper summative assessment, the nature of online education prevented spontaneous conversations and collaboration among students, which meant "students are not able to practice and use the skills they have as much as they could in a classroom" (Teachers' Questionnaire, T4). Hence, whether the course objectives regarding the language skills were achieved or not remained unknown to teachers.

Teachers also verbalized the lack of interaction among students, lack of motivation, discipline problems and some technological problems like unstable internet connection as the main obstacles for successful implementation of UbD units in online education. They stated that no matter how good the unit design was, it had no meaning at all when the students had no access to them due to poor internet connection.

DISCUSSION

The teachers' and department heads' responses revealed findings that concurred with some of the findings of the previously conducted studies. Most of the participants believed that implementing UbD had a positive impact on students' general academic achievement (Brown, 2004, Gloria et al., 2019; Noble, 2011; Özyurt et al., 2021; Uluçınar, 2021; Yurtseven et al., 2013), because they developed deeper understanding of the content (Gloria et al., 2019; Johnson et al., 2017; Uluçınar, 2021), better transferred the knowledge into real life situations (Burson, 2011; Florian & Zimmerman, 2015) and had elevated levels of motivation (Burson, 2011; Uluçınar, 2021; Yurtseven et al., 2013). Most participants also expressed that UbD contributed to students' English language achievement by improving their speaking and writing skills (Bolivar & Rodriguez, 2017; Hosseini, 2019), boosting motivation for language learning and allowing their active participation (Yurtseven & Altun, 2017).

The study revealed that teachers also enhanced their professional performance as they implemented UbD in their classes. This finding is consistent with the results of the recent studies in which teachers developed more positive attitudes towards themselves and the utilization of UbD (Anwaruddin, 2013; Boozer, 2014; Graff, 2011; Gulsvig, 2009). Participants in the current study perceived themselves as more organized during the implementation process as in Yurtseven and Doğan (2018), and more motivated as in Boozer (2014) as they were able to see the purpose of their teaching (Johnson et al., 2017; Kelting-Gibson, 2005) due to their initial focus on desired outcomes and student learning.

On the other hand, teachers' and department heads' experiences with UbD affirmed multiple institutional challenges which were also encountered in other contexts. These challenges include constraints related to time (Anwaruddin, 2013; Uluçınar, 2021; Yurtseven & Altun, 2017), a lack of training (Yurtseven et al., 2013) administrative expectations (McTighe, 2016), the absence of school policy (Uluçınar, 2021; Yurtseven et al., 2013) and heavy workloads (Yurtseven & Altun, 2017; Uluçınar, 2021). Besides, the participants experienced some instructional challenges akin to those observed in Uluçınar's study (2021) regarding the design of authentic assessments, and in Johnson et al.'s study (2017) regarding the management of purposeful teaching and concerns about timely content coverage. Teachers who were hesitant to use UbD in their classes expressed concerns about the need

to cover content within specified timeframes. They also found differentiation and adhering to the stages of the framework during the UbD design process to be challenging.

Furthermore, many participants stated that having students with varying levels of English proficiency, behavioral challenges and diverse classroom dynamics made it difficult to implement UbD in their classes. These findings appear inconsistent with Tomlinson and McTighe's (2006) argument that UbD allows each student to reach their potential and improve their skills, as the framework emphasizes each student individually. However, it is worth noting that the framework can be adapted to meet the unique needs of classrooms with different dynamics and varying English proficiency levels.

The study also uncovered challenges that stemmed from the teachers themselves such as their reluctance to embrace innovative methods and lack of experience in UbD design, which aligns with findings in Uluçınar's study (2021). To avoid this difficulty, McTighe (2016) suggests that teachers should be encouraged to work as a team and UbD should be owned by every member of the school in order for it to work efficiently.

As for the implementation of UbD during distance education, although some of the participants believed that UbD was a framework applicable in every platform, some were partially able to apply it by skipping some steps in the framework such as ensuring the assessments were reliable. There were also teachers who could not apply it at all as it was something new and they did not have a chance to focus on it as their concern was mainly getting through the lessons ensuring students were motivated enough to attend the lessons during the online education.

Conclusion

The present study investigated the perspectives of EFL teachers and department heads tasked to design and implement language teaching units through the UbD framework across all grade levels including online education within the context of their schools. Exploring the experiences and insights of educators actively using UbD was deemed valuable for uncovering the potential benefits and challenges associated with this framework. In this regard this research sought to bridge a significant gap, particularly considering that the adoption of UbD remains limited not only within the Turkish EFL context but also in various educational settings and disciplines.

Given that the participants of the present study expressed more benefits than challenges regarding its application in their context, the insights obtained from active users of UbD can serve as encouragement for other private schools with similar settings and visions in Turkish EFL context to adopt UbD in their course and unit design. These schools should consider contemplating a greater investment in UbD by first training their teachers and then encouraging their efforts to implement its principles so that their students are equipped with the necessary skills to address real-world challenges, develop deeper understandings, and establish meaningful connections through transfer. Furthermore, although this study was conducted in private school settings, the perceived benefits and effectiveness of this framework can also contribute to the English curriculum in public schools. While the restricted number of hours allocated for EFL instruction in public schools remains as the main obstacle for effective language teaching, UbD framework, known for its adaptability to different educational contexts and its capacity to accommodate rich content provided by teachers, can help public schools realign their existing curriculum with UbD principles to emphasize understanding and transfer as the core focus of the curriculum. However, to successfully implement UbD, it is imperative for both administrators and teachers to recognize the necessity for change and maintain an open-minded approach to innovation. In fact, irrespective of whether it is a public or private school, a top-

down change in the program, without teachers internalizing the need for it, will likely be executed reluctantly driven by a sense of obligation, and may not yield success. Therefore, teachers should be educated about UbD as an innovative approach to unit design either by a team of education experts in UbD or as part of their initial teacher education programs, and be offered ongoing trainings and mentoring, and institutional support to reach necessary resources and templates.

Besides, recognizing the potential difficulties, as highlighted in this study, can be helpful for schools to take precautions and plan teaching practices accordingly. For example, given that the UbD process may be time-consuming, schools should develop comprehensive plans for the entire academic year; provide their staff, especially newcomers, with continuous in-service trainings across the year to foster a shared understanding of how UbD principles are implemented. Additionally, schools should refrain from exerting undue pressure on teachers to cover content within strict timeframes, allowing students' learning with UbD to take precedence.

However, the study has some limitations. Since the number of schools in Türkiye where UbD was officially implemented was limited, the study was conducted with a restricted number of participants, particularly department heads. While the number of schools currently implementing UbD may be limited, there exist other institutions where UbD could potentially be used. It is essential for future studies to include these diverse school settings, as the experiences of teachers within their unique contexts may yield distinct results, thus making a valuable contribution to the UbD literature. Another limitation is that the global Covid-19 pandemic prevented face-to-face classroom observations, which could have provided insights into teachers' interactions with students based on the UbD framework. Future research should involve classroom observations and interviews with both teachers and students to gain a deeper understanding of UbD principles. Besides, experimental studies conducted with students may reveal whether the UbD process indeed impacts students' academic achievement and English language skills. Finally, a broader study could encompass the implementation of UbD in various subjects within Turkish schools.

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Appendix A
A sample unit plan designed with UbD

General Information	
Unit:	Welcome To School
Grade Level:	Grade 1
Duration:	6 weeks

<table>
<tr><th colspan="3">Stage 1: Desired Results</th></tr>
<tr><td rowspan="6">Established Goals

Listening:
1Lm.01. Understand, with support, the main point of short talk.
1Ld.01. Recognise a limited range of simple words that are spelled out slowly and clearly.
1Ld.02. Understand, with support, a limited range of short, simple instructions.

Speaking:
1Sc.01. Give basic information about themselves using simple words and phrases.

1Sc.05. Produce short, isolated, rehearsed phrases using gestures and signaled requests for help when necessary.
1Sc.06. Use a limited range of simple grammatical structures, allowing for frequent, basic mistakes.

Reading:
1Rd.01. Recognise, identify, sound and name the letters of the alphabet.
1Rd.03. Understand, with support, simple words and phrases in short, simple, illustrated texts.
1Rd.04. Begin to deduce the meaning of a limited range of simple, familiar words, with support, by linking them to pictures.</td><td colspan="2">Transfer

Students will be able to independently use their learning to...

T1. apply their organizational skills and community habits to different contexts, such as home or social settings to contribute to a safe, respectful, and positive environment.</td></tr>
<tr><td colspan="2">Making Meaning</td></tr>
<tr><td>Enduring Understandings:

EU1. Following school and class rules helps create a safe, respectful and positive community that supports everyone’s learning.

EU2. The organization of our school and classroom environment helps us learn better.

EU3. The use of different tools and resources in our classroom to organize ourselves impacts our learning.

EU4. Kind, respectful and positive relationships within a classroom have a positive impact in our learning.</td><td>Essential Questions:

EQ1. Do we have rules in our school and classroom? Why? How do they help us?

EQ2. What would it be like to live in a world with no rules or organization? Would it be ok if everyone did whatever they felt like doing anytime they wanted?

EQ3. How does our school help us learn?

EQ4. What are some ways to help us organize ourselves in our classroom to learn better?

EQ5. Does our relationship with friends affect our learning? How?</td></tr>
<tr><td colspan="2">Acquisition</td></tr>
<tr><td>Students will know:

K1. classroom objects; a table, desk, ruler, eraser, pencil case, school bag, computer, whiteboard, chairs, crayons, color pencils, books, notebooks</td><td>Students will be able to:

S1. recognize and identify classroom objects, school activities, and school spaces by matching the audio to the pictures, also in a story book.</td></tr>
</table>

Writing 1Wca.01. Write letters and words in a straight line from left to right. 1Wca04. Write familiar words. Use of English 1Ug.02. Use common present simple forms to give basic personal and factual information. 1Ug.05. Use common adjectives, including colours, to say what someone/something is or has. 1Uv.01. Use cardinal numbers 1–20. 1Uv.07. Use common singular nouns, plural nouns [plural 's'] and proper nouns to say what things are.	K2. classroom rules and expectations; listening to the teacher and others, raising their hand to speak, taking turns, using polite language, showing respect for others, sharing materials, taking turns, asking questions, and offering help and encouragement. K3. school activities; read, write, use computers, do math, sing, draw, play, have breakfast and lunch K4. school spaces	S2. identify and follow classroom rules and meet classroom expectations. S3. count and recognize numbers 1-20, and use them to identify objects. S4. describe an object by its colour. S5. describe their daily activities (both at/outside of school, classroom rules and routines, using present simple tense.

Stage 2: Assessment Evidence

Success Criteria	Evaluation Evidence
The booklet should include: 1) a classroom rules chart with pictures representing each item 2) a visual schedule for the week which activities will happen when and where 3) a school map on which different school spaces are located (e.g. bathroom, playground, library)	Performance Task: Welcome to Our School, Froggy! G: to make their new friend feel welcome to school R: students A: the newcomer S: Your teacher announced that there will be a newcomer to your classroom and assigned you as a mentor to help them. The newcomer does not know anything about your school and classroom, so they need to be introduced to the classroom and school community. Your job is to create a welcome booklet with information about class rules and expectations, school spaces and routines. Once you've created your booklet, you will present it to the newcomer and elaborate on each item. P: a welcoming booklet S: clarity, visual appeal, presentation, neatness
	Other Evidence: The type and content of the evidence will change according to the flow of the unit. Teachers can assess the items in the knowledge and skills sections through; ● informal checks for understanding such as dialogues and think-aloud, ● observation,

	● multiple choice, matching, true-false or short-answer format quizzes, ● a combination of mix methods mentioned above.

Stage 3: Learning Plan	
Pre-Assessment *Diagnostic test for literacy, colours, numbers* *KWL chart for class rules and expectations*	
Learning Activities: Orientation-Getting to know each other, ice-breaker games, diagnostic tests Introduction to the big idea and discussing the performance task through essential questions: Why do we come to school? How does our school help us learn? Why do we use certain classroom objects, how do they help us? Present the classroom objects with slides focusing on singular and plural nouns. For each picture ask: ''How does this thing help us learn?'' Froggy can say silly and wrong things such as: a pencil case helps me eat my lunch. Have students correct Froggy. Repeat this with each classroom object. School Bag Craft Classroom objects worksheet Classroom hunt on school objects (pair-work): students walk around the classroom and collect classroom objects in pairs. Then they present what they find to another pair. Story Time: the reading activity is followed by a kind of story report activity such as story jotter, book report, etc. Assessment on classroom objects Introduction to class rules and routines; role-play with Froggy: students will be familiar with school routines, rules, responsibilities and how these help us be organized at school and learn better. During this time, introduce the rules and expectations for their classroom, pair and group work, as well. After the role-play (Froggy doesn't know any rules), ask students how we can help Froggy, then introduce the set of rules with pictures by focusing on kindness specifically. Students might have different understandings of the rules so do modeling with Froggy for each rule. Classroom rules colouring: have students colour the pictures for each rule and tell what each picture represents to their pairs. ''How Would You Feel If … '' Cards (integration of Social Emotional Learning): Go back to the ''Be kind'' rule in the set of the rules and have a discussion with students. Use 'how would you feel if…' cards to have students empathize with some situations and emphasize how to be always kind no matter what happens.	Progress Tracking: Review assessments to check for comprehension and address misunderstandings. Provide additional support or clarification as needed. Monitor progress on performance tasks throughout the lessons.

Create a kindness jar: Discuss how we can be kind to each other. Have students draw random acts of kindness on a piece of paper and collect them in a jar for each group. Pick a card from the kindness jar every day and practice it together with the class until they internalize them. Story Time: This reading activity is followed by a kind of story report activity such as story jotter, book report, etc.) Assessment on Class Rules Introduction to school spaces; brainstorm: students will be learning about the different areas and spaces in their school. This discussion can include places like the classroom, library, playground, cafeteria, sports hall, and other relevant spaces in their school. Revise classroom rules with the pictures, do modeling again. Reinforce positive behaviour. ''Can we do whatever we want wherever we want in our school? For example, can I eat my lunch in the class? etc.'' Elicit answers from students. This activity will help students gain an understanding of the different areas in their school and how each space serves a specific purpose. What spaces do we have in our school? Introduce school spaces with pictures. E.g. This is our library. We can read there or borrow books from the librarian. The librarian helps us with borrowing books. School tour: Take students on a tour around the school and visit different spaces such as the library, cafeteria, playground, etc. Discuss the purpose of each space and how they are organized. Make sure to remind students of the expected behaviour while doing this. School Spaces; pair work: students choose a space, draw it and present what we do in that space: e.g. We read books in the library. Story time: This reading activity is followed by a kind of story report activity such as story jotter, book report, etc. Assessment on School Spaces Performance Tasks, Conclusion, Reflection Discuss the performance task and have students work on it throughout the lessons. Show an example first. Unit reflection sheet or exit card on desired results	

Author Contributions

All authors contributed equally to the manuscript.

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A Teacher Training Program for Learning and Teaching About Scientific Reasoning Skills

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Abstract

This study aims to improve science teachers' scientific reasoning skills (SRS) in using and teaching these skills through a professional development program, Scientific Reasoning Skills Teacher Training Program (SRSTP). Forty-five middle school science teachers participated in the study, which was on convergent parallel design. "Scientific Reasoning Skills Assessment Form (SRSAF)" and "Scientific Reasoning Skills Test for In-service and Pre-service Science Teachers (SRSTIPST)" were used to determine the improvement in teachers' use of scientific reasoning skills. Besides, "Self-efficacy Perceptions towards Teaching Scientific Reasoning Skills Assessment Form (SEPSRSAF)" and "Self-efficacy Perceptions towards Teaching Scientific Reasoning Skills Scale (SEPSRS)" were used to determine teachers' self-efficacy perceptions towards teaching them. Findings from SRSAF and SRSTIPST pointed out that teachers' scores in using specific scientific reasoning skills and their ways of making claims, presenting evidence, and reasoning differed significantly after SRSTP. Findings from SEPSRS showed that teachers got significantly higher scores in creating SRS based learning environment, academic proficiency, using SRS in the classroom, assessment of SRS, and instructional ways for teaching SRS after the professional development program. SEPSRSAF supported these findings by revealing that SRSTP allowed teachers to change their efficacy sources from indirect experience to active experiences and improve personal characteristics such as showing empathy. It was also found that teachers' perceptions of teaching SRS shifted towards teacher-related factors after SRSTP. These findings were discussed, and the contribution of the results was explained.

Keywords

Science teachers, Scientific reasoning skills, Professional development, Teacher training.

Ethics Committee Approval: Ethics committee permission for this study was obtained from Dokuz Eylül University Institute of Educational Sciences Directorate Ethics Committee with the decision dated 18.05.2018 and numbered 05.

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INTRODUCTION

Increasing inclusion of technology into everyday lives makes societies educate appropriate individuals, such as individuals with 21st-century skills for future lives. 21st century skills require communication and collaboration skills, mastery of technology, innovative and creative thinking skills, and problem-solving skills (Larson & Northern Miller, 2011). Inquiry-based learning (IBL) pedagogy is suggested as an effective method for these skills (Chu et al., 2012; Kuhlthau et al., 2015), and scientific reasoning skills (SRS), the main subject of this study, are seen as the functioning way of IBL (Han, 2013; Hogan & Fisherkeller, 2005; Kuhn, 2002; Kuhn & Pearsall, 2000; Zimmerman, 2000). Therefore, SRSs are important for educating students as future citizens.

In the scientific inquiry process, students ask, refine, and evaluate questions; design, refine, and interpret experiments; make observations; collect, represent, organize, analyze, and discuss data; learn and refine theories and models to explain the phenomena (Duschl & Grandy, 2008). However, scientific reasoning skills include asking a scientific question, finding a solution, analyzing data, and interpreting findings (National Research Council [NRC], 1999). This definition of scientific reasoning skills shows their place and importance in IBL. When a student faces a problem, he/she engages in an inquiry process. In this process, he/she determines many possible solutions through hypothetical-deductive reasoning and selects one as a hypothesis to test. Then, he/she makes observations, identifies variables, designs experiments, and collects data. Here, while kinesthetically conducting experiments correspond to using science process skills (SPS), mental skills about inferring causal relations through controlling which variable is dependent/independent correspond to scientific reasoning skills (Chen & Klahr, 1999). When analyzing data, he/she uses causal or correlational reasoning to determine the data patterns or possible causal relationships between variables. Then, tentative conclusions from data patterns are made through inductive, deductive, or causal reasoning. Like controlling variables, while writing a conclusion corresponds to science process skills, mental processes for concluding correspond to scientific reasoning skills. After concluding, if he/she still has questions about the problem, then the cycle, which includes both SPS and SRS, begins with hypothesis generation again. Scientific reasoning skills are required to learn the content of inquiry-based activities (Stender et al., 2018). Because scientific reasoning skills are used in the inquiry process, researchers stated a common view that these skills consist of hypothetical deductive reasoning, inductive reasoning, probabilistic reasoning, proportional reasoning, causal reasoning, correlational reasoning, and control of variables strategy (Lawson, 1978; Zimmerman, 2007).

Although SRSs are important indicators for future societies (Osborne, 2013), according to research findings, students still need to understand how data can be used as evidence (Abdelkareem, 2008; Ibrahim et al., 2016; Sadler et al., 2004; Schimek, 2012). Furthermore, they need to be more capable of using learning when reasoning in authentic contexts (Sadler & Donnelly, 2006). They tend to make and evaluate their arguments based on prior knowledge and beliefs rather than epistemological commitments (Choi et al., 2010). Teachers also need some help with scientific reasoning skills, especially in relation to teaching them. For example, they cannot emphasize some characteristics of IBL, such as evaluating explanations and associating experiment's findings with theoretical knowledge, which corresponds to using scientific reasoning directly (Kang et al., 2008) and creating a classroom culture where the assumption and proof language is used (Geist, 2004; Osborne et al., 2004). Besides, they do not have solid content knowledge (Hilfert Ruppell et al., 2013), and they are incapable of performing some behaviors to promote students' thinking and reasoning (Diezmann et al., 2002; Schwartz et al., 2004).

One way to eliminate these problems is through professional development of teachers. Studies that reported the effect of teacher training on the improvements of teachers' and students' SRS supported this view (Gillies, 2011; Kocagul & Unal Coban, 2022; Smit et al., 2018). However, although the results of some studies informed about the need for training of teachers (Kocagul Saglam & Unal Coban, 2020; Khan & Krell, 2021), teachers' training studies on SRS were rare and existing studies were conducted extensively with teachers in the pre-service (Alonzo & Kim, 2018; Chowning et al., 2012; Gillies, 2011; Hogan et al., 1999; Jacops et al., 2007; Sedova et al., 2016). Furthermore, studies on teachers' training regarding SRS focused heavily on only one reasoning skill (Chowning et al., 2012; Jacops et al., 2007; Wilhelm et al., 2018) or reasoning skills that are different from the skills in the context of this study (Koenig et al., 2012; Tadesse et al., 2017; Wilhelm et al., 2018) or were conducted with different branches of teachers out of science (Jacops et al., 2007).

This study aims to improve the SRS of science teachers in using and teaching these skills through a professional development program, the Scientific Reasoning Skills Teacher Training Program (SRSTP). The study variables are teachers' knowledge about using SRS and self-efficacy perceptions towards teaching them. Knowledge about using SRS was considered mainly by other teacher training studies (Jacops et al., 2007; Koenig et al., 2012; Tadesse et al., 2017; Wilhelm et al., 2018); however, this study also focuses on teachers' self-efficacy perceptions, an important barrier to reflect on their learning in the classroom environment. Furthermore, this study differs in terms of the included SRS. It consists of basic SRS (inductive reasoning, hypothetical-deductive reasoning, causal reasoning, correlational reasoning, proportional reasoning, and control of variables strategy), which researchers agreed on (Lawson, 1978; Zimmerman, 2007). It also includes analogical reasoning, because analogies can be used to promote the understanding of inquiry (Flick, 1991). Seven basic SRSs were taught in different content through various methods such as observation, field trips, modeling, experiments, calculation-based, game-based, and group work.

In this context, the following research problem was considered:

- How does SRSTP affect science teachers' use of SRS and their self-efficacy perceptions toward teaching them?

METHOD

Research Design

This mixed method study addresses determining the impact of SRSTP on teachers' use of scientific reasoning skills and their self-efficacy perceptions towards teaching them. The convergent parallel mixed method design is used and it is a type of design in which qualitative and quantitative data are collected for the same variable simultaneously, analyzed separately, and then merged to provide a comprehensive analysis of the research problem (Creswell & Plano Clark, 2011). In this study, quantitative data for both independent variables (teachers' use of SRS and their self-efficacy perceptions toward teaching them) explain teachers' status, while qualitative data provide justifications. For example, teachers' use of the SRS variable was quantitatively measured through a multiple choice test, and their reasoning style was qualitatively determined using open questions based on scenarios. The reason for choosing this method is that quantitative and qualitative data have the same value to understand the research problem in a comprehensive way.

Participants

The selection of participants was carried out based on purposive sampling. An online application form was created and shared with science teachers through social media groups to determine volunteer teachers. The teachers were then selected based on their gender, professional experience, and geographic region of work where they work. Finally, 45 science teachers working in state or private middle schools participated in the study.

Table 1

Demographic Information on Teachers

Region[a]	*Experience*								
	0-5 years		*6-10 years*		*11-15 years*		*16+ years*		*Total*
	F	*M*	*F*	*M*	*F*	*M*	*F*	*M*	
Aegean	2	-	1	3	2	2	3	1	14
Mediterranean	-	-	-	1	1	-	1	1	4
Black Sea	1	1	1	-	-	-	-	-	3
Marmara	1	-	2	1	1	1	2	-	8
Central Anatolia	-	2	1	1	1	-	2	-	7
East Anatolia	-	3	1	1	-	-	-	-	5
Southeastern Anatolia	2	-	-	1	-	1	-	-	4
Total	6	6	6	8	5	4	8	2	45

Note. N=45

a: Reflects the geographic region of the participants in their work

F: Female and M: Male

Table 1 showed that there were 25 female (55.56%) and 20 male (44.44%) teachers and most of them were from the Aegean region (31.11%). The study was located in Izmir, a city in the Aegean Region. The highest attendance from this region may be due to the ease of transportation in terms of cost. In addition, there was a nearly equal number of teachers in terms of professional experience.

Data Collection Tools

The main aim of this study is to determine whether SRSTP has an impact on ensuring that science teachers learn and teach scientific reasoning skills. Therefore, this study has two independent variables to measure. One is about teachers' content knowledge, which is related to learning about SRS.

Therefore, the first two data collection tools aim to quantitatively and qualitatively measure the knowledge of science teachers about SRS. The other variable is teachers' self-efficacy perception, which is related to the teaching of SRS. The third and fourth data collection tools (2.3.3 and 2.3.4) aim to quantitatively and qualitatively measure the perceptions of self-efficacy of science teachers towards teaching SRS.

Scientific Reasoning Skills Test for In-service and Pre-service Science Teachers (SRSTIPST)

This test, developed by Kocagul Saglam and Unal Coban (2018), aims to determine whether science teachers can use SRS. The test includes 27 items, 4 for inductive reasoning, 3 for deductive reasoning, 5 for causal reasoning, 6 for correlational reasoning, 2 for analogical reasoning, 3 for proportional reasoning, and 4 for control of variables strategy. Expert views confirmed the validity of the content, while factor and item analysis provided evidence for the validity of the construct. Therefore, SRSTIPST, which has only one dimension, is suitable with moderate item difficulty (p=0.523) and high discrimination index (rjx=0.480). The KR-20 reliability coefficient is .812. A sample item is presented in Figure 1.

Figure 1

A Sample Proportional Reasoning Item from SRSTIPST

Deniz is a bike-rider and wants to live the one of X, Y or Z cities. Finally, he decided to live in city Y with the thought of having more chance to ride against car traffic. According to this, which choice is belonged to city Y?

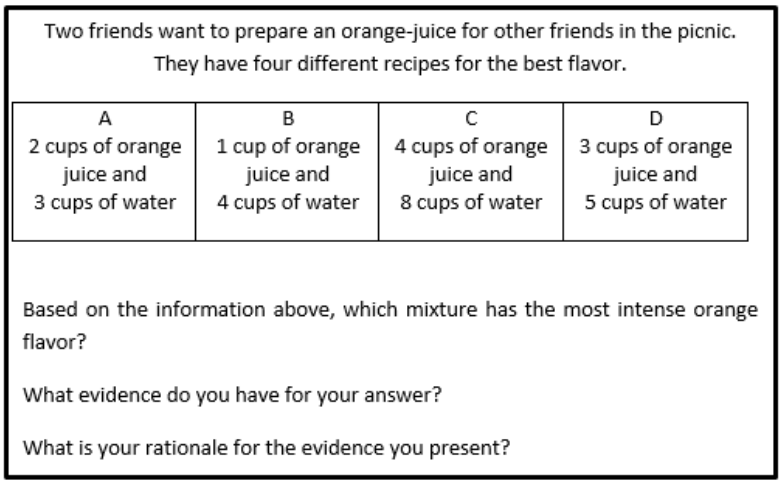
A. 15 hectare area and 12560 cars
B. 3 hectare area and 2502 cars
C. 17 hectare area and 14212 cars
D. 10 hectare area and 7136 cars

Scientific Reasoning Skills Assessment Form (SRSAF)

This form, developed by Kocagul Saglam (2019), aims to determine science teachers' use of SRS in detail based on the "Claim-Evidence-Reasoning Framework" proposed by McNeill and Krajcik (2011). The reason for choosing this framework was to describe the reasoning process in detail. The form includes seven scenarios, each representing a different scientific reasoning skill. Expert opinions confirmed the validity of the content with some revisions. A sample question is presented in Figure 2.

Figure 2

A Sample Proportional Reasoning Question from SRSAF



Two friends want to prepare an orange-juice for other friends in the picnic. They have four different recipes for the best flavor.

A	B	C	D
2 cups of orange juice and 3 cups of water	1 cup of orange juice and 4 cups of water	4 cups of orange juice and 8 cups of water	3 cups of orange juice and 5 cups of water

Based on the information above, which mixture has the most intense orange flavor?

What evidence do you have for your answer?

What is your rationale for the evidence you present?

Self-efficacy Perceptions toward Teaching Scientific Reasoning Skills Scale (SEPSRS)

This scale, developed by Kocagul Saglam (2019), aims to reveal science teachers' self-efficacy perceptions toward teaching SRS. Expert views shed light on content and face validity while explanatory and confirmatory factor analyses for construct validity. The scale includes 20 items under five dimensions entitled creating an SRS-based learning environment, academic proficiency, using SRS in the classroom, assessment of SRS, and instructional ways of teaching SRS, respectively. The Cronbach alpha value for the scale is .947.

Self-efficacy Perceptions Toward Teaching Scientific Reasoning Skills Assessment Form (SEPSRSAF)

This form, developed by Kocagul Saglam (2019), aims to reveal science teachers' self-efficacy perceptions toward teaching SRS. The questions were created based on some components of the Teacher Efficacy Model proposed by Tschannen Moran et al. (1998). The form asks for teachers' efficacy information, personal teaching competence, and analysis of teaching tasks, respectively. The consequences of teacher efficacy and performance are separate from the form because collecting data regarding them is possible only when the teacher teaches. Expert views confirmed the validity of the content and the form, which includes three questions, was implemented for teachers.

Scientific Reasoning Skills Teacher Training Program (SRSTP)

According to Mizell (2010), the success of a professional development program depends on its content related to teachers' classroom problems. Therefore, the Scientific Reasoning Skills Teacher Training Program (SRSTP) was created based on teachers' need to teach SRS (Kocagul Saglam & Unal Coban, 2020). It aimed to increase teachers' awareness about SRS, which they already used without awareness, and their efficacy for promoting SRS-based instructional practices without guidance in their classrooms. In addition, SRSTP activities were organized to allow teachers to experience them as if they were students to contribute to empathy development and communication skills.

SRSTP activities were designed based on the learning principle from simple to complex. In the first part of SRSTP, "Introduction to Scientific Reasoning Skills," teachers engaged in activities to explore the claim, evidence, and reasoning and their similarities and differences. In this part, the terms claim and evidence were presented by constructing the concepts systematically before teaching the term scientific reasoning directly. In the second part, "Defining Scientific Reasoning Skills," teachers engaged in activities to define each reasoning skill independently. Activities in this part aimed to help teachers assess their students' status in each scientific reasoning skill. In the third part, "Development of Scientific Reasoning Skills," teachers experienced pedagogical methods for developing these skills by engaging in activities about three approaches to inquiry-based learning (structured, guided, and open inquiry), transforming existing activities into the inquiry by making small changes, and question types that engage students into the inquiry process. Activities in this part aimed to help teachers understand the role of scientific reasoning in the inquiry process and the interaction between inquiry-based learning, questioning, and scientific reasoning. In the fourth part, "Designing learning environment," teachers used all learning from training in a different subject matter. They visited a water treatment plant and designed an SRS-based learning environment based on the content learned there. The activities in this part aimed to contribute to teachers' awareness of factors related to designing a scientific reasoning-based learning environment. Detailed information on SRSTP activities is shown in Table 2.

Table 2

Dimensions of SRSTP and Activities

Dimensions	*Activity Name*	*Activity Purpose*
Part 1. Introduction to Scientific Reasoning Skills	Role of Evidence in a Claim	Exploring what the evidence is and which data can be used as evidence to support a claim.
	Evidence use in competing theories	Importance of evidence to determine which claim is best and the use of competing theories to develop students' reasoning skills
	Role of Reasoning in a Claim	Emphasizing what the reasoning is and the role of reasoning in making a claim more convincing.
	Similarities and differences between evidence and reasoning	Explaining the differences in the roles of both evidence and reasoning in a claim.
	Assessment of Reasoning	Exploring how teachers give feedback to students about the use of evidence and reasoning and how they guide them.

	Learn-Design-Share-I	Determining the possible difficulties of students with evidence and reasoning taught before five activities and developing an activity to overcome these difficulties.
Part 2. Defining scientific reasoning skills	Inductive reasoning	Experiencing an activity based on inductive reasoning in the context of shadows.
	Deductive reasoning	Experiencing a deductive reasoning-based activity in the context of the Bernoulli principle.
	Causal reasoning	Experiencing causal reasoning from simple to complex processes in the context of electrical circuits.
	Correlational reasoning	Experiencing correlational reasoning through drawing graphs about velocity-time and position-time.
	Control of variables strategy	Experiencing control of variables strategy in the context of factors that affect fermentation.
	Proportional reasoning	Experiencing proportional reasoning in the context of the gold rate.
	Analogical reasoning	Experiencing analogical reasoning in the context of homeostasis.
Part 3. Development of scientific reasoning skills	Assessing the "wh" questions	Analyzing investigable and non-investigable "wh" questions to engage students in the inquiry process.
	Learn-Design-Share-II	Developing "asking questions" activities to promote students inquiry and reasoning skills by strengthening learning in the previous activity.
	Three Approaches to Inquiry	Experiencing structured, guided, and open inquiry approaches and their similarities and differences.
	Adaptation of existing activities to inquiry	Exploring that there is no need to develop specific activities to engage students in inquiry and adapt an existing activity into inquiry.
Part 4. Creating a learning environment	Field trip	Experiencing the stages of the water treatment process.
	Learn-Design-Share-III	Creating and designing a learning environment based on scientific reasoning skills through learning in the previous activity.

The first part of the SRSTP activities lasted 5 hours 15 minutes, the second for 8 hours, the third for 5 hours 15 minutes and the fourth for 12 hours 15 minutes in total. The SRSTP activities included at least one method among observation, experimentation, field trips, calculation-based, game-based, art-based, group work, and modeling activities. For example, in the correlational reasoning activity, teachers read an article about "What should the walking speed be for a healthy life?" and then engaged in the activity to calculate their walking speed. In the proportional reasoning activity, teachers explored

the Fibonacci sequence with a calculation-based activity and then investigated the gold rate of the Mona Lisa with an art-based activity. Finally, in the deductive reasoning activity, teachers conducted experiments to explore Bernoulli's principle and then engaged in a game-based activity to create the farthest-flying aircraft.

Setting

Before implementing SRSTP, an online application form was created and shared in teacher social media groups to determine volunteer teachers. Then, 45 teachers were selected to form a heterogeneous group regarding their gender, years of professional experience, and geographical region where they work. First, teachers completed all data collection tools as pre-tests. Then, the teachers participated in SRSTP activities for four days between 09.00-18.30 hours. Teachers worked in groups of five; however, they individually completed activity worksheets based on the Predict-Observe-Explain (POE) technique. After each activity, whole-class discussions were held on important points emphasized by the activity and how the learning from the activities could integrate into the classes. Finally, after completing all activities, teachers again completed all data collection tools as post-tests.

Data Analysis

SRSTIPST and SRSAF were independently analyzed to answer the research problem. First, the scores were checked for normal distribution to analyze the data from SRSTIPST through statistical programs. The results of the Shapiro-Wilks test showed that the scores did not normally distribute (Zpretest=.863, p=.000; Zposttest=.773, p=.000; Zpre-ir=.638, p=.000; Zpost-ir=.660, p=.000; Zpre-dr=.745, p=.000; Zpost-dr=.776, p=.000; Zpre-cr=.893, p=.001; Zpost-cr=.859, p=.000; Zpre-cor=.881, p=.000; Zpost-cor=.772, p=.000; Zpre-pr=.796, p=.000; Zpost-pr=.618, p=.000; Zpre-cov=.782, p=.000; Zpost-cov=.715, p=.000; Zpre-ar=.613, p=.000; Zpst-ar=.485, p=.000) based on the significance criteria .05 (Buyukozturk, 2012), so the Wilcoxon signed-rank test was used to test if there was a significant difference in SRSTIPST scores after the training. However, next, descriptive analysis was used for the data from SRSAF. The Claim-Evidence-Reasoning Rubric, developed by McNeill and Krajcik (2011), was adapted to Turkish by Kocagul Saglam (2019). The reliability of the adapted rubric was provided by Miles and Huberman's interrater reliability formula (1994). It was found to be 76.35% for the pre-test and 78.35% for the post-test. After that, the rubric scores were checked for normal distribution. The results showed that the total scores before and after the test had a normal distribution (Zpretest=.985, p=.814; Zposttest=.959, p=.111), while the scores of the SRSAF components did not (Zpre-claim=.911, p=.002; Zpost-claim=.903, p=.001; Zpre-evidence=.977, p=.014;. Zpost-evidence=.894, p=.001; Zpre-reasoning=.943, p=.029; Zpost-reasoning=.933, p=.012; Zpre-ir=.879, p=.000; Zpostir=.890, p=.001; Zpre-dr=.819, p=.000; Zpost-dr=.834, p=.000; Zpre-cr=.795, p=.000; Zpost-cr=.837, p=.000; Zpre-cor=.920, p=.005; Zpost-cor=.864, p=.000; Zpre-cov=.823, p=.000; Zpost-cov=.829, p=.000; Zpre-pr=.835, p=.000; Zpost-pr=.918, p=.004; Zpre-ar=.891, p=.001; Zpost-ar=.920, p=.005 Therefore, paired sample t-test was used for total pre and post-test scores, while the Wilcoxon signed-rank test was for SRSAF components. The IzI / sqrt N formula was used to calculate the effect size values for Wilcoxon signed rank test results and was interpreted as small for .10, medium for .30, and large for .50 (Corder & Foreman, 2014). After analysis, the findings of SRSTIPST and SRSAF were interpreted together.

SEPSRS and SEPSRSAF data were also independently analyzed. First, the scores were checked for normal distribution. The results showed that the scores had a normal distribution (Zpretest=.970, p=.295; Zposttest=.941,p=.124; ZpreF1=.974, p=.416; ZpostF1=.909, p=.372; ZpreF2=.958, p=.100; ZpostF2=.958, p=.102; ZpreF3=.963, p=.155; ZpostF3=.917, p=.103; ZpreF4=.973, p=.377;

ZpostF4=.920, p=.107; ZpreF5=.978, p=.551; ZpostF5=.967, p=.079; therefore, paired sample t test was used for all SEPSRS scores. Cohen's formula d was used to calculate the effect size values and was interpreted as small for .20, medium for 50, and large for .80 (Cohen, 1988). However, next, the SEPSRSAF data were analyzed via content analysis. All teachers' answers were coded first and categories were created based on these codes. Then, the frequency value of each code was calculated to interpret teachers' tendencies in their self-efficacy perceptions toward teaching scientific reasoning skills for both pre and post-test answers. After analysis, the findings of SEPSRS and SEPSRSAF were interpreted together.

Ethical Principles

The ethics committee permission for this study was obtained from the Ethics Committee of the Dokuz Eylül University Institute of Educational Sciences Directorate with the decision dated 18.05.2018 and numbered 05.

FINDINGS

SRSTIPST Findings

Wilcoxon signed-rank test results are presented in Table 3.

Table 3

Wilcoxon-signed Rank Test Results for SRSTIPST Scores

Posttest-Pretest	*N*	*Mean Rank*	*Sum of Ranks*	*Z*	*p*	*ES*
Negative rank	12	16.04	192.50	-2.936	.003**	0.44
Positive rank	28	22.41	627.50			
Ties	5					

Note. **p<.01

ES: effect size

Table 3 showed that the total scores of SRSTIPST differed significantly in support of the post-test scores (Z=-2.936; p=.003<.01) with a medium effect. For detailed analysis, the pre- and post-scores of each reasoning skill were also analyzed, and the results are presented in Table 4.

Table 4

Wilcoxon-signed Rank Test Results for Each Reasoning Skill in SRSTIPST

Reasoning Skill	*Posttest-Pretest*	*N*	*Mean Rank*	*Sum of Ranks*	*Z*	*p*	*ES*
Inductive (IR)	Negative rank	12	16.04	192.50	-2.936	.003**	0.44
	Positive rank	28	22.41	627.50			
	Ties	5					
Deductive (DR)	Negative rank	15	12.67	190.00	-.798	.425	0.12
	Positive rank	10	13.50	135.00			
	Ties	20					
Causal (CR)	Negative rank	7	12.21	85.50	-3.094	.002**	0.46
	Positive rank	23	16.50	379.50			
	Ties	15					
Correlational (CoR)	Negative rank	10	14.00	140.00	-2.576	.010*	0.38
	Positive rank	23	18.30	421.00			
	Ties	12					
Proportional (PR)	Negative rank	7	13.71	96.00	-1.890	.059	0.28
	Positive rank	18	12.72	229.00			
	Ties	20					
Analogical (AR)	Negative rank	3	6.33	19.00	-1.303	.193	0.19
	Positive rank	8	5.88	47.00			
	Ties	34					
Control of variable (CoV)	Negative rank	7	8.71	61.00	-1.130	.258	0.16
	Positive rank	11	10.00	110.00			
	Ties	27					

Note. *p<.05, **p<.01

ES: effect size

Table 4 showed significant differences with medium effects in inductive, causal, and correlational reasoning skills in support of post-test scores (Z_{CR}=-3.094; p=.002<.01; Z_{CoR}=-2.576; p=.010<.05).

SRSAF Findings

The paired sample t-test was used for pre and post-total scores, while the Wilcoxon signed-rank test was used for each component and reasoning skill score.

Table 5

Paired Sample t-Test Results for SRSAF Scores

Parameter	*M*	*SD*	*t(44)*	*p*	*Cohen's d*
Pre-test	21.42	4.69	-6.162	.000***	0.97
Post-test	26.13	5.07			

Note. ***p<.001

ES: effect size

According to Table 5, there was a significant difference between pre and post-test total scores of SRSAF in support of post-test scores (t=-6.162; p=.000<.001). The results for detailed analysis are presented in Table 6 and Table 7, respectively.

Table 6

Wilcoxon Signed-rank Test Results for SRSAF Components

Components	*Posttest-Pretest*	*N*	*Mean Rank*	*Sum of Ranks*	*Z*	*p*	*ES*
Making claim (C)	Negative rank	5	13.40	67.00	-4.123	.000***	0.61
	Positive rank	30	18.77	563.00			
	Ties	10					
Presenting evidence (E)	Negative rank	9	15.28	137.50	-4.075	.000***	0.60
	Positive rank	34	23.78	808.50			
	Ties	2					
Reasoning (R)	Negative rank	13	14.69	191.00	-3.288	.001**	0.49
	Positive rank	29	24.55	712.00			
	Ties	3					

Note. ** p<.01, ***p<.001

ES: effect size

Table 6 indicated that the pre- and post-test scores of the teachers of all components of SRSAF differed significantly in support of the post-test scores (Z_C=-4.123, p=.000<.001; Z_E=-4.075, p=.000<.001; Z_R=-3.288, p=.001<.01) with large effects in all components.

The teachers' statements in SRSAF also showed this significance. The difference between the pre- and post-test scores of each component for each teacher was calculated, and the best statements were presented to provide the best examples. For example, in making a claim component, teacher Si. Ak. *(First two letters from name and surname*) gave a wrong answer (0 points) to the deductive reasoning question in the pre-test, but he got 2 points by giving the correct answer in the post-test. Similarly, teacher Sa. Ar. gave a wrong answer (0 points) to the control of variables strategy question in the pre-test, but he could write a complete and correct claim in the post-test. In the presenting evidence component, teacher Gu. Es. provided evidence that did not support her claim (0 points) in the pre-test of the control of variables strategy question, and she provided appropriate and sufficient evidence for her claim (2 points) in the post-test. In the reasoning component, teachers tended to repeat the claim or evidence in the pre-test, but they could link the claim and evidence in the post-test. The best example of reasoning in the control of variables strategy is as follows:

Pre and post-test claim: Materials in different colors absorb different amounts of light (2 points).

Pre and post-test evidence: When equal light is exposed to the same amount of ice, the melting times for ice that has different colors are different (2 points).

Pre reasoning: Materials having different colors absorb different amounts of light (0 points, repeating the claim)

Post reasoning: Colors close to ultraviolet light have a short wavelength and more energy. Therefore, these colors can absorb more light. Because the purple box absorbs more light than other boxes, its temperature increases, and more amount of ice can melt (2 points, relating claim and evidence by using appropriate scientific principles)

Table 7

Wilcoxon Signed-rank Test Results for Each Reasoning Skill in SRSAF

Reasoning Skill	*Posttest-Pretest*	*N*	*Mean Rank*	*Sum of Ranks*	*Z*	*p*	*ES*
Inductive (IR)	Negative rank	4	20.13	80.50	-3.888	.000***	0.58
	Positive rank	31	17.73	549.50			
	Ties	10					
Deductive (DR)	Negative rank	10	14.80	148.00	-1.008	.313	0.15
	Positive rank	17	13.53	230.00			
	Ties	18					
Causal (CR)	Negative rank	8	11.06	88.50	-2.699	.007**	0.40

	Positive rank	20	15.88	317.50			
	Ties	17					
Correlational (CoR)	Negative rank	8	14.63	117.00	-3.762	.000***	0.56
	Positive rank	30	20.80	624.00			
	Ties	7					
Proportional (PR)	Negative rank	14	14.64	205.00	-1.847	.065	0.27
	Positive rank	21	20.24	425.00			
	Ties	10					
Analogical (AR)	Negative rank	12	14.29	171.50	-1.533	.125	0.23
	Positive rank	19	17.08	324.50			
	Ties	14					
Control of variable (CoV)	Negative rank	8	14.29	114.00	-3.524	.000***	0.52
	Positive rank	28	17.08	552.00			
	Ties	9					

Note. **p<.01, ***p<.001 ES: effect size

According to Table 7, the inductive, causal, and correlational reasoning skills of the teachers in addition to control of variables strategy improved significantly (Z_{IR}=-3.888, p=.000<.001; Z_{CR}=-2.699, p=.007<.01; Z_{CoR}=-3.762, p=.000<.001 and Z_{CoV}=-3.524, p=.000<.001). There was a small effect on deductive, proportional, and analogical reasoning and a medium effect on causal reasoning, while there were large effects on inductive and correlational reasoning skills in addition to the control of variables strategy.

In sum, the analysis of teachers' use of SRS indicated significant differences in teachers' pre and post-test total scores and causal and correlational reasoning scores in SRSTIPST. Although it was not significant, teachers' post-test scores for deductive reasoning skills were lower than the pre-test. The SRSAF findings supported significant developments in teachers' use of inductive, causal, and correlational reasoning skills and the control of variables strategy. Unlike the SRSTIPST findings, the SRSAF findings showed an increase, but not significant, in the deductive reasoning scores. In addition, the ways of making claims, presenting evidence, and reasoning of the teachers differed significantly. For example, teachers could justify their claim while they presented evidence of the claim example before training.

Similarly, they could associate their claim with evidence by generally using insufficient scientific principles after training. The SRSAF data verified the significant developments in teachers' use of causal and correlational reasoning skills and revealed the significant differences in other reasoning

skills. In addition, they shed light on the developments in teachers' ways of making claims, presenting evidence, and reasoning. As shown in the SRSAF findings, improvement in the ways of reasoning of teachers could explain the significant differences in some specific reasoning skills.

SEPSRS Findings

The results of the paired sample t-test are presented in Table 8.

Table 8

Paired Sample t-Test Results for SEPSRS Scores

Parameter	*M*	*SD*	*t(44)*	*p*	*Cohen's d*
Pre-test	148.75	22.73	-9.543	.000***	1.48
Post-test	177.26	15.28			

Note. ***p<.001

Table 8 indicated that the total SEPSRS scores differed significantly in support of the post-test scores (t (44)=-9.543, p<.05) with a large effect. Pre and post-scores of each dimension of SEPSRS were also analyzed for detailed analysis. The results are presented in Table 9.

Table 9

Paired Sample t-Test Results for SEPSRS Dimensions

Dimensions	*Parameter*	*M.*	*SD*	*t(44)*	*p*	*Cohen's d*
Creating an SRS-based learning environment (F1)	Pre-test	39.73	5.73	-	.000**	0.97
	Post-test	44.71	4.59	6.501		
Academic proficiency (F2)	Pre-test	26.91	6.17	-	.000**	1.71
	Post-test	35.22	3.16	9.660		
Using SRS in the Classroom (F3)	Pre-test	31.35	4.64	-	.000**	1.27
	Post-test	36.31	3.05	7.294		
Assessment of SRS (F4)	Pre-test	28.60	5.76	-	.000**	1.20
	Post-test	34.64	4.24	7.850		
Instructional ways to teach SRS (F5)	Pre-test	22.15	4.41	-	.000**	1.17
	Post-test	26.37	2.67	7.583		

Note.***p<.001

Table 9 showed that there were significant differences with large effects in all dimensions of SEPSRS dimensions ($t_{F1}(44)=-6.501$, p=.000<.001; $t_{F2}(44)=-9.660$, p=.000<.001; t_{F3} (44)=-7.294, p=.000<.001; t_{F4} (44)=-7.850, p=.000<.001, and $t_{F5}(44)=-7.583$, p=.000<.001).

SEPSRSAF Findings

To compare the results, Tables 10, 11, and 12 presented the pre-and post-test findings for each question.

Table 10

Teachers' Efficacy Sources

Before SRSTP				*After SRSTP*			
Category	*Cod*	*f*	*f%*	*Category*	*Cod*	*f*	*f%*
Vicarious experience	Undergraduate courses	5	11.11	Mastery experience	Learning by doing and living	8	11.9
	Graduate courses	3	6.67		Experiencing conducting a sample lesson	8	11.9
	Seminars, etc.	4	8.89		Introducing each reasoning skill independently	9	13.4
	Social media / Internet	4	8.89		The high number of activities	3	4.4
	Books	3	6.67	Vicarious experience	Discussion sessions held after each activity	4	5.9
Mastery experience	Professional experience	7	15.55		Gaining knowledge about SRS	18	26.9
Other	No answer	19	42.22	Verbal persuasion	Emphasis on the relationship between curriculum and SRS	1	1.5
					Emphasis on the roles of teachers and students	6	8.9
				Psychological/ emotional arousal	Aware that he/she has already taught based on SRS	6	8.9
				Other	No answer	4	5.9

Most teachers (42.23%) pointed out vicarious experiences as the source of existing SRS knowledge before SRSTP, while they mainly benefited from SRSTP through mastery experiences (41.6%) and vicarious experiences (32.8%).

According to Table 11, teachers tended to consider the factors related to them mostly after SRSTP, while they considered student-related factors (32.7%) the most influential factor before training. Furthermore, 72.6% of them considered instructional factors, which only 22.1% of teachers considered before training, the most important factor after SRSTP.

Table 11

Teachers' Instructional Task Analysis

Before SRSTP				*After SRSTP*			
Category	*Cod*	*f*	*f%*	*Category*	*Cod*	*f*	*f%*
Student-related factors	Individual differences	10	13.1	Instructional factors	Asking investigable questions	15	14.4
	Developmental characteristics	10	13.1		Integration of technology	6	5.8
	Content knowledge	3	3.9		Use of analogies	2	1.9
	Knowledge about technology	2	2.6		Emphasis on the relationship between science and daily life	1	0.9
Academic proficiency	Content knowledge	3	3.9		Multisensory instruction	2	1.9
	Pedagogical knowledge	6	7.8		Group work	2	1.9
	Knowledge of science process skills	2	2.6		Inquiry-based learning	7	6.7
	Experimentation skills	2	2.6		Conducting experiments	3	2.8
Environmental factors	Socio-economic factors	11	14.4		Discussion sessions	1	0.9
	Physical status of the classroom	7	9.2		Justifying knowledge	4	3.8
	Attitudes of the school administrator	1	1.3		Teaching claim-evidence-reasoning terms	7	6.7
Instructional factors	Asking questions/inquiries	6	7.8		Teacher's content knowledge	1	0.9
	Use of technology	1	1.3		Behaviors of teachers to promote SRS	20	19.2
	Interdisciplinary teaching	1	1.3		Presentation of clear instructions to students.	5	4.8
	Problem-solving	1	1.3	Student-related factors	Readiness	13	12.5

	Making observations	1	1.3		Developmental level	1	0.9
	Allowing students to be active	3	3.9		Demographical characteristics	3	2.8
	Associating science with daily life	2	2.6		Misconceptions	1	0.9
	Expressing thinking freely	2	2.6		Motivation	8	7.7
	No answer	1	1.3				
Other	No knowledge	1	1.3	Other	No answer	21	46.7

According to Table 12, 22.75% of the teachers felt adequate for teaching SRS, needed development in instructional design (26.31%), and personal factors (43.85%) to feel adequate for teaching SRS before training. However, after training, they stated that SRSTP changed their perceptions about instructional design (64%) and personal factors (36%).

Table 12

Assessment of Personal Teaching Skills of Teachers

Before SRSTP				*After SRSTP*			
Category	*Cod*	*f*	*f%*	*Category*	*Cod*	*f*	*f%*
Instructional design	Promoting students to be an inquirer	3	5.26	Instructional design	Designing an inquiry-based learning environment	13	26
	Active students	2	3.51		Using appropriate Wh questions to promote SRS?	12	24
	Transferring learning	2	3.51		Using analogies	1	2
	Promoting the use of the scientific method	2	3.51		Creating SRS-based activities	6	12
	Asking questions to promote thinking	2	3.51		Showing empathy toward students	2	4
	Designing an SRS-promoted learning environment	4	7.01	Personal factors	Providing guidance	2	4
	Gaining SRS	18	31.58		Classroom behaviors to promote SRS	5	10
Personal factors	Training needs for TPACK[a]	2	3.51		Increased level of SRS knowledge	9	18
	Taking into account individual differences.	1	1.75				
	Guide students	1	1.75				

Other	Problem-solving skills	1	1.75
	Use of technology	2	3.51
	Enough materials and equipment	1	1.75
	No answer	3	5.26

In summary, teachers expressed that their efficacy sources were primarily based on indirect experiences, and only 17.5% of teachers' efficacy sources were based on active experiences. However, after training, the teachers stated that their sources of efficacy were based on active experiences due to SRSTP activities. To support this, teachers rated themselves as having high efficacy in the SEPSRS items on developing students' reasoning skills, knowing about SRS, and coping with problems faced during SRS teaching. Therefore, the finding that reported sources of teacher efficacy that evolved strongly into active experiences could explain and confirm the significant development in the dimension of academic proficiency of SEPSRS.

Before training, teachers determined student-related factors as the most influential factor in developing students' SRS; however, after training, this view evolved into instructional factors. This finding could explain and confirm the significant differences in creating an SRS-based learning environment and using SRS in the SEPSRS classroom dimensions.

Although 77.25% of teachers felt inadequate to teach SRS before training, all teachers gained efficacy in instructional design and personal factors to promote these skills. This finding could also explain and confirm significant developments in instructional ways to teach SRS and the dimensions of academic proficiency of SEPSRS.

DISCUSSION

This study aimed to improve the SRS of science teachers in the use and teaching of these skills. In this context, teachers participated in the SRSTP. Data on their use of SRS and self-efficacy perceptions toward teaching these skills were collected qualitatively and quantitatively for detailed analysis and interpretation.

Findings related to teachers' use of SRS showed significant differences in SRSTIPST total scores, especially in correlational and causal reasoning skills. Additionally, there were significant differences in the total SRSAF scores, especially in the inductive, causal, and correlational reasoning skills, in addition to the control of variables strategy. Some studies indicated that training and transfer could improve scientific reasoning skills (Adey & Shayer, 1994; Chen & Klahr, 1999). Therefore, the improvements in specific reasoning skills may stem from the second part activities of SRSTP. In this part, each scientific reasoning skill was introduced to the teachers and whole-group discussions were held about how each reasoning skill could be developed. For example, teachers engaged in deductive reasoning through a Bernoulli principle activity. In the activity, the teachers made Bernoulli principle experiments first, and then they played a game about the farthest flying aircraft using deductive reasoning skills. Teachers can transfer their learning by answering the questions in data collection tools. This obtained finding was supported by other studies that reported that scientific reasoning skills could be developed and improved through instructional practices (Piraksa et al., 2014; Vass et al., 2000).

The first finding pointed out an interesting thing. Although each scientific reasoning skill was introduced to teachers, only inductive, causal, correlational reasoning skills, and control of variables strategy were found to be improved significantly. This may be due to the commonality of the processes among these reasoning skills. According to Gopnik et al. (2004), knowing causality allows people to predict future events and facilitates understanding the outcome of an event. Based on this, knowing causality or understanding causal reasoning may affect the development of inductive and correlational reasoning skills in addition to the control of variables strategy. Other studies supported that knowing causality affected inductive reasoning skills (Hayes & Thompson, 2007; Opfer & Bulloch, 2007). A similar statement can be used for the control of variables strategy. According to Zimmerman (2005), defining and isolating causal relations is the heart of understanding the control of variables strategy. Although correlation and causation differ, knowing causality implies knowing correlation because causation may occur between correlated variables. The Harrington study (2019) showed that intervention in causality could improve the understanding of causal relationships. On the basis of this, learning causal reasoning may affect the improvement of correlational reasoning.

The second finding was that teachers performed better in making claims, presenting evidence, and describing the reasoning components in SRSAF. Before training, the teachers presented evidence as an example of the claim. This finding may stem from insufficient classroom discussions not focused on experiments' results or on data that could be used as evidence, as Jimenez Aleixandre et al. (2000) said. Similarly, Schimek (2012) reported that students from all grade levels could not use scientific evidence or know-how data could be used as evidence. Furthermore, before training, the reasoning of teachers was based on repeating the claim or evidence. This finding was also a common problem reported in SRS studies (Abdelkareem, 2008; Bell & Linn, 2000; Ibrahim et al., 2016; Lindahl & Lundin, 2016). However, after training, teachers could present the appropriate evidence for the claim and justify their evidence using appropriate but insufficient scientific principles. This finding may stem from the first part activities of SRSTP. In these activities, teachers learned the claim, evidence, and reasoning, their differences and similarities, and the roles of reasoning and evidence in a claim. The obtained finding followed Loch's (2017) study, which reported that the Claim-evidence-reasoning framework promoted students' use of evidence and reasoning in their claims but had no effect on using scientific principles in their reasoning. Furthermore, according to the National Academies of Sciences, Engineering, and Medicine (2018), gaining knowledge through experience facilitates new and related knowledge gain. Therefore, the learnings from the first part of SRSTP can lead to significant differences in the SRSTIPST and SRSAF scores.

Related to the other important finding, Vass et al. (2000) stated that proportional reasoning skills cause developments in correlational reasoning skills. However, although there were significant differences in causal, correlational reasoning, and the control of variables strategy, no significant differences were found in proportional reasoning skills. Therefore, an inconsistency between the two studies occurred.

Another important finding was related to deductive reasoning skills. Although the SRSTIPST findings showed a decrease in the post-test scores for deductive reasoning, the SRSAF findings showed developments in this skill. This inconsistency may be due to the type of data collection tool. SRSTIPST includes long multiple-choice questions, while SRSAF includes short answers. Teachers may struggle with the length of the questions. This finding is supported by other studies that reported difficulties using SRS (Park & Han, 2002; Wooley et al., 2018). These studies informed that when using deductive reasoning, individuals could not read premises carefully in multiple-choice questions and could try to

answer questions based on their beliefs and knowledge, not on premises. One of these reasons may be related to deductive reasoning questions.

SEPSRS findings showed that teachers' total post-test scores were significantly higher than total pre-test scores. Additionally, post-test scores of SEPSRS dimensions also differed significantly from the pre-test scores. The SEPSRSAF findings supported these findings. Teachers stated that mainly vicarious experiences (42.23%) caused their efficacy in teaching SRS before training; however, their sources of efficacy consisted of mastery experiences (41.6%). In SRSTP, teachers first experienced introductory claims-evidence-reasoning activities. Then, each reasoning skill identification, instructional ways, and promoting questions for teaching SRS, and finally, they designed a sample lesson at the end of the training. Teachers engaged in all activities by living and doing and worked collaboratively with other teachers. Researchers said that gaining mastery experiences is the strongest source of self-efficacy beliefs (Bandura, 1977; Brand & Wilkins, 2007). Therefore, the finding that the sources of efficacy reported from teachers consisted mainly of mastery experiences may be the reason for another finding that, while a percentage of 77.25 of teachers said they felt inadequate before training, all stated that they had efficacy for teaching SRS after training. Koponen et al. (2021) also concluded that explicit support of mastery experiences and social persuasion were positively associated with self-efficacy perception.

Another finding was that teachers considered student-related factors mostly for teaching SRS before training. In contrast, the most considered factor was instructional factors, such as asking investigable questions or teacher behaviors, after the training. In other words, the factors considered by teachers in teaching SRS evolved into self-related factors. This may be due to an increase in their knowledge of SRS. Before training, teachers explained that they learned a lot about scientific reasoning skills through vicarious experiences, while nearly half knew nothing about them. Teachers with little or no knowledge might perceive student-related factors, such as developmental level or readiness, and differences, as obstacles to teaching SRS. However, after training, teachers who gained knowledge and efficacy in teaching SRS may think that they can develop students' reasoning skills through well-designed instruction. Other studies reported the effect of instruction on improving SRS (Bezci & Sungur, 2021; Kocagul & Unal Coban, 2022; Yanto et al., 2019).

Conclusion

This study aimed to improve the SRS of science teachers in using and teaching these skills through SRSTP. This study proved that:

- SRSTP is an effective training program to develop teacher knowledge and efficacy in teaching SRS.
- SRSTP allows teachers to improve their use of SRS, especially in causal, correlational, inductive, and deductive reasoning skills and control of variables strategy.
- SRSTP can improve the way teachers make claims, present evidence, and reason.
- SRSTP can develop teacher self-efficacy perceptions toward teaching SRS.

The results obtained have some implications. The most important value of this study is to present an original training program on teaching scientific reasoning skills. In this way, other researchers will be informed about a new teacher training program to improve the status of scientific reasoning skills. Furthermore, the detailed information about SRSTP presented in this study will help other researchers implement the training program in their countries. This may improve students' scientific reasoning

skills worldwide and provide authentic evidence of SRSTP effectiveness. This study also presents a solution to the problem of "not coordinating theory with evidence" that is reported mostly in studies related to scientific reasoning skills. Because teachers could perform better at making claims, presenting evidence, and reasoning when proposing scientific explanations after the SRSTP. Another contribution of this study was the data collection tools. They are all original and can provide rich data. Other researchers should also use these data collection tools.

Recommendations

This study showed that SRSTP was effective in most of the reasoning skills. Therefore, SRSTP may be included at the beginning and end of teachers' seminars to provide more teachers with experience in this training program. In addition, investigable questioning, three inquiry approaches, and adaptation of existing activities to inquiry activities were included in SRSTP. However, it was observed that most teachers still needed a solid understanding of inquiry and argumentation, although curriculums emphasized these instructional ways. Therefore, more teacher training programs focused on inquiry-based learning may be held.

It was also found that SRSTP improved teachers' ability to make claims, present evidence, and reason. Therefore, teachers should engage them in discussion after conducting experiments on how and which data can be used as evidence, comparing groups' results and possible differences between them to develop students' claim-evidence-reasoning skills.

This study considered teachers' use of SRS and their perceptions of self-efficacy towards teaching SRS. Other researchers may test the effect of SRSTP activities on other variables.

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All authors contributed equally to the manuscript.

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Pre-Service Teachers' Motivations to Participate in the Near-Peer Mentoring Program

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Abstract

Recent research indicates that college students experienced increased stress and academic anxiety during the Covid-19 era. Near-peer mentoring is a program that pairs students in different grade levels with the goal of enhancing their academic, emotional, and social development. This study uses the Expectancy-Value Theory to examine the motivation of pre-service science teachers to participate as mentors in the near-peer mentoring program, and the costs they attach to participating in the program. The qualitative research was conducted with a total of twelve pre-service science teachers. Data were collected through individual interviews during the spring semester of 2021. Results revealed that participants found the program useful, benefited from this program in terms of social/emotional support and academic career, and stated that it would be more beneficial if the content of the program were improved. The participants' motivation to participate in the near-peer mentoring program were categorized into seven, from the most beneficial to the least, as follows: (1) developing learning strategies, (2) career planning, (3) access to university services, (4) communication, (5) sense of belonging, (6) academic development, and (7) support in registration and course selection. This research carries notable importance as it can strengthen the sense of community among pre-service teachers. This study is likely to provide an opportunity for the design of near-peer mentoring programs in universities and the development of content in accordance with the findings. Furthermore, the insights derived from this study can be crucial in designing and implementing effective near-peer mentoring programs at tertiary education levels, promising mutual benefits for both the mentor and the mentees.

Keywords

Mentoring program, near-peer mentoring, pre-service teachers, science education.

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INTRODUCTION

The sudden shift to online education during the Covid-19 pandemic has created many challenges for students around the world. During these difficult times, students have experienced many positive and negative aspects of the educational processes and methods. Studies have shown that college students' stress and academic anxiety levels have increased during the Covid-19 process, where their learning and overall motivation decreased, and they suffered from academic and social support from instructors and peers (Son et al., 2020; Tan, 2021). First-year college students face many transition and adjustment issues, and they may be particularly in need of guidance during this process (Akinla et al., 2018; Salimi et al., 2021). College students in their junior or senior years have gone through similar processes, and they may be able to guide students new to college through the difficulties they have experienced.

Near-peer mentoring (NPM) is a form of mentoring in which peer mentors and mentees are close in age and often in the same program at different grade levels. NPM has been shown to help college students with their personal, academic, and professional development (Marshall et al., 2021; Zaniewski & Reinholz, 2016). NPM also provides opportunities for students studying at different grade levels to continue their education with similar interests and explore new areas (Hidayat et al., 2023; Tenenbaum et al., 2014).

Research on NPM points to the positive outcomes of peer mentoring for both mentors and mentees (e.g., Lopatto, 2010). Peer mentors experience the intrinsic motivation of supporting other students to apply concepts to their own lives, and develop new relationships (Colvin & Ashman, 2010). In addition, NPM can enhance mentors' leadership, communication, and organizational skills (Hall & Jaugietis, 2011). Since the goals of teacher education programs are to train pre-service teachers who can adapt to innovation, take informed decisions, be solution-oriented, and renew and develop themselves for real life, the NPM program may provide an opportunity for pre-service teachers to acquire and demonstrate these characteristics. This study examined the motivations of pre-service teachers to participate in the NPM program as mentors according to the Expectancy-Value Theory (Eccles, 1983). This theory provides a comprehensive framework for examining how an individual’s motivation for a task is related to expectations, beliefs, and goals because of behavior. With this goal, the research questions of this study are:

(1) What is the motivation of pre-service teachers to participate in the Near-Peer Mentoring Program as a mentor?

(2) What kind of costs do mentors attach to participating in the Near-Peer Mentoring program?

The significance of this research lies in its potential to enhance the sense of belonging among pre-service teachers in teacher education programs, facilitate exploration of career options, increase motivation (particularly in the context of distance education), foster virtual connections among students who may not have previously interacted despite attending the same university, and improve academic engagement. Additionally, this study is expected to contribute to the design and implementation of effective NPM programs in colleges and universities, ultimately benefiting both mentors and mentees alike.

Expectancy Value Theory (EVT)

Motivation and engagement play a crucial role in creating a successful learning environment, which includes behavioral, sensory, and cognitive aspects (Crosling et al., 2009; Eryılmaz, 2013; Newmann,

1992; Saritepeci et al., 2015; Yang & Wu, 2012). Motivation, as emphasized by Lumsden (1994) and Marzano (2006), refers to an individual's desire and interest to participate in a process. Wigfield et al. (2015) further emphasize that motivation can be observed not only through willingness but also through the intensity of engagement in a particular activity. Ryan and Deci (2000) define motivation as the driving force behind behavior. Therefore, contemporary motivation theories and research focus on understanding and explaining how individuals' beliefs, values, and goals influence their motivation levels (Wigfield et al., 2015).

One widely used theory in the field of motivation is Expectancy-Value Theory (EVT), which links motivation to individual expectations and value perceptions in each context (Atkinson, 1964; Wigfield & Eccles, 2000). EVT posits that motivation results from an individual's expectations for task performance in each context and the values they attribute to the task (Brophy, 1999). Expectations are recognized as a fundamental source of motivation across domains (Eryılmaz, 2013), and values significantly influence choice, effort, and persistence in achievement-related activities (Guo et al., 2015; Marsh et al., 2005). EVT provides a comprehensive framework for analyzing academic and career preferences based on expectations, achievement-related values, and career goals (Eccles, 1983; Wigfield & Eccles, 2000).

According to EVT, students are more motivated to persist and complete a task if they value its accomplishment (Wigfield & Eccles, 2000). Task value, as defined by Eccles (2009), refers to the qualities of a task that increase or decrease the likelihood that an individual will choose it (p. 82). EVT categorizes task value into four dimensions: (1) achievement value, (2) intrinsic value, (3) utility value, and (4) perceived cost (Eccles & Wigfield, 2002; Wigfield & Eccles, 2000). Achievement value refers to the personal significance of a task in relation to an individual's self-concept (Wigfield & Eccles, 2000). Intrinsic value represents the enjoyment or intrinsic interest derived from the task (Wigfield & Eccles, 2000). Utility value refers to the usefulness of the task in achieving an individual's present and future goals (Eccles & Wigfield, 2002). Perceived cost involves what an individual must sacrifice to perform a task and the expected effort required to complete the task (Eccles, 2005, p. 113).

EVT has been widely employed to examine students' motivation, expectations, and educational experiences in diverse programs (Matusovich et al., 2008; Thomson & Palermo, 2018). Research consistently suggests that values strongly predict engagement and persistence in various tasks, programs, and career paths (Wigfield & Eccles, 2000). In the context of peer mentoring programs, the extant literature highlights their potential as influential contextual factors in promoting student motivation and persistence in their chosen fields (Kuhn et al., 2022; Sattler et al., 2012).

Near-Peer Mentoring (NPM) Program

In a constantly changing and complex world, mentoring is an essential approach so that individuals can keep up with the changing conditions, receive emotional support, and develop themselves in various areas. Cornu (2005) described mentoring as “a formal process whereby a more experienced person can give support and advice to a less experienced colleague for the purpose of professional growth” (p. 355). Though mentoring has the same purpose in general, there are various mentoring programs in the literature, including different contexts such as professional mentoring, peer mentoring, and faculty advisors to doctoral student mentoring (Sanchez et al., 2006). In the educational setting, mentorship programs have long been considered a successful model to encourage the development of students in the early years of K-12 and college education (Budge, 2006). Especially, college students’ attrition has long been a source of concern for higher education administrators, so university peer mentoring

programs have been discussed as having the potential to increase student engagement (Sanchez et al., 2006; Terrion & Leonard, 2007). Educational mentoring programs, which can be executed formally and informally, have different instructional aims, such as decreasing dropout rates of students, developing the students pedagogically, and enhancing relationships between students and faculty members (Rodger & Tremblay, 2003).

Students in their early years may have difficulty adapting to the new environment, coping with stress, and networking (Akinla et al., 2018; Singh et al., 2014). Therefore, the NPM program has a crucial role in effective undergraduate education (Colvin & Ashman, 2010; Rodger & Tremblay, 2003). NPM program is a mentoring program that allows undergraduate students or recent graduates to come together as mentors with slightly younger or less experienced students to encourage them professionally and personally (Akinla et al., 2018; Colvin & Ashman, 2010). The difference between the peer mentoring program from other traditional mentoring programs is that the age difference between the mentee and the mentors is slight (Terrion & Leonard, 2007). Colvin (2007) emphasized that it is necessary to identify the roles between mentors and mentees decisively and to provide training for the program in NPM programs. The NPM program has several positive effects on both mentor and mentee students regarding social, cognitive, and professional aspects (Budge, 2006; Krause & Moore, 2022; Rodger & Tremblay, 2003). For example, college students' social and faculty relationships, self-esteem and academic self-efficacy, motivation, self-regulation, and retention rate are developed with the NPM programs (Akinla et al., 2018; Rodger & Tremblay, 2003; Budge, 2006; Zaniewski & Reinholz, 2016).

There are various studies concerning NPM in the literature, but the difference is to align these studies with numerous theories such as social support theory (Hall & Jaugietis, 2011), experiential learning theory (Wagner & Du Toit, 2020), identity-based motivation theory (Madison, 2020), relational model of mentoring (Heirdsfield et al., 2008), self-determination theory, cognitive career theory, social exchange theory (Limeri et al., 2017) and expectancy-value theory (Limeri et al., 2017; Sattler et al., 2012). Among studies that commonly integrate EVT into a peer-mentoring program to understand motivation and outcomes, some studies also combined three emerging theories that are self-determination theory, cognitive career theory, and EVT, in line with the data analysis to demonstrate the motivation of mentors (Limeri et al., 2017). This study was framed with EVT from the perspectives of peer mentors (Wigfield & Eccles, 2000).

Near-Peer Mentoring and Expectancy Value Theory

Near-peer mentoring (NPM) is highlighted in the literature as a divergent form of traditional mentorship at the university level to help students' transition into higher education (Akinla et al., 2018; Heirdsfield et al., 2008). The differences between the aims of participation in programs in NPM and traditional forms of mentoring require a theory that fits the motivation of participation. Literature indicates that participating in an NPM program is associated with expectations and values in peer mentors' and mentees' personal, academic, and professional development (Sattler et al., 2012). With the need for mentoring programs at the university level, many studies have been conducted about NPM considering different theories (i.e., EVT, social support theory, experiential learning theory). These theories vary according to the aim of the mentoring program. Literature reveals that peer mentors are motivated to help other students, apply concepts in their own life, and form new relationships (Colvin & Ashman, 2010). Also, Wigfield and Eccles (2000) claimed that expectancy-value theory (EVT) could allow for a well-aligned study of outcome expectations. From this perspective, this

study has been conducted in line with EVT (Eccles, 1983), reflecting the motivation to be mentors in a science education program.

Various studies in different fields (i.e., engineering, medicine, and education) have been conducted regarding NPM with EVT. Even though many studies consider the EVT as a framework to understand the motivation of peer mentors and mentees to participate in the program, there are some similarities and differences between those studies in the aspects of grade level, context, department, aim, values of the theory, costs, and perspectives (Daley & Zeidan, 2020; Limeri et al., 2017; Sattler et al., 2012). For instance, Sattler and colleagues (2012) revealed a peer mentoring model in an online environment that has value for professional and personal development for graduate students in an engineering program with EVT, particularly regarding the associated value, utility value, and cost. Similarly, Limeri et al. (2017) investigated the mentoring relationship between graduate students as mentees and postgraduate researchers as mentors through the lens of postgraduate mentors in the aspects of motivations for mentoring and their perceived outcomes. Daley and Zeidan (2020), on the other hand, focused on a particular group and showed that EVT is consistent with the mentoring programs in the aspects of motivation and experiences of participants with learning disabilities.

Even though numerous research has been conducted on diverse elements of NPM with EVT, the motivation and experience of the participants may vary by department. For instance, undergraduate students in teacher education programs can benefit from the program in the aspects of teacher professional development as a divergent outcome of the program from medical or engineering programs (Akinla et al., 2018; Cornu, 2005; Sattler et al., 2012). Since NPM may improve mentors' leadership, communication, and organizational skills (Hall & Jaugietis, 2011) as an outcome of the program, participation in an NPM program may be particularly important for pre-service teachers. The aim of the teacher education programs, which are adapting the innovations, taking quick actions, being solution oriented as well as renewing themselves for real life, aligns with the opportunities for pre-service teachers in NPM programs. It may be crucial to explore pre-service science teachers' motivation as mentors to participate in an NPM program developed in an online environment during the Covid-19 pandemic period, when students may need more academic, social, and professional support than before. Therefore, this study utilizes the EVT to investigate the motivations of pre-service teachers to participate in the NPM as a mentor and the costs they attach to participating in the program.

METHOD

Research Design

This research adopts a qualitative exploratory methodology, aligning well with the objectives laid out for studies of this nature as defined by Marshall and Rossman (2016). Such an approach is particularly suited for minimally explored topics and where limited existing literature exists (Creswell & Creswell, 2018). Specifically, the present study focuses on a relatively under-researched area, pre-service teachers' motivations for engaging as near-peer mentors. Due to the scant research available on this subject, this study aims to construct an initial conceptual framework to inform future investigations (Creswell & Creswell, 2018).

Open-ended, semi-structured interviews were conducted to capture a rich, multifaceted understanding. This qualitative data collection technique enables participants to express their viewpoints comprehensively and aligns with the discovery-oriented nature of exploratory research

(Marshall & Rossman, 2016). An inductive thematic analysis was conducted to identify recurring patterns and themes in the collected data. This analytical approach is deemed suitable for under-investigated areas as it allows for data-driven exploration of the topic (Braun & Clarke, 2012). The sample size is intentionally small and purposively selected, consistent with the guidelines for exploratory research, which advocate for the richness of information over statistical generalizability (Marshall & Rossman, 2016). Furthermore, while the EVT serves as a guiding framework for our investigation, it is not the object of formal testing in this study. This flexible application of theoretical constructs is emblematic of the qualitative exploratory research model (Agee, 2009).

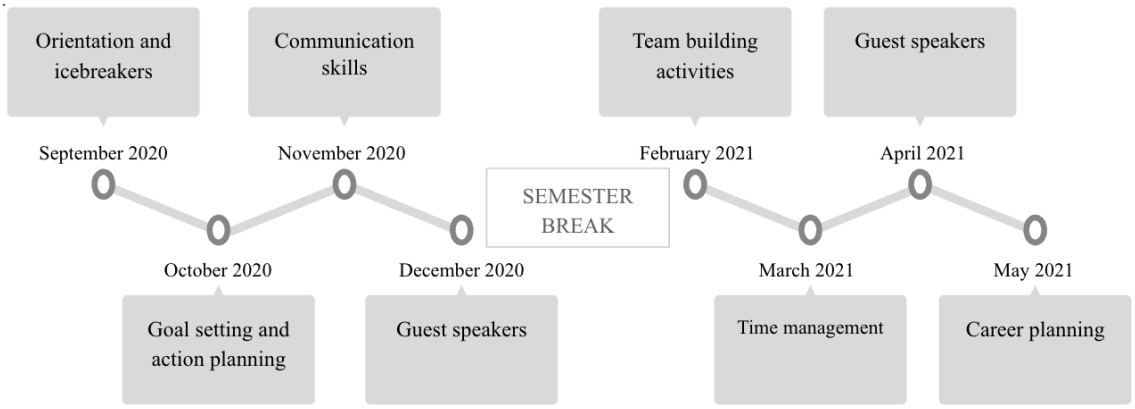
In summary, this investigation embodies the quintessential features of qualitative exploratory research, which include the pursuit of novel insights into less-examined phenomena, the use of open-ended data collection and analysis methods, a small and purposively chosen sample, and a flexible theoretical framework to illuminate the findings (Agee, 2009; Marshall & Rossman, 2016). This approach is congruent with established guidelines for conducting exploratory research in the educational context (Creswell & Creswell, 2018).

Procedure

This study was conducted at a large, research-intensive public university in Turkey. During the Covid-19 pandemic, an NPM program was developed to support first-year pre-service teachers. Junior and senior pre-service teachers volunteered as mentors in the NPM program. As part of the program, these volunteer mentors virtually met with first-year pre-service teachers four times each semester in the 2020-2021 academic year. The first meeting focused on introducing and explaining the purpose of the NPM program. Then, the first-year pre-service teachers listed their expectations for the meetings, and the content of the following sessions was determined according to their needs and expectations. The topics included various activities to enhance the mentoring experience and promote learning and growth (Figure 1).

Figure 1

The flow of the NPM program



As shown in Figure 1, the NPM program was designed to address a comprehensive range of areas, encompassing academic, social, career, and professional development. Through sessions collaboratively shaped to align with the unique needs and objectives of the mentees, the program

provided a targeted approach to skill acquisition, knowledge enhancement, and network building. Specific activities within the program were strategically crafted to cultivate these essential competencies and connections.

The first session was dedicated to an introductory overview, where the foundational principles and objectives of the program were articulated with icebreaker games. Additionally, the meeting provided a forum for mentees to voice their individual expectations for subsequent sessions. The second session focused on goal setting and action planning to guide mentees on specific action steps as a pre-service teacher, target dates, resources needed, potential obstacles and ways to manage challenges. The third session was dedicated on communication skills including conversations and activities on active listening, providing feedback, presentation abilities, etc. The fourth and seventh sessions included invited speakers to give tips and tricks to pre-service teachers about study skills, campus resources and services, as well as student clubs. The fifth session included team building activities to promote sense of belonging and a community of practice. The sixth session was on time management to help mentees develop time management skills and strategies. The last session was on conversations concerning post-graduate trajectories and vocational avenues within the domain of science education were a focal point of discussion.

Participants

Participants of the current study were twelve junior and senior pre-service teachers in the science education program who volunteered to be peer mentors. These twelve participants were between 21 and 26 years of age, and all of them were female. Participants were selected through purposive sampling. The selection criteria were that they were junior and senior pre-service science teachers who participated as mentors. The research objective was to investigate the motivations and perceived costs associated with pre-service teacher mentors. This approach is in line with the use of purposive sampling, a technique where participants are deliberately selected based on their specific relevance to the research questions, guided by predetermined criteria (Etikan et al., 2016). With a sample size of twelve participants, the study adhered to the principles of purposive sampling, prioritizing the attainment of nuanced, qualitative insights over statistical representativeness.

Data Collection

This study was designed as a qualitative inquiry to investigate the motivation of pre-service science teachers to participate in the NPM program as mentors, and the costs they attach to participating in the program. Data sources for the current study included semi-structured interviews with junior and senior pre-service teachers who participated in the NPM program voluntarily as mentors in the 2021 Spring semester to provide an in-depth understanding of their mentoring experience. The interview questions were approved by the university's human subject research review board (E-84391427-050.01.04-18323). Participants was informed about the study and filled out the consent form prior to data collection. The individual interviews were held by the first three authors via Zoom and, on average, were 30 minutes long. The interviews were audio-recorded and then transcribed.

In developing the interview protocol for the present study, the initial step involved a comprehensive literature review centered on the topic of near-peer mentoring programs. This review served to highlight existing research gaps, notably the dearth of studies exploring the motivations of pre-service teachers to act as mentors. Previous research indicated various benefits for mentors, such as enhanced leadership, teaching skills, and communication abilities (Hall & Jaugietis, 2011). However, the specific motivations that drive pre-service teachers to become mentors remained largely unexamined, thus

necessitating further inquiry. Given this identified research gap, the interview questions were strategically formulated to align closely with the study's objectives, particularly focusing on mentors' motivations and perceived costs associated with participation. The EVT framework (Eccles et al., 1983) served as the theoretical scaffolding for the structuring of the questions. A matrix was developed to map each interview question to the corresponding research question and EVT construct, thereby ensuring that the questions were anchored both in the study's aims and its theoretical underpinning.

Approximately 5-7 open-ended questions were devised, in accordance with Turner's (2010) guidelines, to afford participants the latitude to elaborate on their experiences and perspectives in depth. Predefined follow-up probes were also incorporated into the protocol for instances where further clarification or exemplification would be necessary. Expert methodology consultants reviewed the draft protocol, offering feedback with respect to its alignment with the study's goals and the clarity of the questions posed. Based on this external review, the protocol underwent subsequent revisions aimed at bolstering its validity. A pilot test was conducted with 2-3 participants, resulting in additional refinements based on these preliminary interviews. Ultimately, the final interview protocol emerged as a rigorously designed tool, firmly anchored in the existing literature, the study's explicit objectives, and its theoretical framework (Appendix 1). This meticulous design process contributes to the credibility and trustworthiness of the qualitative findings derived from the study.

Data Analysis

In this study, qualitative content analysis was used. Each participant was coded with numbers. Interviews were transcribed anonymously with assigned numbers. The data were analyzed using thematic analysis within the EVT framework. First, researchers constructed the codes and themes individually regarding the EVT framework. Then, the codes and themes were brought together and sorted out. Researchers selected, examined, simplified, summarized, and transformed the data. Common codes and themes were determined. The first three researchers independently read the transcribed interviews and coded them individually. Researchers compared coding results and discussed coding categories between reading episodes until reaching full agreement.

Ethical Principles

Ethics committee permission for this study was obtained from Rectorate of the University of Boğaziçi Social Sciences and Humanities Human Research Ethics Committee with the decision dated 18.06.2021 and numbered 2021/05.

FINDINGS

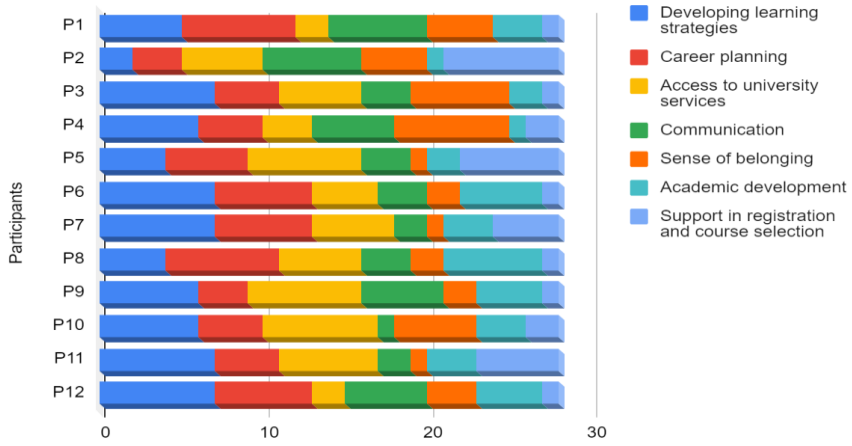
According to the research questions, the results were formed into two categories as motivation and cost. For the first research question, utility, common problems, sense of belonging, and socialization codes emerged as the motivation of the participants. The utility value that the participants attached to the NPM program were the most mentioned category and had subcategories such as academic development, career planning, and personal/emotional support. The costs attached to the program are categorized as engagement and program. Low participation and lack of time were examples of the engagement category while unplanned schedule and lack of content were of the program category.

The Motivation of Participants to Participate in the Near-Peer Mentoring Program as a Mentor

The participants' motivation to participate in the NPM program was categorized into seven. The frequency from the most beneficial to the least as follows: (1) developing learning strategies, (2) career planning, (3) access to university services, (4) communication, (5) sense of belonging, (6) academic development, and (7) support in registration and course selection (see Figure 2).

Figure 2

The motivation of participants to participate in the NPM program



According to the analysis of the first research question, four subcategories were formed, which are utility, sense of belonging, socializing, and common problems (see Table 1). The highest motivation among participants to participate in the program was grouped in the utility category, where all the participants found the NPM program useful. The second most common motivation for participants to participate in the program was grouped in the category of common problems, where most of the participants stated the common problems experienced by mentees and mentors as a source of motivation to participate in the program. Sense of belonging and socializing also emerged as categories that participants indicated for the motivation to participate in the program as mentors.

Table 1

The Motivation of Participants to Participate in the NPM Program

Category	Subcategory	Number of Participants	Sample Participant Statements
Motivation	Utility	12	Participant 1: "My biggest motivation was that someone benefits from our experiences, changes their lives according to these experiences, and makes their lives easier for them."
	Common Problems	9	Participant 4: "I always say when I encounter with something that I wish someone had told me this before. For example, I had the thought of changing a department before or I had questions about how I could study for a course or there were questions about which teacher I should choose. There was no someone who could help me. There was no one I could ask. I said that if I participate in such a program as a mentor, I will help from the beginning of the preparation whether it is about who they should take in the course selection or how they should study."
	Sense of Belonging	3	Participant 2: "I was a remedial student, actually it took a long time for me to feel a sense of belonging to the school. The aim of the program was to help get to know the school, the culture of the university, the department, and the operation, and to provide guidance. I thought this program might be very useful. My motivation was that."
	Socialization	2	Participant 5: "When I was studying as an undergraduate, I said: I wish there was a guide for me. I wish I knew more people from departments or could meet with my professors or not only in class but also through different programs."

According to the analysis, the utility value that the participants attached to the NPM program were the most mentioned category and included subcategories in academic development, career planning, and personal/emotional support. Specifically, in terms of the utility of the NPM program for academic development, two subcategories emerged. The first one was the academic contribution, where most of the participants found the program useful considering learning about instructors and courses. The second one was content which included content development, improving communication skills, and classroom management. Half of the participants found the program valuable in terms of content development for science education (Table 2).

Table 2

Utility of the NPM Program for Academic Development

Category	Subcategory	Number of Participants	Sample Participant Statements
Utility value for academic development	Academic Contribution	8	Participant 3: "Probably not much. My expectation was not like a benefit, as I already said academically as well. Those meetings were like meeting with our friends. In other words, I don't think it adds anything academically to me as feedback because it's always been like information transfer. It was like we were having coffee with our friends. That's why I don't think it's a very professional benefit."
	Content	6	Participant 2: "Collecting content or, for example, coping with the problem when the participation is not high and producing new content has developed academically. I am studying in the science education department. One of the biggest parts of my job is to produce content and shape things according to the current situation. In this respect, it was academically useful."

In terms of the utility of the NPM program for career planning, half of the participants stated that the program was useful in terms of introducing different career paths and providing networking (Table 3). As networking, both mentees and mentors got to know each other and see how they work in a community. The participants stated that the program enabled mentees to learn career paths that they did not know before. The mentees also had a chance to communicate with the professors whose courses they did not take. Additionally, the participants emphasized that they also learned about different opportunities to advance in science education thanks to the communication they established with each other and with the professors. The program subcategory means the science teaching program. Some of the participants indicated that the NPM program was useful in terms of knowledge related to science teaching such as content creation, technological tools, useful websites for students, ice-breaking activities, and teaching and leading skills. Most of the mentors expressed that taking different responsibilities in meetings was preparing them to be a teacher. Even though the meetings had different topics than science education, the mentors had a chance to practice and improve their classroom management and leadership skills. In the non-utility subcategory, students expressed that they already know about their friends' experiences, so the program did not bring any utility in terms of career planning for mentors.

Table 3

Utility of the NPM Program for Academic Development

Category	Subcategory	Number of Participants	Sample Participant Statements
Utility value for career planning	Career Path	6	Participant 6: "In terms of career, there was a peer meeting about a master's degree. If you ask if it meant a lot to me on the first dates, no, but on the last dates, yes. What can happen when you graduated with a master's degree? My friend mentioned that he works for a company."
	Non-utility	5	Participant 12: "I would have benefited from the experiences of my friends as I listened to the mentors' own experiences during this process, but I already knew what everyone was doing, as we had a warm atmosphere in the department with the mentors. However, for someone who does not know, I think it will help."
	Program	4	Participant 2: "Planning, organization, producing content, communicating with people and maintaining them, answering questions, sharing experiences, and exchanging ideas are all part of our profession. These kinds of things are important because I am planning an academic career, not just working in the field. You set a purpose for something that is valuable and you work for it. You discuss the pros and cons. You are looking for a solution. These items are at the forefront of both academic and professional requirements."

In terms of the utility of the NPM program for personal/emotional support, all the participants found the program beneficial for themselves, and the vast majority of the participants found the program useful for socialization, happiness, and emotional satisfaction (Table 4). Since the program was conducted during distance education, participants had a chance to socialize with their peers. Moreover, that period was mentioned as depressive by most of the students for different reasons such as health problems, family problems, or unsuccessfulness. The participants regarded the program as bringing happiness because it provided an environment where they can get away from such problems. The participants stated that they were able to meet their social needs as there were alternative meeting times where they could spend time together with other students, share their experiences in that period, and find possible solutions for their problems. The way they support each other enabled them to achieve emotional satisfaction.

Table 4

Utility of the NPM Program for Personal/Emotional Support

Category	Subcategory	Number of Participants	Sample Participant Statements
Utility value	Socialization	11	Participant 1: "This program was very good for me in terms of sociality. I felt very good after each meeting. Starting to see such different people, talking about different things. It is time to talk for us because we are constantly listening during the lesson. Frankly, it was good for me that we were more active."
	Happiness	9	Participant 12: "Absolutely. I can definitely say here. Because it was a time when we were very depressed, I can say that those meetings really made us happy. I do not remember ever complaining."
	Emotional Satisfaction	5	Participant 2: "It is not just socialization, they are things that support each other when morale and motivation rise from there. I saw people after a day I spend alone, I chatted, it provided emotional satisfaction. It's nice to pass on what you know to people because people take advantage of it."

The Costs Participants Attached in Engaging in the Near-Peer Mentoring Program

The second research question was about the costs of the NPM program. The definition of the cost category was the stated sacrifices participants experience while serving as mentors in the NPM program. Half of the participants stated that they did not attach a cost to participating in the program. However, participants who attached a cost to participating in the program expressed the hardships considering engagement and the program (Table 5). The cost of engagement in the NPM program included low participation, lack of communication, workload, low motivation, failure to attend on time, and lack of time. The cost for program content in the NPM program included a lack of content, unplanned schedules, and the uncertainty of the content.

Table 5

Utility of the NPM Program for Personal/Emotional Support

Category	Subcategory	Number of Participants	Sample Participant Statements
Cost	Program content	11	Participant 2: "We may have had difficulties in producing content that appeals to everyone during this pandemic period."
	Engagement	9	Participant 6: "I just could not always attend meetings. Because it was a crowded team, there was difficulty in finding the common time."
	No-cost	5	Participant 4: "No, it was not difficult for me. It used to happen every two or three weeks. My classes were busy, yes, but it's not something that takes a long time. There was no difficulty for me, such as arranging meeting times, workload, or allocating time."

DISCUSSION

The current study focused on the motivation and cost of participating in the NPM programs. Similar to the finding of this research, the utility and intrinsic value categories are consistent with the literature (Budge 2006; Colvin & Ashman, 2010). However, the importance of the program might be different for mentors in line with the contents of the program and participation. When the program's utility is considered, mentors might regard one category as beneficial for mentees rather than mentors. Although the mentors stated academic development and support for courses as the second most useful aspect of this program, they indicated that the program did not contribute to their academic development because they evaluated the program in terms of both mentors' and mentees' points of view and they saw it as an experience sharing and conversation environment. This finding is consistent with the literature that indicates mentorship programs were effective in satisfaction but did not improve academic performance (Sanchez, 2006).

In the study of Terrion and Leonard (2007), they cited career-related function as one of the important features of the program. However, in the current study, mentors stated that they benefited from speakers and each other in terms of different career options, but they did not consider it a prominent aspect of the entire program. When the entire NPM program is considered, it has been seen that this program is quite beneficial in terms of personal emotional support, as well as support in registration and course selection in the literature, the importance of the ability to arrange a schedule together for meetings was emphasized as the difficulty of mentoring programs (Terrion & Leonard, 2007). Like the findings of this current study, relevant research also reported that mentors and mentees often use the lack of time to explain the cost associated with their mentoring relationships. Considering the costs attached to the program, when asked what can be done to overcome these difficulties, the vast majority of the participants offered suggestions about the development of the content of the program and promoting the program to the new coming students. Most of the participants indicated that

compulsory participation in the program and face-to-face meetings should be provided for close relationships among the participants. In addition, the vast majority of the participants stated that they would like to receive support/training for being mentors in order to improve the effectiveness of the NPM program.

Similar to the findings of the current study, Terrion and Leonard's study (2007) revealed that mentors had not been trained before, but as a result of the study, mentoring training was actually necessary, as it arose in the current study. Also, Terrion and Leonard (2007) suggested that taking at least one year of training to join the mentoring program as a mentor would make mentors more proficient, and this should be considered as a criterion for the choice of mentor. It has been emphasized that volunteering and training are necessary for successful mentors in their field (Terrion & Leonard, 2007). Similarly, in the current study, mentors stated that training is necessary and thus the program becomes more planned and effective. When considering the practical and research implications of this study considering the above results and discussions, this program can be conducted more planned in terms of time and content, and mentor training can be given to volunteers. The limitations of this research were that the number of participants was small and the interviews with mentees couldn't be conducted. Therefore, future research can be conducted with more participants from other departments and mentees. Furthermore, the voluntary participants of the current study were female, thus, further research may be conducted in a more gender balanced NPM program.

The findings of this study indicated differences in the perceived motivations and costs described by pre-service science teachers as peer mentors. Given the potential benefits to participants, NPM programs may be designed to provide clear roles, responsibilities, and expectations from mentors and mentees to maximize the support provided to mentees. This study will contribute to mentoring literature for the researchers to develop and design effective NPM programs when considering the mentors' perspectives. Future research may focus on the mentees' perspectives on the effectiveness of the NPM programs. The findings of this study may also lead researchers and educators who work on near-peer mentoring to find innovative approaches to improve the utility of the program for mentors.

Conclusion, Limitations and Recommendations

This study examined the motivations and costs associated with participating in NPM programs. The findings aligned with previous research regarding the utility and intrinsic value categories. However, mentors' perceptions of program importance varied based on content and participation. While mentors acknowledged the program's benefit to mentees, they did not view it as significantly contributing to their own academic development. The study also emphasized the value of emotional support in mentoring relationships. This may be particularly important in pandemic times.

Regarding the costs participants associated to the program, they suggested an improve in the program content to make it more relevant to the needs of the mentees, making participation compulsory, and when possible, organizing face-to-face meetings. Participants also indicated a need for mentor training to enhance program effectiveness. Future research could be conducted with a larger sample, including interviews with mentees, and considering gender balance. The findings of this study provide insights for promoting effective design of NPM programs, including clear roles, responsibilities, and expectations to escalate support for mentees.

Based on the findings of this study, several recommendations can be made to strengthen the effectiveness of the NPM programs and to promote the motivation of the mentors. First, a detailed

planning for the time and content of the NPM program is recommended to meet the needs and expectations of the mentees and mentors. NPM program developers may include emotional, academic, and professional support in the mentorship program. Including mentorship training is the second suggestion based on the findings of this study. Mentorship training could help mentors develop the skills and knowledge necessary to effectively support mentees. The training program could include communication skills, goal setting, and career guidance.

Another suggestion based on the findings of the study is incorporating clearly defined roles, responsibilities, and expectations for both mentors and mentees to improve the effectiveness of the program. NPM program developers and mentors could also be encouraged to include innovative approaches to promote the utility of the program. The innovative approaches could include integrating new technologies and exploring mentoring models addressing specific challenges.

Future research could also include a more gender-balanced participants to establish a more complete understanding of NPM programs. This may provide insights into potential gender differences in the mentoring motivations, costs, and outcomes. Finally, participants from different departments could help expanding the scope of the research and help developing a broader understanding of the effectiveness and impact of NPM programs across academic disciplines.

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Appendix 1

Interview Protocol

1. What is your motivation for participating in the peer mentoring program?
2. What were your expectations from this program?
3. Which topics were discussed in the group meetings within the program?
4. What was your contribution/influence in the group meetings within the program?
5. Did the peer mentoring program benefit/contribute to you? Please explain
6. Do you think the peer mentoring program helped/contributed to the mentees? Please explain
7. Has the peer mentoring program been challenging for you? Please explain
8. Do you think the peer mentoring program had any challenges for the mentees? Please explain
9. What do you think can be done to overcome the challenges you mentioned?

Author Contributions

All authors contributed equally to the manuscript.

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A Comparative Analysis of Gifted and Typically Developing Secondary School Students' Perceptions of the Future

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Abstract

This study is to examine the future perceptions of typically developing and gifted secondary school students. The participants consisted of sixth-grade students, typically developing and gifted, enrolled in two different secondary schools in the Marmara region of Turkey during the 2022-2023 academic year. The study, which was designed as a basic qualitative study, used a phenomenological study design. The future perceptions of typically developing and gifted students were assessed through story completion and drawing activities. The story completion activity revealed that the future literacy dimension of fictionalizing the future used the expressions corresponding to the dystopia (future anxiety) sub-dimension more intensely than the utopia (future hope) sub-dimension. In the drawing activity, it was observed that participants frequently used objects related to the Utopia sub-dimension. However, the fact that they did not include many expressions corresponding to the dimensions of preparing for the future, planning, and controlling the future shows that their future expectations are harmful and that they feel inadequate in terms of preparing, planning, and controlling against these negativities. For this reason, it would be beneficial to conduct studies on the development of future literacy skills in the curriculum so that students can take action to prepare for the future.

Keywords

Future perception, future literacy, typically developing students, gifted students.

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INTRODUCTION

By nature, humans have been making predictions, inventing, designing, and planning since ancient times. Many of the inventions we benefit from today have their roots in ancient times. However, thanks to scientific and technological progress and individual and social development, inventions that facilitate human life have become universal (Daştan, 2021). What is meant by individual and social development is that people become open to cognitive development and begin to make predictions and plans by thinking about the past, present, and future. In this regard, people have learned to plan for the near and distant future and become aware of what they must do next. This situation highlights the development of the human ability to think about the future.

Predicting the future involves forming perspectives and approaches for all positive and negative life situations. It does not represent any profession, gender, race, religion or community and cannot be attributed to specific individuals, institutions or societies. Every individual who seeks his or her well-being and the well-being of society can consider every aspect of life through the ability to think about the future. In particular, by utilizing current knowledge and technology, every individual, society, institution, and company can create their vision for the future and shape their destiny. Whether it's individual or societal, it is believed that a strong vision can propel humanity forward. Individuals with a genuine vision can actively shape and change future outcomes by continuously acting through the "now" (Frey, 2014). From this perspective, in order for societies to have a vision, it is crucial to improve the ability of the individuals who make up societies to read and interpret the future.

Future literacy refers to the ability of individuals and societies to read and interpret the future. UNESCO (2020) defines future literacy as the ability to imagine and interpret possible, probable, and desirable futures and consider today’s potential in shaping the future. Future literacy is a learned skill that fosters analytical rigor in predictive activities such as future studies and organizational foresight (Miller, 2015). To possess the skill of future literacy, it is critical to consider the future along with the past and present. This is because to make predictions about the future, it is necessary to learn from past events and know about current conditions. Individuals who can quickly adapt to changes and developments by considering the past, present, and future and who can control the factors can be said to have developed an awareness of future literacy (Acar, 2019).

Individuals' perspectives on future literacy are influenced by their interactions with people in their social environment, their family's expectations, their personal goals, their living conditions, their academic performance, the physical environment of their school, the variety of social activities available, and their motivation to engage in these activities (Yavuzer et al., 2005; Baş & Altun, 2020). At this point, it is essential not to overlook the significant role of learning-teaching processes in the development of individuals' future literacy skills.

Secondary school is one of the most important stages in forming desires and expectations for the future. This period is crucial for personality formation, career orientation, assuming social roles, and shaping the future of individuals. During the secondary school period, students undertake tasks such as personality formation and career choice, gaining admission to a higher school, and adapting to individual and social roles (Baş & Altun, 2020). It is recognized that the influence of family, teachers, friends, school administrators, and various environmental factors play an critical role in shaping the future of individuals (Uluçay et al., 2014). Given the amount of time individuals spend in the school environment, it can be argued that the influence of the school is significant in shaping their futures and future aspirations and expectations, as these are influenced by various factors within the school.

In determining secondary school students' perceptions of the future, it is crucial to identify a pattern regarding future literacy skills. In this regard, Altun (2020) stated that future literacy skill begins with envisioning the future and establishing a pattern consisting of six dimensions related to this skill. These dimensions are as follows:

i. Imagining the future with dreams

ii. Making the past-present-future connection

iii. Planning for the future

iv. Predicting the future

v. Preparing for the future

vi. Controlling the future

In the first dimension, imagining the future, individuals can emphasize that they can dream about the future with either future anxiety (dystopia) or future hope (utopia). The second dimension, making the past-present-future connection, emphasizes the importance of reflecting on the past to shape the present and future. The third dimension of future literacy is planning for the future. The first step in planning for the future is to have a strong perspective on the future or vision. This dimension assesses how individuals focus on the future, make plans, and determine strategies to achieve these plans in the context of their visions (Altun, 2020).

Monitoring the trends of individuals, institutions, and governments is the fourth dimension's most important aspect of predicting the future. In this regard, Frey (2014) has argued that the ability to predict and understand future trends and realize these trends depends on our ability to understand. Scenarios are important in preparing for the future. These scenarios emphasize that deviations can occur; therefore, they focus on worst-case scenarios, bringing the term "catastrophic thinking" to the forefront. The sixth dimension of controlling the future focuses on sowing the seeds of vision and creating attractors. Emphasizing that individuals' visions of the future can influence their decision-making styles, Altun (2020) points out that the ability to shape the future (attractor) can influence their future building and, consequently, their ability to control the future.

UNESCO emphasizes developing thinking skills related to the future, leading to a significant change in how, why, and what people will use in the future. UNESCO has also included 'future literacy' among the 21st century skills, alongside developments in science, technology, and society (UNESCO, 2020). The future is also rapidly approaching in the 21st-century, characterized by faster change and development than in previous centuries. This situation has also opened the way for people to address their expectations for the future when discussing their dreams, ideals, and the meaning of life. One factor that catalyzes individuals to connect with life, maintain their mental health, and realize their potential is future expectations. From this perspective, it is crucial to study secondary students' perceptions of the future, in other words, their future literacies, because their ideas will shape this century and inspire future generations.

Several studies have been conducted in the literature on the future in Turkey and worldwide. In the Turkish literature, researchers have conducted studies on topics such as the adaptation of scales (Avcı & Erden, 2009; Summak Gören, 1998), university students' perceptions of the future (Avcı, 2008; Avcı & Erden, 2013; Bayav, 2018; Gümüşgil et al., 2016; Kocadağ & Bardakçı, 2016), the study of university students' attitudes toward the future (Büyüktopçu, 2017), the level of hopelessness and future

expectations among gifted students (Ogurlu, 2016), and university students' future anxiety (Kocaman & Kuybu-Rol, 2020; Tayfun et al., 2022). A review of the international literature has identified studies on various aspects of the future, including future time perspective (Fingerman & Perimutter, 1995; Peetsma, 2000; Bembenutty & Karabenick, 2004; Husman & Shell, 2008; Bilde et al., 2011; De Lange et al., 2011; Coudin & Lima, 2011; Allemand et al., 2012; Brothers et al., 2014; Henry et al., 2017; Kooij et al., 2018; Lucija, 2018; Büyük & Çelik, 2020), the relationship between future planning and life satisfaction (Azizli et al., 2015), the present perception and future vision of gifted students (Krneta, 2016), and future orientation (Gjesme, 1975; Gjesme, 1979; Gjesme, 1983; Holman & Silver, 2005; Carstensen & Lang, 2006; Hortsmanshof & Zimitat, 2007; Joireman et al., 2012; Carmi, 2013; Joireman & Liu, 2014; Daly et al., 2015; Gutierrez-Braojos, 2015). In this regard, we have found limited studies in Turkey and abroad focusing solely on secondary school students' perceptions of the future. "Furthermore, researchers have observed that the existing literature in this area mainly consists of literature reviews and conceptual research, with a lack of applied studies that aim to identify students' perceptions of the future. The data from this study, conducted to address this gap and generate original findings, are believed to contribute to researchers and the field that focus solely on secondary school students' perceptions of the future. "Furthermore, researchers have observed that the existing literature in this area mainly consists of literature reviews and conceptual research, with a lack of applied studies that aim to identify students' perceptions of the future. The data from this study, conducted to address this gap and generate original findings, are believed to contribute to researchers and the field.

The purpose of this study is to determine secondary school students' perceptions of the future and to seek answers to the following questions:

1. What are the future predictions of academically gifted students compared to typically developing students?

2. What are the future predictions depicted in the drawings of academically gifted students compared to typically developing students?

3. What is the distribution of secondary students' future predictions on dimensions of future literacy?

METHOD

Research Design

Due to its scope and content, the study was conducted within the framework of qualitative research methods using a phenomenological design. The phenomenology model focuses on known phenomena that require deep and detailed understanding. Facts can appear in various forms, such as perceptions, concepts, situations, events, experiences, and tendencies. It is believed that the phenomenological model can provide a suitable research basis for studies that investigate phenomena that are not entirely foreign. At the same time, however, we cannot infer their exact meaning (Yıldırım & Şimşek, 2005). In essence, the phenomenological model asks, "What is reality?" It is a method that seeks to answer this question. Therefore, individual experiences play an essential role in the phenomenological approach. In this approach, the researcher considers the personal experiences of the sample and examines their perceptions and the meanings they attach to events. Since phenomenology is descriptive research, it is essential to describe the phenomena rather than make generalizations in phenomenology (Akturan & Esen, 2008).

Participants

The participants were sixth-grade students enrolled in two different secondary schools in the Marmara region of Turkey during the 2022-2023 academic year. Gifted students are coded as "GS" and typically developing students are coded as "TDS." The study included 71 students, 34 (23 girls-11 boys) were typically developing, and 37 (17 girls-20 boys) were academically gifted, and the students were designated into two separate groups (GS-1/TDS-1) with codes according to their order. A convenient sampling approach was preferred to identify the typically developing secondary school students participating in the research. Convenient or convenience sampling is based on items that are fully available, quick, and easy to access (Patton, 2005). In this study, the researcher selected students quickly and easily accessible and who were typically developing as the sample. For gifted students, the criterion sampling approach, one of the purposive sampling methods, was preferred. It is the study of all situations that meet a set of predetermined criteria. The researcher creates the criteria, or a previously prepared list of criteria can be used (Marshall & Rossman, 2014). In the selecting the gifted students in this study, the criteria were that they were identified as gifted in general mental ability according to the Science and Art Centers Directive of the Ministry of National Education and that they were educated in the Science and Art Center.

Data Collection Tools

Activity forms named "Building a New World" and "Painting the Future" prepared by the researcher were used as data collection tools in the study. For the activity form named "Building a New World", a literature review was conducted, and the works written by Yıldırım (2007) and Hamarat (2021) were examined with the help of these works, a fictional story set in the year 2122 was created. This story was written in a fictional way about what the daily life of a child who wakes up in the year 2122 would be like, and the students who participated in the study were asked to put themselves in the place of the child in this story and complete the story. For the activity titled "Painting the Future", Kibar's (2014) master's thesis on the subject of miniature in literature was studied and a form was created that students were asked to fill out to imagine what kind of life would be lived in 2122 and to reflect the ideas and objects that came to their minds with pictures. After an expert in the field and a linguist had reviewed both activity forms, the fictional story was further expanded and adapted to the student level based on the experts' opinions. The studies conducted by Altun (2020), Frey (2014), and Miller (2015), which were accessed in the literature review conducted to analyze the data in the activity forms, were examined and based on the "Dimensions of Future Literacy" pattern proposed by Altun (2020), a "Future Perception" assessment form was created. The forms prepared by the researcher were examined by an expert in the field, a lecturer and an expert in the field of measurement and evaluation. In accordance with the experts' opinions, keywords related to the dimensions of future literacy were created, and the data collection instruments were finalized by eliminating spelling mistakes.

Data Collection and Analysis

Typically developing and gifted students included in the study were given an activity sheet titled "Building a New World," which included a fictional story set in the year 2122. They were asked to complete the story provided on the form. Students were given approximately 20 minutes to complete these tasks. The same students were given another activity sheet titled "Drawing a Picture of the Future" and were asked to imagine and draw what life would be like in the year 2122. Another group of students were given the "Drawing the Picture of the Future" activity sheet and asked to imagine and draw what life would be like in the year 2122. Students were given approximately 30 minutes to

complete this task. The data collected from the students were entered into the Future Perception Assessment Form and analyzed using descriptive analysis methods. Descriptive analysis, part of qualitative data analysis, involves examining, summarizing, and interpreting data obtained through various data collection techniques based on predetermined themes or categories.

During the process of descriptive analysis, the primary objective is to present the findings obtained in the research in a processed, summarized, and interpreted manner in order to convey them to the reader (Yıldırım & Şimşek, 2005). In the first stage of descriptive analysis, a framework for data analysis is created based on the research's main objectives, sub-objectives, or conceptual framework. This framework guides how the data will be organized and presented and provides structure and direction for the analysis process. The next step is to organize the collected data and describe the findings. In the final stage, the described findings are further elaborated, interpreted, and contextualized (Şahin, 2010). In this study, the data obtained from secondary school students were analyzed descriptively through the "dimensions of future literacy" proposed by Altun (2020) and critical expressions reflecting these dimensions. The expressions used by the students in the story completion activity called "I am Building a New World" and the ideas and objects they used in the painting activity called "I am Painting the Future" were analyzed through these critical expressions. The dimensions and keywords of future literacy used data analysis are presented in Table 1.

Table 1

Dimensions and Key Terms of the Future Literacy

Dimensions of Future Literacy	Key Terms
Imagining the Future	Dystopia, Utopia
Making a Past-Present-Future Connection	Past-future relationship
	Present-future relationship
Planning the Future	
	Creating a strong perspective
	Having a vision
	Trends
Predicting the Future	Scientific data
	Limitations
	Needs
Preparing for the Future	Bad scenarios
	Good scenarios
Controlling the Future	Creating a vision
	Creating an attractor

Various methods can be used to ensure the study's validity, such as long-term engagement, expert opinion, participant validation, researcher triangulation, and in-depth data collection. In this study, researcher triangulation was used to ensure validity. The duration of the study was extended, and the opinions of three experts were sought in the preparation of the data collection instrument and during the data analysis phase to enhance the study's validity. In order to increase the external validity

(transferability) of the research findings, it is recommended to conduct detailed descriptions and purposive sampling (Yıldırım & Şimşek, 2005). In line with this, during the data collection phase of the study, the documents were analyzed without making any changes, and the academic studies related to the study topic were thoroughly examined in detail. As part of the study, the data obtained through the analyses conducted were comprehensively described to increase the external validity and consistency.

During the study process, expert opinions were obtained from two researchers to determine the reliability of the categories and subcategories created. The generated codes and themes were then compared with the categories created independently by two researchers in a separate content analysis. The inter-coder reliability of the coders was calculated using the formula of Miles and Huberman (1994) as [consensus / (consensus + disagreement) x 100], and the result was found to be 91.1%. A reliability result more significant than 70% is generally considered sufficient for the purposes of the study (Miles & Huberman, 1994).

Ethical Principles

Ethics committee permission for this study was obtained from Sakarya University Educational Research and Publication Ethics Committee with the decision dated 12.04.2023 and numbered 18/22.

FINDINGS

Findings Related to the Imagining the Future Dimension

The responses of secondary school students in the study were analyzed through the concepts of future anxiety (dystopia) and future hope (utopia), which correspond to imagining the future dimension of future literacy. During the analysis process, negative statements about the future were evaluated as future anxiety, and positive statements were evaluated as future hope in the responses of secondary school students to the "I am building a new world" activity. The analyses of this dimension are presented in Table 2.

Table 2

Distribution of Secondary School Students' Responses Related to the Dimension of Imagining the Future Literacy

	Dystopia	Utopia
Typically Developing Secondary School Students	15	11
Gifted Secondary School Students	12	5

Looking at Table 2, it was found that 15 of the typically developing students in the study used dystopian expressions, and 11 of them used utopian expressions. In contrast, 12 of the gifted students used dystopian expressions and five used utopian expressions. The responses of the secondary students in the study were analyzed as two separate contents: future anxiety (dystopia) and future hope (utopia),

which are the keywords for imagining the future dimension of future literacy. Below are the responses of typically developing and gifted students, and a comparative analysis is made.

According to the analysis carried out on the expressions of secondary school students corresponding to the Future Anxiety (Dystopia) sub-dimension of the Imagining the Future dimension, it was found that students have concerns such as the weakening of communication in the future, the disappearance of street games, and the negative impact of technology and digitalization on human life. In this regard, TDS-1 said: "Everyone is at home, they do not go out, parks have been removed, trees have been cut down, buildings have been built in green areas, the weather and the world are not the same as before, everyone is looking at their phones, and no one is talking face to face. Children do not go out and play in the streets and they play on phones and tablets. That is why everyone wears glasses now. TDS-2: "People and animals are addicted to technology; even cats watch cat food commercials. Also, people do not talk to each other; everything is virtual. There are no children outside, no balls are sold in the markets and everything is done virtually. TDS-4: "There is not a single person around and the year 2122 is now like the year of the apocalypse.

Similarly, GS-1: "My main problem this year has been loneliness. He expressed concern about the weakening of communication in the future. Among the students' responses regarding their future concerns are the negative situations that may occur in the nutritional conditions. TDS-6: "There will be food vending machines in the markets, and the food will not be tasty, so people will want to go back to the old times and reunite with their families.", TDS-7: "People will become wild, and dog meat and rabbit meat will be sold in vending machines and the importance of mother's meals will disappear". GS-6: "When he was hungry, he went to a restaurant and learned that the food was paid for in time, and when he realized that he was wasting much time of his life by eating, he became anxious. They responded as follows. Economic problems, unemployment, and laziness are among the responses of secondary school students that correspond to their anxiety about the future.

Regarding these questions, TDS-11 said, "In 2122, he had no money and no one, he did not know how to hold on to life, he was also looking for a job but could not find a job. TDS-20 "People do not eat, they even swallow pills instead of water. Clothes can teleport like magic; there are no summer and winter seasons, there are not even books, no one uses telephones anymore because everyone can communicate with each other thanks to their technological clothes, people can read each other's minds, there is no ground traffic anymore, only sky traffic. Children play games that open with the buttons on their clothes." GS-7 said, "He took 20 TL from home and went out and looked for a place to eat. He was very surprised to see that the hamburger he ate for 19.99 TL cost 70 TL, and he decided to go to the market and buy cookies. However, when he saw that the cheapest biscuit was 30 TL, he was surprised and began to feel anxiety and fear about the future.", TDS-31 "Everyone has destroyed the world by becoming lazy.", GS-12 "He worked as a waiter for one day and with the money he earned he could only buy something to eat and food. "He was able to get water. They gave answers. These results show that typically developing students have more answers about future fears than gifted students. In addition, it was found that some students gave responses to the future anxiety sub-dimension from the perspective of the character in the story, while others gave responses from a general assessment of the situation.

According to the analysis carried out on the expressions of the secondary school students corresponding to the future hope (utopia) sub-dimension of the imagining the future dimension, it was found that the students gave hopeful answers about the development of technology in the future, the

use of flying vehicles, the increase in the rate of production, and the change in eating habits. TDS-3 said, "When I opened the games on my phone, it was like I was in the game. TDS-15 said, "After I left home, I saw a small shop. This place sold things called special micro-meals in the form of pills that, when swallowed, make you feel like you are eating a good meal and keep you full throughout the day." TDS-23 "Production has accelerated because vegetables grow or form within a minute using fast-growing hormones. A microphone is used to understand what the animals are saying. GS-3 "There was only tube food, sweets, seaweed, and pills. There was a zero-gravity environment to have fun." GS-4 "Where he went to eat, he was served food in front of a machine; GS-36 "When he entered the restaurant, it was not visible from the outside, and he entered with excitement, as soon as he stepped inside, he heard a voice. He came and a robot appeared beside him and said, "Hello, sir, welcome, here is your ticket. He pressed the red button behind me and was surprised to see a screen reflected in front of him and the food on it.", TDS-19 "This year cars were flying in the air.", TDS-24 "I saw flying cars, motorcycles and even flying bicycles on the road when I came to school. It was found that imagining the future dimension produced responses corresponding to the Utopia sub-dimension.

According to the analyses conducted on the dimension of imagining the future through utopia (hope) and dystopia (fear), which are assessed within the framework of imagining the future, it was found that typically developing students use responses containing hope (utopia) more than gifted students.

Findings Related to Making the Past, Present, and Future Connection Dimension

Among the responses of secondary school students corresponding to the second dimension of future literacy, connecting the past, present, and future, TDS-1 said, "Now everyone looks at their phones, we play games on phones or tablets, and it will be like that in the future." TDS-3: "When I opened the games on my phone, it was as if I was in the game." TDS-10 "After waiting a few seconds in front of the door, I suddenly started moving forward. But I didn't, because when I looked under my feet, I saw something like an escalator", TDS-18 "Everyone, whether children, adults, or young people, had a cell phone in their hands.", TDS-20 "There are no summer and winter seasons, global warming has increased, there are no books, and children have stopped playing games.", GS-28 "We were in a dark, colorless period. People were bitter and dreamless, hopeless, like black pepper, and the human population is 40 people; you are one of them; the sun no longer rises because it is tired, people are 600-700 years old and cannot hear, see, or understand, you can hardly breathe because there are no trees, all people are obese, and this There are expressions that make a present-future connection, such as "You are begging to live as little as possible in the world. When the students' responses were examined, it was found that typically developing students used more expressions about the past-present-future connection dimension of future literacy than gifted students. In addition, it was found that typically developing students generally emphasize on the connection between the past, present, and future and cannot make many connections to the past.

Corresponding to the past-present-future connection, the second dimension of future literacy of secondary school students is TDS-5 "My first task was to find a job, I traveled around and finally became a security guard in a luxury shopping mall. And two years and six months passed, and I had a villa and a car, but I had no friends". TDS-9 said, "They do not use any additives in their food, and you see robots walking on the street everywhere you go, even in most stores there are no human employees and robots work. TDS-11 "He began to lose first his biggest supporters and then himself. However, he had to endure because that was life. First, he would find a job, then he would find his family; he was afraid he had no one. He was now alone with himself. However, he had to put his sadness aside and move

on. It was tomorrow and he had found a job. He was happy with his life now, so his life went on. A girl who had established her order and was able to support herself could hold on to this life. TDS-15 "After leaving home, I saw a small shop. They made statements corresponding to the dimension of planning the future with the following expressions: "This place sold special micro-meals in the form of pills that make you feel like you are eating a good meal when you swallow them and keep you full throughout the day." TDS-27 "Yes, it finally happened, I made my dreams come true. In the year 2122, I dreamed of becoming a lawyer. There were many innocent people and people with no heart in front of them. "And I had a tiny little house, a black car and animals, and of course, my driver's license," he replied with plans for the future. According to these findings, typically developing secondary students used expressions related to the dimension of planning for the future. Gifted students, on the other hand, did not provide any responses related to this dimension.

Findings Related to the Future Planning Dimension

The future planning dimension, the third dimension of future literacy, includes principles for creating perspectives about the future and making plans for the future. Based on these principles, the students' responses within the scope of the study were analyzed in terms of the future planning dimension, and the students' responses corresponding to this dimension are presented below.

Corresponding to the future planning dimension of future literacy of secondary school students, TDS-5 "My first task was to find a job; I traveled around and finally became a security guard in a luxury shopping mall. And two years and six months passed, and I had a villa and a car, but I had no friends". TDS-9 said, "They do not use any additives in their food, and you see robots walking on the street everywhere you go, even in most stores there are no human employees and robots work. TDS-11 "He began to lose first his biggest supporters and then himself. But he had to endure because that was life. First, he would find a job, then he would find his family, he was afraid he had no one. He was now alone with himself. However, he had to put his sadness aside and move on. It was tomorrow and he had found a job. He was happy with his life now, so his life went on. A girl who had established her order and was able to support herself could hold on to this life. TDS-15 "After I left home, I saw a small shop that sold special micromeals in the form of pills that make you feel like you are eating a good meal when you swallow them and keep you full throughout the day. TDS-27 "Yes, it finally happened, I made my dreams come true. In the year 2122, I dreamed of becoming a lawyer. There were many innocent people and people with no heart in front of them. "And I had a tiny little house, a black car and animals, and of course, my driver's license," he replied with plans for the future.

According to these findings, five of the typically developing secondary students used expressions related to planning for the future. In contrast, the gifted students did not provide any responses related to this dimension.

Findings Related to Predicting the Future Dimension

Predicting the future, the fourth dimension of future literacy includes principles such as following current trends, scientific data, limitations, and needs. Based on these principles, the students' responses in the study were analyzed in terms of predicting the future, and the students' responses corresponding to this dimension are presented below.

According to the analysis carried out on the answers of secondary school students corresponding to the prediction of the future dimension of future literacy, it was determined that they used expressions related to current trends, limitations, and needs. Regarding nutritional needs, TDS-3 said: "There were

no fruits and vegetables, the pills had breakfast, lunch, dinner, snack, chocolate, etc. written on them, tablets and phones were transparent. The pens used in schools had a voice part, and we were told what to write, and it was written. When we opened the games, it was as if we were in the game; most of the cashiers in the markets were robots, there was no forest fire, and everything seemed perfect." TDS-15 "This game is in the form of a pill, called special micro meals, which make you feel like you are eating a nice meal when you swallow them and keep you full throughout the day." "It sold things." GS-5 replied, "There were only food tubes, seaweed, and pills for dessert, and a zero-gravity environment for fun." Regarding today's technology trends, TDS-10 said, "A few minutes later, I came to a school, I walked in, and what did I see? The students had virtual reality glasses on their eyes, and when I looked at their teachers, I saw that there was no teacher here, but a robot, he was telling the students about the cultures of different countries. TDS-12 "There are flying cars, etc., on billboards as everyone thinks. There were sides"; there were spaces behind people's ears the size of a small chip port. These chips are used to improve people. Humans also have technological intelligence. TDS-13 "Asel gave me a pair of shoes and said, 'Wear these; they will help you fly.'" TDS-19 "Cars were flying in the air this year.", GS-29 "He thought the year 2122 would be very nice, but he was wrong; every time A screen on the ground and an artificial environment, then he looked for ways to return home and found a time machine and returned to his year and realized again what a beautiful environment he lived in. "GS-3 "Everyone was flying from one place to another, shopping was online and all the streets It was empty." GS-37 "When he entered the restaurant, it was not visible from the outside, and he entered with excitement. As soon as he entered, a voice came and a robot appeared next to him. It said, 'Hello, sir, welcome, here is your ticket. They gave answers according to the future prediction dimension, such as, "He pushed the red button behind me and was surprised to see a screen reflected in front of him and the food on it. These results found that typically developing students responded more to the future prediction dimension than gifted students.

Findings Related to the Preparing for the Future Dimension

Below are the student responses analyzed based on the two foci: scenarios and extraordinary situations, which are part of the fifth dimension of future literacy, the dimension of preparing for the future.

The fifth dimension of future literacy, preparing for the future, focuses on scenarios and extraordinary situations. Based on these two foci, TDS-10 said, "Several small robots began to pass through my arms. They had food; when I say food, I mean small medicines. GS-29 "When I woke up in the morning, I was on an island. The island was tiny. I found a note beside me. The note said: To explore the world, the answer is hidden under the sea. Then I found a little hood next to me. I was told to use it to go under the sea. I immediately dived into the sea. When I went a little deeper, I saw a door. I entered the door, and a world appeared before me. Here, technology was used in every area. They gave answers according to the dimension of preparing for the future, such as, "In the digital greenhouses, fruits grew on the tips of the algae. I saw someone there, I think it was a sea creature". Based on the students' responses, it was determined that typically developing and gifted students each gave an answer corresponding to the dimension of preparing for the future.

Findings Related to the Controlling the Future Dimension

The sixth dimension of future literacy, controlling the future, includes sowing seeds of vision and creating attractors. Based on these principles, the students' responses in the study were analyzed in the context of controlling the future. In the context of the principles of vision and creating an attractor,

TDS-2 said, "Children did not play outside because balls were not sold; everything was virtual. Isn't there a school? He said and began to walk around. In the school, education was provided through a tablet. He said we must stop this and asked a woman, Auntie, how are you? He said. The aunt looked at him and realized no one had ever asked her such a question. He was able to say, "I'm fine," and everyone's phone fell out of their hands. Everyone started talking to each other, and they always used their phones wisely. Elif had made many such trips, and now, with one word, she was saving lives. It was time to return", GS-31 "This year was much hotter than our year; people wore special clothes and kept all the water in a special place so that the water would not evaporate. It was determined that the statements "When I looked at the signs on the street, I saw that the temperature was 78 degrees Celsius" responded to the dimension of controlling the future. Based on the student's responses, it was determined that typically developing students and gifted students each gave one response to the dimension of controlling the future.

Findings Related to the Pictures Drawn by Secondary School Students about the Future

The drawings about the future made by middle school students with typically development and gifted students within the framework of the research were analyzed, and the results of this analysis are presented in Table 3.

Table 3

Distribution of Content in Drawings Made by Gifted Students

	Distribution of Content in Drawings Made by Gifted Students		Distribution of Content in Drawings Made by Typically Developing Students	
Sex	Theme	f	Theme	f
Female	Technology	19	Flying vehicles	5
	Transportation	12	Robotic products	2
	Ecology and climate	9	Sky restaurant	1
	Social life	9	Ability to turn the sun on and off	1
	Nutrition	5	Cinema at home	1
	Health	5	A green world	1
	Economy	3		
	Education	2		
	Production	2		
	Specialization of continents in certain areas	1		
Male	Social life	9	Flying vehicles	6
	Technology	7	Artificial Intelligence	2
	Ecology and climate	6	Development of medical facilities	1
	Transportation	4	Life in space	1
	Health	3		
	Wars	2		
	Education	2		
	Nutrition	1		

Production of stone objects	1	
Total	102	21

According to Table 2, it was found that among the students in the study, the students who study in schools for gifted students created pictures with more future-oriented content, with 102 content, than those who study in schools for typically developing students. It was found that the most gifted female students (19) included figures corresponding to the "technology" theme in their pictures. Figures corresponding to this theme include the development of smartphones, food technologies, capsules, computers, textile products technology, solar energy technology, and eyeglasses. Second, secondary school students (12) included figures corresponding to the "transportation" theme. Among these figures, the most frequently used are flying carpets, flying cars, personal flying vehicles, fast public vehicles, and sky roads. Thirdly, it was found that they used figures corresponding to the themes of "environment and climate" and "social life," nine each. Regarding these themes, it was determined that they used figures corresponding to the themes of a green world, a clean environment, drought, tree extinction, and seawater pollution. Then it was found that they made paintings corresponding to the themes of "Food (5)", "Health (5)", "Economy (3)", "Education (2)", "Production (2)", and "Specialization of continents in certain fields," respectively. It was found that gifted male students mostly used (9) "social life" figures in their paintings. These figures are the development of soccer games, movie events, development of shopping malls, increase in noise, lack of communication, and unhappiness. Second, (7) they made capsules, developed of food technology and glasses figures according to the theme of "technology". Thirdly, (6) it was found that they made paintings corresponding to the theme of "environment and climate" and included figures of decreasing seawater, pollution of the environment, and overheating of the earth. After that, it was found that they made paintings corresponding to the themes of "transportation (4)", "health (3)", "wars (2)", "education (2)", "nutrition" and "production of stone objects", respectively. In the analysis of the pictures of the future made by typically developing students within the framework of the study, it was found that the female students drew pictures with the content of flying vehicles (5), robotic products (2) and a sky restaurant, the ability to turn the sun on and off, cinema at home, a green world, and the male students also drew pictures with the content of flying vehicles (6), artificial intelligence (2), it was found that they made pictures about the development of medical facilities and life in space.

DISCUSSION AND CONCLUSION

The results of the study to determine secondary school student's perceptions of the future indicate that the students who participated in the study preferred responses corresponding to the dystopia sub-dimension in the dimension of imagining the future more than responses corresponding to the utopia sub-dimension. Among the participating students, 26 used dystopian expressions, while 17 used utopian expressions. This suggests that more students are worried about the future. This finding contradicts the study conducted by Krneta (2016) on high school students' visions of the future, where it was found that students had a more pronounced tendency to accept items indicating thoughts about the future and hope for a positive future, and less tendency to accept items with negative expressions about the future. This discrepancy can be attributed to the different age groups, cultural backgrounds, and levels of well-being of the students involved in the studies, resulting in cognitive and affective differences among the students.

Similarly, it contradicts the research conducted by Ogurlu (2016) on the future expectations of gifted students, where the students' average scores on the positive future expectations scale indicated high positive expectations for the future. Recent adverse events, such as the successive outbreaks of coronaviruses, wars between countries, and economic difficulties, have influenced students' pessimism.

According to the responses of typically developing middle school students in the dimension of envisioning the future as a utopia, it was found that they made predictions related to professions, overcoming old age, nutrition through pills, technological advances, flying vehicles, teleportation, mind reading, and the development of games. On the other hand, gifted students provided answers corresponding to utopian ideas such as flying vehicles, zero-gravity environments, alternative forms of nutrition, life on other planets, underwater habitats, and the increasing influence of robots on human life. This finding parallels Büyükbingöl's (2018) statement that "if protocols are implemented that allow communication between space and networks on Earth, cyber communication will not be a problem regardless of the distance between the two." This situation can be attributed to the rapid development of artificial intelligence and the Internet of Things in the post-Fourth Industrial Revolution era, which has led to significant advances in robotics and a rapid increase in the use of robots in various aspects of daily life, as well as the introduction of robotics and coding lessons in schools. It can also be said that the prediction of the widespread adoption of robotic products worldwide and in Turkey is related to the current trends and developments.

This suggests that students' responses reflect their awareness of technological advances and their expectations for the future. Educators and policymakers must consider these perspectives and adapt educational practices to meet students' evolving needs and interests, including integrating robotics and coding education. By providing students with opportunities to explore and engage with emerging technologies, society can better prepare them for the future and empower them to contribute to the advances and challenges of the digital age.

In examining the responses of both typically developing and gifted secondary students on the dimension of making connections between the past, present, and future, it was found that the majority of students, regardless of their developmental level, primarily made connections between the present and the future, but had difficulty making connections to the past. This finding may be attributed to the inadequate teaching of time perspectives to students in social science subjects such as social studies and history, which play an essential role in developing students' understanding of the connection between past, present, and future.

Furthermore, in the 21st century, characterized by a faster pace of change than ever and a tendency to move more quickly into the future, there may be a societal tendency to think independently of the past. This societal shift may also contribute to students making connections primarily between the present and the future, with less emphasis on the past.

It is essential to recognize the importance of developing students' time perspective skills, as it enables them to have a deeper understanding of historical events, cultural heritage, and the impact of past decisions on the present and future. Educators can address this by incorporating multidimensional and interdisciplinary approaches that help students see the connections between the past, present, and future, thus fostering a sense of historical awareness and future-oriented thinking. This can be achieved through engaging and interactive teaching methods, exposure to diverse historical narratives, and encouraging critical thinking about the complex relationships between periods.

When examining the responses of secondary school students in terms of planning for the future, which is the third dimension of future literacy, it was found that students expressed plans related to integrating robots in the workplace, establishing a life routine, and engaging in professional life. This finding is consistent with the goals of middle school curricula, which aim to familiarize students with different careers and equip them with the necessary skills and knowledge for their desired careers. In this context, it is believed that students at the secondary level can also be supported with workshops such as "Object-Oriented Programming" and "Robotics and Coding" prepared by the General Directorate of Vocational and Technical Education of the Ministry of National Education. In addition, it is considered necessary for the curriculum to update the content used in the learning-teaching process in this context.

According to the analysis conducted within the dimension of future literacy in predicting the future, it was found that middle school students provided answers regarding the possibility of flying vehicles, time travel, the use of products with artificial intelligence, and the presence of robot teachers in the educational process. In this regard, the statement of Büyükbingöl (2018) supports the findings of this study by stating that the education process in which artificial intelligence and robots are used effectively will shape the future and create a new turning point, whether it is distance education or traditional school education. Renowned futurist Prof. Dr. Michio Kaku also suggests that the Internet will transform and exist as a state of consciousness. During periods when we are not aware of its presence, materials such as textbooks and tablets will not be used. Instead, lens-like Google glasses will be used, and all information will be accessed through a "blink" gesture. He also suggests that there will be no need to memorize formulas, three-dimensional materials will be used in all classrooms, and no excuse for missing class because the lessons will be projected on a screen. Any unclear points will be explained by robot teachers (Büyükbingöl, 2018).

In addition, it was observed that students made predictions about increased Internet addiction, the development of online shopping, nutrition through pills, the creation of a new world due to adverse conditions, the prevention of forest fires, the prevention of aging, and the integration of chip technology into humans. Frey (2014) supports students' responses about chips by stating, "Soon, microchips, small sensors, and transmitters will be widely embedded in objects. Solar panels will be mounted on rooftops, sidewalk readers will be installed on streets, and identity transmitters will help people avoid security and customs lines. Devices will become part of the environment through wireless energy, eliminating the need for wires or massive batteries and the need to recharge the technological materials we use." Students also made predictions about the development of wearable technology, loading games onto clothing, and the ability to communicate with animals, indicating their expectations for future technology.

When evaluating the responses of the middle school students in the fifth dimension of future literacy, which is preparing for the future, the following observations were made: they expressed concern about the disappearance of seasons and global warming, predicted a significant decrease in the human population, mentioned the creation of underwater habitats, anticipated the prevention of aging and an increase in the elderly population, predicted an increase in the number of robots, and mentioned the emergence of elements such as nutrition through pills. They stressed the need to be prepared for these changes.

It is possible to assume that the students focused on negative scenarios and experienced "catastrophic thinking" in their scenarios regarding the disappearance of seasons, increased global warming, and a

significant decrease in the human population. Altun (2020) supports this finding by stating that in the dimension of preparing for the future, focusing more on negative scenarios involves generating a worst-case scenario by considering all possible consequences of a disaster, reflecting in detail on the adverse outcomes that may occur in the scenario, and ultimately being prepared for all these adverse situations. This supports the notion that catastrophic thinking is exemplified in preparing for the future based on scenarios, emphasizing being better prepared.

When the responses of secondary school students are evaluated in terms of the sixth dimension of controlling future literacy, it is noted that they provided explanations about the virtual society, a society without schools, asking "How are you?" as a preventive measure for hot weather, and how the future will be and how it can be controlled. Frey (2014) stands out as one who expresses the most detailed thoughts with the statement, "If you can control the future, why bother making predictions about it?" Here, Thomas Frey emphasizes that the future can be created in people's minds and puts forward two critical ideas: creating a vision and an attractor. Frey (2014) says about creating a vision: "Our visions move us forward. Great visions somehow spread to almost everyone they touch. As ideas spread, they create wants, needs, and desires, which create a market." This statement emphasizes that having a vision can develop both the individual and his or her community. The second concept that Frey (2014) highlights as "the event that draws people into the future" is the concept of an attractor: "Attractors can be influenced, shaped, and even built up to a certain point. This can be achieved by working in the present and focusing on the dynamic systems of life. Our most significant areas of uncertainty are natural systems, such as natural disasters and human systems, such as human behavior. Our ability to manage and direct these systems (the attractor) is the key to controlling the future. This statement provides evidence that the future can be constructed and managed. Based on this, people can make decisions today by interpreting things that will likely happen in the future (Altun, 2020). It was concluded that only two students included in the study, one with typically development and the other gifted, made predictions corresponding to controlling the future, indicating that their visions of the future needed to be revised. It is believed that if individuals develop a vision of the future at a young age, how they make decisions can also be changed by constructing a vision, as the future can change the present.

When the drawings of the secondary school students who participated in the study, reflecting their perceptions of the future, were examined, it was found that they drew pictures that reflected more positive meanings compared to the story completion activity. This can be interpreted as the students activating their imagination more while drawing and focusing on positive ideas reflected in their drawings. Seventeen of the typically developing students drew pictures that reflected their perceptions of the future, and among the most common elements used in these pictures were flying vehicles. The gifted students also included many flying vehicles in their drawings, predicting their potential use in transportation. The students' drawings are reminiscent of the themes of flight depicted in the works of Leonardo da Vinci, one of the most famous painters. Da Vinci's vision of the future inspired many who have dedicated themselves to realizing their dreams by creating flying machines. Today, the fact that flying vehicles are one of the most extensively researched topics by scientists has influenced students to think extensively about this subject. Second, it was found that they mainly drew pictures of robotic products and objects reflecting artificial intelligence. It is predicted that in the future, robots will be highly skilled, capable of connecting to mobile systems, have a better environmental perception, and be present not only in factory production but also in warehouses, depots, and retail locations. Through AI technology, it is envisioned that consumers will have the

opportunity to experience products and services in ways they have never experienced before, such as trying on new clothes in a virtual studio, changing the color of their clothes, adding accessories to garments, or getting feedback from friends on social media (Westerman, George; Bonnet, Didier; McAfee, Andrew, 2014, p. 294). The analysis of the students' drawings included in the research also supports this finding, as similar themes were identified. In addition, drawings representing a green world, advances in medical facilities, home theater enjoyment, celestial restaurants, living in space, and the ability to control the sun's rising and setting were also identified.

When the drawings of gifted students were examined, it was found that female students drew pictures that corresponded to the themes of "technology," "transportation," "environment and climate," and "social life." Other themes represented in the drawings were "food," "health," "economy," "education," "production," and "continents specializing in certain areas. Among the themes that stood out in the drawings made by gifted male students, "social life" was the most prominent. Other themes included "technology," "environment and climate," "transportation," "health," "wars," "education," "food," and "transition to the production of stone objects. These results indicate that gifted students' imaginative powers are more pronounced than those of typically developing students and are reflected in their drawings. This observation is consistent with Sak's (2012) statement that "gifted and talented students are characterized by rapid learning, creativity, excellent memory, enhanced imagination, high motivation in areas of interest, and original ideas.

In the study, both typically developing and gifted students' futures were assessed through storytelling and drawing activities. The storytelling activity revealed that students used expressions corresponding to the dystopian dimension of future literacy, which involves imagining the future with fear more intensively than the utopian dimension (hope for the future). This suggests that students focus on negative scenarios in their future expectations. In addition, their limited use of expressions related to preparing for the future, planning for the future, and controlling the future indicates that they have negative future expectations and feel inadequate in preparing, planning, and controlling these negative aspects. Therefore, efforts should be made to develop future literacy skills in the curriculum to help students feel more confident about their future perceptions. In this way, middle school students, who are the future generations, can improve their ability to read and interpret the future and become a source of inspiration for future generations.

As a result of the analyses carried out within the framework of the study, it was found that secondary school students used the responses corresponding to the dimensions of imagining the future, making past-present-future connections, and predicting the future of future literacy in the story completion activity, on the other hand, they used the responses corresponding to the dimensions of planning the future, preparing for the future, and controlling the future. It was found that these were used less. When the responses of typically developing and gifted students were compared, it was found that typically developing students generally used responses related to fear of the future, making past-present-future connections, planning for the future, and predicting the future more in the story completion activity than gifted students. In addition, it was found that both groups of students responded to the dimension of preparing for the future and controlling the future.

When evaluated in the context of the painting activity, it was found that gifted students used more objects with future content in their paintings than typically developing students. Regarding gender, it was observed that gifted female students used future pictures more than other students. When these results are considered in the context of future literacy, it was found that typically developing secondary

students included more content than gifted students in the story completion activity. On the other hand, gifted students used more pictures with future content in the drawing activity. This shows that typically developing secondary students have a higher attention span in prose activities. The fact that gifted students use more future-related objects in the drawing activity shows that they express their perceptions more quickly by preparing visuals rather than plain text. This situation is consistent with the results of Sarouphim's (2001) study of gifted students, which showed that these students have high potential creative thinking, visual and performing arts, and psychomotor skills.

These results show that typically developing students have more responses regarding future anxiety than gifted students. In addition, it was found that some students responded to the future anxiety sub-dimension from the perspective of the character in the story. In contrast, others responded from the perspective of the general situation. In this context, it is believed that students at the secondary level can also be supported with workshops such as "Object-Based Programming" and "Robotics and Coding" prepared by the General Directorate of Vocational and Technical Education of the Ministry of National Education. In addition, it is considered necessary for the curriculum to update the content used in the learning-teaching process in this context.

To further develop and effectively implement these findings, the following suggestions can be made:

- Quantitative research with larger or cross-cultural samples may provide more generalizable results.
- Exploring the factors that influence students' perceptions of the future and researching interventions to address these factors can contribute to the literature in this area.
- Implementing activities to develop future literacy skills and investigating the contribution and impact of these activities can provide insights into the developmental process of this skill. It is also essential to provide gradual education from an early age to help students cope with future anxiety, make healthy plans, and prepare effectively.

Overall, these suggestions aim to improve understanding of students' perceptions of the future and provide them with the necessary skills and support to navigate the future with confidence.

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Inclusion Practices and Emergency Remote Teaching from the Perspective of Classroom Teachers

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Abstract

The recent Kahramanmaraş earthquake and the COVID-19 pandemic led to the implementation of emergency remote teaching (ERT) to prevent the interruption of education services. This rapid implementation of ERT in the educational process led to many new experiences for classroom teachers in implementing teaching activities for students with special educational needs (SWD) in terms of successful inclusion practices (SIP). It is essential to have information about the teachers' experiences of SIP through ERT to determine which strategies they used to cope with the difficulties experienced in this process, to assess their needs and suggestions about the process, and to take measures to overcome these difficulties to realize effective teaching in case similar disasters occur again in the future. This study aims to determine the experiences of classroom teachers on ERT practices for effective instruction for SWD in the process of SIP. The study adopts qualitative research, and a phenomenological design was utilized to analyze classroom teachers' experiences on the subject in depth. The participants of the study consisted of eight primary school classroom teachers. The research data were obtained using a semi-structured interview form applied to the participants. Through thematic analysis of the qualitative data obtained, themes, sub-themes, and codes were created and analyzed. The findings showed that the ERT process carried out within the scope of SIP has advantages and disadvantages for teachers and SWD. The Advantages and disadvantages of teaching basic academic skills (Turkish, mathematics, life science, social studies, and science) were also identified. In addition, it was concluded that teachers have needs and expectations in the SIP process for SWD, and if necessary, studies are carried out in this regard; the more comprehensive distance education method can be used in the relevant process instead of the ERT method. Research findings were discussed within the literature framework, and limitations and recommendations were stated.

Keywords

Emergency remote teaching, distance education, successful inclusive practices, students with special educational needs, teachers' experiences, effective instruction.

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INTRODUCTION

On February 6, 2023, two significant earthquakes of magnitude 7.7 and 7.6, centered in Kahramanmaraş, located in many earthquake zones, occurred in Turkey. The earthquake killed, injured, and left many people homeless, especially in the provinces of Adana, Adıyaman, Diyarbakır, Gaziantep, Hatay, Kahramanmaraş, Kilis, Malatya, Osmaniye, and Şanlıurfa (Yamamoto ve Altun, 2023). The coronavirus (COVID-19), which emerged before this dramatic situation (in early 2020), spread rapidly through social interaction and turned into a deadly pandemic (United Nations Educational, Scientific and Cultural Organization [UNESCO], 2020a, World Health Organization [WHO], 2020). The increasing number of illnesses and deaths caused by these disasters has led to the widespread use of social isolation practices, even to the extent of curfews. When these practices were insufficient, the decision was made to temporarily suspend public service activities in many areas, including the education sector (UNESCO, 2020a). The disruption of education services due to the earthquake and pandemic has created a risk situation that may cause significant damage in the context of both individual and social development in the form of the inability of a large number of students in the world and Turkey to benefit from education services sufficiently, as well as the failure of educators to work (UNESCO, 2020b). Due to these unexpected situations, emergency boards were convened by the authorities, and a digital transformation (Bozkurt & Sharma, 2020) based on the principle of initiating teaching practices with emergency distance teaching (ERT) method at all levels to avoid or minimize interruption in education (Bozkurt et al., 2021; Mseleku, 2020; Quezada et al., 2020) (Bozkurt & Sharma, 2020; Carrillo & Flores, 2020; König et al., 2021; Terenko & Ogienko, 2020; Unger & Meiran, 2020; Yamamoto ve Altun, 2023). It is essential to point out that in our country, as a precaution against the interruption of education due to disasters, the transition to emergency remote teaching, not a comprehensive distance education (Bozkurt & Sharma, 2020), is a necessity, not a preference (Woltran et al., 2021). Therefore, it refers to a temporary situation, not a permanent systematic and comprehensive situation (Bozkurt, 2020).

Learning is possible by stretching the boundaries of time and space in the learning process with the ERT method (Huang et al., 2020). Online learning within the scope of distance education (Kırık, 2014), the first applications of which started in the 18th century with letters and then newspapers (Bozkurt, 2020), is teaching that the teacher can direct over the internet, where the teacher and the student are physically separated (Bozkurt, 2020). Today, with technology integration into education, significant advantages are possible with distance education (Yamamoto ve Altun, 2023). Different distance learning solutions can be used depending on learners' needs, such as digital learning management systems, collaboration platforms that support live video communication, or tools for creating digital learning content. Online content can be delivered using the Internet, digital technologies, audio, live interactive video, and pre-recorded video formats (Slootman et al., 2023). Online course delivery can be synchronous (synchronous) or asynchronous (asynchronous) (Setzer & Lewis, 2005). In synchronous instruction, students and teachers are online simultaneously, enabling real-time interaction between students and teachers. In asynchronous education, on the other hand, students can watch recorded instruction at a convenient time, usually with set completion deadlines. For example, students may be presented with online content that they must respond to electronically by a set date. However, asynchronous online environments often limit the teacher's ability to detect subtle differences in a student's physical appearance, emotional state, or tone (Frumos, 2020). Video conferencing tools address some of these challenges in synchronous environments (Slootman et al., 2023). However, infrastructure and hardware constraints can negatively affect the quality of video and other simulation

software. Besides synchronous and asynchronous education, hybrid or blended learning programs combine online teaching with face-to-face interactions (Coy et al., 2014).

Successful inclusion practices (SIP) are the most natural right of students with special educational needs (SWD) (Assembly, 1948). When a child's right to education is wholly or partially denied, the likelihood of success and happiness in life is reduced (Fortin, 2005). SIP can be realized by enabling SWD to benefit from the educational services they need by the principle of most minor restrictive education by providing support and additional services in the general education classroom with their peers. In many countries, SWD has benefited to varying degrees from the ongoing efforts of governments and non-governmental organizations to safeguard the SIP. Another issue that needs to be addressed at this point is the principle that all SWD should be effectively and efficiently integrated and benefit from educational opportunities in the same environment with their peers, not just inclusive practices based on the principle that children with mild to moderate special needs are educated in general education classes (Byrne, 2013; Peters, 2007). Nowadays, in Turkey, within the scope of the possibilities and regulations, inclusive practices can be carried out, not integration practices (Ministry of National Education [MoNE], 2020).

The widespread earthquakes and the pandemic have made the availability of learning environments necessary for SIP challenging for SWD (Porter et al., 2021). ERT can be considered a student-centered, student-centered method that can be used to maintain the educational activities of SWD affected by both pandemic and earthquake disasters (Slootman et al., 2023). It is possible and necessary to transition from ERT to the online classroom (Frumos, 2020). The realisation of SIP with ERT (e-inclusion) depends on the existence of educational organizations in which components such as the classroom teacher, SWD, peers, parents, school administration, and other specialists (physiotherapist, speech and language impairment therapist, etc.) actively work in a coordinated manner in cooperation, and individualized education programs (IEP) based curricula and activities are designed for the student (Francis et al., 2021; Srivastava et al., 2015). Teachers have essential responsibilities in this regard. In the process of realizing SIP with ERT, it is critical to the operation of SIP to include every SWD as much as possible in daily classroom activities, to develop a sense of belonging to the school and the classroom, to design a quality education in a shared learning environment that ensures the progress of all students, is supportive and prioritizes adaptation and transitions (Ferguson, 2008). This goal requires an effective SIP-based education process that includes instructional and physical adaptations based on socialization, personal development, equality of opportunity, and active participation (Hardy & Woodcock, 2014; Haug, 2016). In this way, contributions can be made in the form of personalized activities suitable for the needs and abilities of SWD so that they can participate in classroom activities on an equal level with their peers and learn as much as they need, thereby fulfilling their potential (Ferguson, 2008; Meyer et al., 2014; Peters, 2007). In connection with this situation, when the national and international literature is examined, it is seen that SWD, teachers, and families experience advantages and disadvantages in the process of SIP through ERT (Başar ve Gündüz, 2022; Colombo & Santagati, 2022; Jothinathan et al., 2021; Harris et al., 2020; Mengi ve Alpdoğan, 2020; Parmigiani et al., 2021; Sani-Bozkurt et al., 2022; Schuck & Lambert, 2020; Toquero, 2021). One of the challenges that can be encountered in this process is the lack of social interaction, which negatively affects the motivation and participation of the SWD. Another challenge is digital barriers for SWD, who do not have high-quality technical equipment and digital connections and are less "digitally literate." At the same time, using digital tools in education offers many more options for diversification and activation, increasing the accessibility and attractiveness of education for SWD (Slootman et al., 2023).

In addition, some teachers may have competing responsibilities, such as homeschooling their children, caring for vulnerable family members, and managing their mental health (Schleicher, 2018). All of this goes hand in hand with teaching their students remotely and maintaining the non-teaching elements of their job. These circumstances can potentially create a highly stressful situation for teachers, as individuals may assess and interpret the same stressors differently (Kim & Asbury, 2020). From the perspective of SIP, classroom teachers need to consider the characteristics of distance learning, design the curriculum, and take advantage of all the benefits of the distance learning environment (Frumos, 2020). In this respect, adapting teaching for SWD to ERT conditions immediately can reduce the likelihood that SWD will fall further behind, increasing existing social inequalities and widening the educational gap relative to their peers (Letzel-Alt, 2022). Teachers need to be aware of how they can combat this inequality through the appropriate use of digital tools in teaching technology, pedagogy, and content in a digital learning environment, taking advantage of the learning opportunities provided by technology, and balancing the possible disadvantages of technology use. Therefore, it does not only the question of whether closure can be compensated by teachers' and students' use of digital tools in online teaching but also the question of teachers' competencies and how digital competence learning opportunities contribute to teachers' coping with the challenges of the specific situation (König et al., 2021; Schleicher, 2018).

Getting information about teachers' experiences in conducting inclusive education through ERT, determining which strategies they used to cope with the difficulties experienced in this process, and evaluating their needs and suggestions about the process is essential for taking measures to overcome these difficulties in case similar disasters occur again in the future (Sani-Bozkurt et al., 2022; Slootman et al., 2023). Since distance education is likely to continue in the future, unless changes are made in the access and quality of online teaching in the SIP process, SWD will continue to be left behind by their peers. When implemented with proper planning and adequate teacher training, virtual learning environments and online teaching can achieve positive outcomes associated with face-to-face teaching, especially for SWD (Porter et al., 2021). Although many studies on distance education have been published, only a limited number of studies have addressed the depth of the outcomes, associated challenges, and opportunities of primary school-level classroom teachers' implementation of the ERT method of teaching SWD in the SIP process (Jothinathan et al., 2021; Toquero, 2021).

Findings can contribute to a more qualified and systematic planning of the ERT implementation in the SIP process for SWD. In this way, it may be possible to use the distance education method most effectively and efficiently to cope with possible problem situations that may be encountered and thus turn the crisis into an opportunity (Bozkurt, 2020). From this point of view, the study aims to determine the experiences of classroom teachers regarding the inclusion practices they realised through ERT for SWD. In line with this purpose, answers to the following main problem and sub-problems were sought within the scope of the research:

1. What are the classroom teachers' experiences regarding the inclusion practices they implemented through ERT for SWD in the SIP process?

1.1. What are the experiences of classroom teachers regarding the efficiency (advantages-disadvantages) of inclusive practices for SWD through ERT?

1.2. What are the classroom teachers' experiences on teaching academic skills (Turkish, Mathematics, Life Science, Science, Social Studies) to individuals with special needs during the process of inclusive practices through ERT for SWD?

2. What are the classroom teachers' expectations and suggestions for effective teaching through ERT for SWD in the inclusive practices process?

METHOD

This section gives information about the research method, model, participants, data collection process, data analysis, reliability, and validity of the research.

Research Design

This study was designed using phenomenology as part of qualitative research. The phenomenological design aims to conduct in-depth research on phenomena about which superficial information is available but detailed information is not (Creswell, 2017). In other words, phenomenology is a research strategy that is conducted to uncover human experience about a phenomenon (Yıldırım ve Şimşek, 2016). The rationale for this choice is that the study focused on classroom teachers' experiences of inclusion practices for individuals with special needs through ERT. A semi-structured interview was used as the data collection tool in this direction. In the semi-structured interview technique, the interview questions prepared by the researcher were supplemented with probing questions to elaborate the participants' answers and make them more explicit (McMillan & Schumacher, 2006).

Participants

The study comprised eight classroom teachers identified by the criterion sampling method. Since qualitative research primarily relies on observations and interviews, a large and diverse group of participants is unnecessary. This is because, at a certain point, both words and interviews can be repeated (Morse, 2016; Shenton, 2004). Studies with a phenomenological design suggest that study groups typically range from three to ten people (Rubin & Babbie, 2016) or six to fifteen (Guest et al., 2006). When abbreviating technical terms, they will be explained on first use. To participate, individuals must have conducted at least one ERT with an SWD in a classroom since the academic year of 2020-2021, hold a bachelor's degree in classroom teaching, have completed preparatory training, and have volunteered to join the study. The reason for seeking these criteria in the study group is to obtain valid and reliable data for the research. Criterion sampling involves developing a sample that comprises individuals, events, objects, or situations that possess the attributes required for the problem being investigated (Yıldırım ve Şimşek, 2016).

Table 1

Demographic information about the participants

Participant No	Age	Gender	Education Level	Year of Experience	Student Diagnosis
P1	39	F	Md	15	Mild Intellectual Disability
P2	27	M	Bd	5	Learning Disabilities
P3	23	F	Bd	2	Learning Disabilities

P4	37	F	Bd	13	Muscular Dystrophy
P5	31	F	Bd	6	Learning Disabilities
P6	24	M	Bd	3	Learning Disabilities
P7	26	M	Bd	2	Learning Disabilities
P8	29	F	Bd	2	Learning Disabilities

Notes: P = participant; M = Male; F = female; Bd = bachelor's degree; Md = master's degree.

Table 1 shows the demographic information of the participants in the study group. According to Table 1, 5 of the eight participating classroom teachers were female (62.5%), and three were male (37.5%). Furthermore, when looking at the diagnoses of SWD in the classrooms of the classroom teachers, most of the SWD have a diagnosis of learning disability (n=6, 75%), as well as one SWD each with a diagnosis of mild learning disabilities (12.5%) and muscle wasting (12.5%). Furthermore, looking at the level of education and years of service, one of the teachers has a master's degree (12.5%), and the others have a bachelor's degree (87.5%). On the other hand, the demographic information shows that the teachers have 2-15 years of professional experience.

Data Collection

In this study, a data collection tool was utilised via a semi-structured interview form developed by the investigators. The interview questions prepared by the researchers before the interview were supplemented with probing questions, using the semi-structured interview technique to elucidate participants' responses and clarify their answers (McMillan & Schumacher, 2006).

The interview form was completed after incorporating feedback from three field experts and adjusting the semi-structured interview questions. An example of such revisions is the inclusion of the advantages and disadvantages of teacher experiences in the context of the lessons.

The study's data were obtained from three participants in written form online and five participants who voluntarily participated in online interviews. As the research was carried out during the pandemic, semi-structured interview questions were sent to participants via email before the interviews were conducted.

If the participants did not understand the interview questions, they were requested to inform the researchers.

The data was transcribed and converted into written documents after the interviews were conducted over two months.

Data Analysis

The research data underwent thematic analysis, collating similar data according to concepts and themes for interpretation. The study arranged and analysed data in a manner comprehensible to the reader (Yıldırım ve Şimşek, 2016). The researcher assessed the interview answers provided by the participating teachers in line with established categories and themes.

In the results section, typical codes were presented descriptively using exact quotes from the viewpoints of the classroom educators in the corresponding group and topic.

Validity and Reliability

Validity is one of the strengths of qualitative research. It refers to determining the accuracy of the findings obtained from the perspective of the reader, participant, and researcher (Yıldırım ve Şimşek, 2016). To ensure the validity of the research, the interview form was finalised by incorporating feedback from three field experts in the field and implementing the required revisions. Thus, it was aimed to ensure content validity. In addition, to check the interview questions' incomprehensibility, they were sent to two classroom teachers as a pilot study before the research, and their opinions were obtained. It was aimed to contribute to the reliability of the survey through direct quotations given in the findings section. The classroom teachers who participated in the study were coded as P1, P 2, P 3... P8 in consideration of ethical principles. To calculate the reliability of the study, the formula "Reliability = Agreement/Agreement + Disagreement" created by Miles and Huberman (2015) was used. Two qualitative experts independently analysed the interview responses from the participants, and the reliability formula was calculated. Accordingly, the reliability of the study was found to be 92%. It is recommended that the reliability level should be 80% and above (Batdı, 2019). When the reliability value of 92% obtained from the study is compared with the critical importance of 80%, it is accepted that the findings from this research are reliable. The research participants were contacted with legal permission after obtaining information from the MoNE. The research process was explained to the participants beforehand.

Ethical Principles

Ethics committee permission for this study was obtained from Sakarya University Educational Research and Publication Ethics Committee with the decision dated 11.05.2022 and numbered 07/12.

FINDINGS

In this part of the study, which was carried out to determine the experiences and suggestions of classroom teachers regarding the ERT practices they carried out with the SWD, the themes, sub-themes, and codes obtained through thematic analysis are given. As a result of the thematic study conducted in line with the semi-structured interview questions within the scope of the research, "ERT Process in SIP: i. ERT from the Teachers' Perspective ii. ERT in terms of SWD iii. ERT in terms of Academic Skills Teaching and iv. Suggestions for Distance Education" themes were reached.

Table 2

ERT Process in SIPs

Themes
ERT from the Teachers' Perspective
ERT in terms of SWD
ERT in terms of Academic Skills Teaching
Suggestions for Distance Education

Notes: ERT = emergency remote teaching; SWD = students with special educational needs.

Teachers' Perspectives on ERT

Table 3

Teachers' Perspectives on ERT

Sub-theme	Code	Participant	f
Advantages of ERT for Teachers	Sustainability of the Educational Process	P1, P2, P4, P5, P6	5
	Family Support/Participation	P4, P5, P6, P7, P8	5
	Technological Facilities	P1, P2, P3, P8	4
	Ability to Use Technology	P5, P6, P7, P8	4
	Peer Teaching	P5, P7, P8	3
	Use of Methods/Techniques/Strategies	P1, P3, P8	3
	Attention Span/Activity Participation Time	P5, P7	2
	Effective and Maintenance Teaching	P5, P8	2
	Classroom Management	P2, P7	2
	Synchronous / Asynchronous Teaching	P7	1
	Feedback (Feedback)	P4	1
	IEP Preparation and Implementation	P7	1
	Recognition of SWD and Families	P5	1
	Usefulness	P3	1
	Providing Healthy Application Opportunities	P3	1

Notes: ERT = emergency remote teaching; IEP = individualised, individualised education programs; SWD = students with special educational needs.

In Table 3, under the sub-theme of "Advantages of ERT for Teachers," the participants' opinions were grouped as "Sustainability of the Educational Process, Family Support/Participation, Technological Facilities, Ability to Use Technology, Peer Teaching, Use of Methods/Techniques/Strategies, Attention Span/Activity Participation Time, Effective and Maintenance Teaching, Classroom Management, Synchronous / Asynchronous Teaching, Feedback (Feedback), IEP Preparation and Implementation, Recognition of SWD and Families, Usefulness, Providing Healthy Application Opportunities". Some sample statements made by participants about these codes were as follows:

> For the teacher, avoiding packed classrooms and continuing education is exceptionally advantageous (P2).
>
> It proved beneficial due to the supportive nature of our parent profile (P7).
>
> Its use should be adopted as it enables quicker access to all parties involved (P4).
>
> An alternative to halting education activities is an advantage for the teacher (P1).
>
> Something is to be said about our limited resources as a village school, which prevented us from utilising advanced equipment like smart boards and projectors. Nevertheless, I found a workaround by accessing the internet and using it to visually display pictures, videos, and tests to the children, resulting in a more engaging and practical teaching experience (P6).
>
> I frequently had them utilise Web 2.0 tools, which amazed them (P5).

This arrangement provided benefits for the teacher's health and budget (P3).

Table 4

Teachers' Perspectives on ERT

Sub-theme	Code	Participant	f
Disadvantages of ERT for Teachers	Classroom Management Difficulty	P2, P3, P4, P5, P6, P7, P8	7
	The Problem of Effective and Maintenance Teaching	P1, P3, P4, P5, P6, P7, P8	7
	Problem of Method/Technique/Strategy Use	P1, P2, P3, P5, P7, P8	6
	Lack of Feedback	P3, P4, P5, P7, P8	5
	Difficulty in Activity Tracking	P1, P3, P4, P5, P7	5
	Attention Span/Lack of Participation Time	P3, P4, P5, P7	4
	Technology Usage Skills Problem	P3, P5, P6, P7	4
	Lack of Sustainability of the Educational Process	P4, P5, P6, P7	4
	Technological Constraints	P3, P4, P5, P7	4
	Evaluation Issues	P3, P5, P7	3
	Inadequacy of Textbooks and Materials	P6, P7	2
	Synchronous / Asynchronous Teaching	P7, P8	2
	Lack of Social Interaction	P4, P5	2
	Technology Addiction	P5	1
	Peer Instruction/Support Missing	P5	1
	Lack of Family Support/Participation	P4	1
	The Problem of Teaching Classroom Rules and Routines	P6	1
	Lack of IEP Preparation and Implementation	P8	1
	Lack of Support and Additional Services	P4	1
	Excessive Workload	P6	1

Notes: ERT = emergency remote teaching; IEP = individualised education programs.

As can be seen in Table 4, under the sub-theme of "Classroom Management Difficulty, The Problem of Effective and Maintenance Teaching, Problem of Method/Technique/Strategy Use, Lack of Feedback, Difficulty in Activity Tracking, Attention Span/Lack of Participation Time, Technology Usage Skills Problem, Lack of Sustainability of the Educational Process, Technological Constraints, Evaluation Issues, Inadequacy of Textbooks and Materials, Synchronous / Asynchronous Teaching, Lack of Social Interaction, Technology Addiction, Peer Instruction/Support Missing, Lack of Family Support/Participation, The Problem of Teaching Classroom Rules and Routines, Lack of IEP Preparation and Implementation, Lack of Support and Additional Services, Excessive Workload." The participants' sample responses related to these codes can be stated as follows:

> From the teacher's point of view, I do not think it is beneficial. I do not believe it is helpful in the following way: now, an inclusive student is a child who needs special care. When they do not feel that close contact in the classroom, when they are far away, children can sometimes break

away, and we can see this very much in other children, and attention deficit and distraction can be much more in inclusive students (P4).

We had much difficulty with them, you know, the SWD wants to enter, and we, the classroom teachers, are more self-sacrificing, you know, I cannot just explain it. When the inclusive student does not achieve that outcome, it inevitably becomes a problem for you (P2).

We are worn out, teacher; sitting in front of that computer and explaining for one year is like 1 hour is worth 6-7 hours face to face (P8).

Yes, we had not received any training on these things, you know, giving distance education, using that board, because we had not received training on these things before, we always learned by trial and error on our own. You know, maybe it was a waste of time for us, so from that point of view, there were disadvantages (P7).

However, I cannot do anything, you know, how to do it together, so I think I had much difficulty (P5).

ERT in terms of SWD

As a result of the thematic analysis carried out in line with the answers of the participants, the theme of "ERT from the perspective of SWD" and the sub-themes of "Advantages of ERT from the perspective of SWD" (Table 5) and "Disadvantages of ERT from the perspective of SWD" (Table 6) were reached.

Table 5

ERT for SWD

Sub-theme	Code	Participant	f
Advantages of ERT for SWD	Peer Learning/Support	P5, P6, P7, P8	4
	Least Restriction	P1, P3, P5, P7	4
	Sustainability of the Educational Process	P3, P4, P5, P8	4
	Family Support/Participation	P4, P6, P7	3
	Attention Attractiveness/Event Participation Duration	P5, P7, P8	3
	Ability to Use Technology	P5, P7	2
	Synchronous / Asynchronous Learning	P3, P5	2
	Displaying Behavioural Disorder	P4, P5	2
	Technological Facilities	P8	1
	Feedback	P7	1
	Peer Bullying	P2	1
	Learning Effectively and Maintenance	P8	1

Notes: ERT = emergency remote teaching; SWD = students with special educational needs.

An analysis of Table 5 shows that under the sub-theme of "Peer Learning/Support, Least Restriction, Sustainability of the Educational Process, Family Support/Participation, Attention Attractiveness/Event Participation Duration, Ability to Use Technology, Synchronous / Asynchronous Learning, Displaying

Behavioural Disorder, Technological Facilities, Feedback, Peer Bullying, Learning Effectively and Maintenance."

The participants' sample responses related to these codes consisted of such statements as follows:

> According to my system, the older siblings get involved and can count on support in this process. This is because I might not always be available, the teacher has specific hours, or they might be too shy to reach out. In such cases, they might not understand, but if the family has a certain level of education, the older siblings will step in (P6).
>
> I think it is suitable for students who need extra support. With the teacher's help, the child is in a safe environment where they can continue calmly and without disruption or challenging behaviour (P4)."
>
> In terms of the inclusive student, for example, since the child is usually educated in a safe environment since they are connected at home, they do not leave this comfort zone for the student. Therefore, this gave him an advantage. Being related to education in a place where he is with his family and feels safe has turned into a gift for him regarding distance education (P5).
>
> Yes, I mean, web 2.0 tools were a significant advantage in keeping our attention and the attention of the children (P4).
>
> There are currently many teachers in the academy teaching about social media and digital environments instead of us. They can listen to someone else if they do not listen to me (P3).
>
> Attending education in a trusted location, perhaps near family, has become an advantage for distance learning (P5).
>
> Students have homework assignments that are delivered individually and completed by them. Assessments are checked from that location (P7).
>
> For instance, puzzle-completion activities used to be completed. "They enjoyed it, and it felt like a treat. They would say, 'Let us do this, and then let us all do puzzles together.' It was very sociable (P8).

Table 6

ERT for SWD

Sub-theme	Code	Participant	f
Disadvantages of ERT for SWD	Attention Attractiveness/Event Participation	P1, P3, P4, P5 P6, P7, P8	7
	Duration Problem		
	Technological Impossibilities	P3, P4, P5, P6, P7, P8	6
	The Problem of Feedback	P3, P4, P5, P7, P8	6
	The Problem of Effective and Permanent Learning	P1, P4, P6, P7, P8	6
	The Problem of Social Interaction	P3, P4, P5, P6, P8	6
	The Problem of Sustainability of the Educational Process	P3, P5, P6, P7, P8	5
	The Problem of Technology Addiction	P4, P5, P6, P7	4
	Least Constrained Problem	P3, P6, P7, P8	4
	Synchronous / Asynchronous Learning Issue	P6, P7, P8	3

	Problem Learning Classroom Rules and Routines	P4, P5, P6	3
	The Problem of Technology Using Skills	P3, P4, P7	2
	The Problem of Doing Homework	P3, P8	2
	The Problem of Peer Bullying and Peer Pressure	P5	1
	Peer Learning/Support Issue	P5	1
	Family Support/Participation Problem	P7	1
	Behavior Problems Issue	P6	1
	Support and Additional Services Issue	P4	1

Notes: ERT = emergency remote teaching; SWD = students with special educational needs.

When Table 6 is analysed, it is seen that the participants' opinions under the sub-theme of "Disadvantages of ERT in terms of SWD" are as follows: "Attention Attractiveness/Event Participation Duration Problem, Technological Impossibilities, The Problem of Feedback, The Problem of Effective and Permanent Learning, The Problem of Social Interaction, The Problem of Technology Addiction, The Problem of Sustainability of the Educational Process, Least Constrained Problem, Synchronous / Asynchronous Learning Issue, Problem Learning Classroom Rules and Routines, The Problem of Technology Using Skills, The Problem of Doing Homework, The Problem of Peer Bullying and Peer Pressure, Peer Learning/Support Issue, Family Support/Participation Problem, Behaviour Problems Issue, Support and Additional Services Issue." Some of the sample statements of the participants regarding these codes can be stated as follows:

> Inclusive students' participation decreased; I mean, our inclusive students were not in an excellent financial situation simultaneously (P8).

> The disadvantages include lack of one-to-one attention, inequality of opportunity, difficulty following up on homework, lack of psychological readiness for education, and shorter attention span (P3).

> There is such a problem that you have to open the screen one by one and scroll the screen one by one and examine it, which means a time process, which means minutes, and in this regard, you know, we have significant problems in terms of checking or giving feedback (P2).

> Inclusive students cannot access the internet anyway. Some do, but their internet is running out. It is not enough. Alternatively, they turn it off somehow. I do not know how they get off, but they do. Apart from that, if they log in, we deal with problems such as how to do this and enter the password. The class time is running out (P3).

> Since none of these routines, such as opening a book, preparing for the lesson, recess bell, or class time, take place at home, we, as teachers, have to draw attention to the study at a much higher level because none of these routines takes place in the form of focusing on the lesson. Likewise, it was much more difficult for me and my students to create the environment and perception that I am in class at home (P5).

> We also had big problems such as the lack of internet connection, the mother going to work, and not having a phone. In other words, we can say that its disadvantages reflected on me more than its advantages (P7).

> The Education Information Network television channel (Education Information Network [EIN] TV) was unprepared for them. Because I was watching and following EINTV in primary school, it did not address individual differences. It was content prepared for the average student, which was also a disadvantage for them (P6).
>
> For inclusive students, yes, it was just the phone, playing games, or different activities; I mean, I never saw them using it in the lesson. I mean, we were trying to involve them, but I think they did not want to; of course, maybe there was progress in the use of phones at home, but screen addiction increased at home, so they used phones and tablets (P4).
>
> It is too much for him. It is difficult for him to see these videos from EINTV or the videos made. So, I do not think it is very effective (P1).

ERT in terms of Teaching Academic Skills

The third question was asked to the participants about the experiences of classroom teachers regarding the efficiency of inclusion practices carried out through distance education. As a result of the thematic analysis carried out in line with the participant's responses, the theme of "ERT in terms of Academic Skills Teaching," the sub-themes of "Turkish Language Teaching," "Mathematics Teaching," "Life Science Teaching," "Social Studies Teaching" and the codes of "advantages/disadvantages" belonging to these sub-themes were reached.

These themes, sub-themes, and codes can be seen in Table 7.

Table 7

ERT, in terms of Teaching Academic Skills

Sub-theme	Code	Participants
Teaching Turkish	Advantages	P6, P8
	Disadvantages	P1, P2, P4, P5, P6, P7, P8
Teaching Mathematics	Advantages	P6, P7
	Disadvantages	P1, P2, P3, P4, P5, P6, P8
Teaching of Life Science	Advantages	P5, P7
	Disadvantages	P2, P3, P4, P6, P7
Teaching Social Studies	Advantages	P8
	Disadvantages	P2, P3, P4, P5, P8
Teaching Science	Advantages	P4, P8
	Disadvantages	P2, P4, P6, P5

Notes: ERT = emergency remote teaching.

As Table 7 shows, under the theme of "ERT in terms of Teaching Academic Skills, "the participant opinions consisted of sub-themes as "Turkish Teaching, Mathematics Teaching, Life Science Teaching, Social Studies Teaching, Science Teaching" and "Advantages" and "Disadvantages" codes for each sub-theme.

Some of the sample statements of the participants regarding these codes can be stated as follows:

I did not have any problems with visual reading. The child tells me what they see in the picture they see well. When I ask them to tell me what they see in the picture, they tell one of them, especially the one who likes to talk, so they mean it, so there is no regression in visual reading (P6).

I mean, the literacy process seems impossible to me, especially for a student with a distracted attention span in distance education (P7).

The most significant loss is that their reading has slowed down and regressed. I mean, I had students who never picked up a book even though they were halfway through the third grade. I had a system. I used to give the child a book every day and test them the next day to see if they had read it. I used to get feedback and make them read, but now we cannot do this remotely (P1).

The most challenging subject for us was Turkish, followed by Mathematics, then Life Science, Science, and Social Studies, and these continued relatively more positively than Turkish. However, we still experience a lack of this in Turkey, for example, in distance education (P5).

There were severe losses due to not getting the sounds correctly, especially in situations that require close attention, such as writing letters and holding a pencil (P2).

I generally used EIN videos. Since their videos were explained with animations, they attracted their attention, and I benefited more from them because the subjects were abstract (P4).

For example, one of my parents was trying to teach the child numbers in mathematics, you know, by making them more concrete, you know, addition, subtraction, you know, my parent was trying to be interested (P3).

Life science was more interactive because we taught the lesson more conversationally or with their memories; for example, we started to teach a class with a case study, listening to their memories and seeing their sharing from there was more interactive (P7).

In science, you know, experiments that we could not do much, how to do them, I would open videos on the internet and videos of mixtures, sinking and swimming in the water, properties of substances by giving pictures. This was very good for us for science lessons. In the village, we did not have many opportunities to do this because I could not open videos. We did not always have experiment materials or anything. This way, I could open videos and show them (P8).

Suggestions for Distance Education

Finally, as a result of the thematic analysis carried out based on the participants' answers, the theme "Suggestions for the process of distance education for inclusion students" and the sub-theme "Teachers' expectations" were reached.

These themes, sub-themes, and codes are shown in Table 8.

Table 8

Suggestions for Distance Education

Sub-theme	Code	Participant	f
Teachers' Expectations	Teaching Technology Use Skills to Teachers	P3, P4, P5, P6, P7, P8	6
	Teaching Technology Use Skills for SWD	P3, P4, P6, P7, P8	5
	Sample interactive activities for SWD	P2, P4, P5, P6, P8	5
	Teaching technology skills to families	P3, P6, P8	3
	Solving Internet infrastructure problems	P4, P8	2
	Technology equipment support	P8	1
	Support and Additional Services for SWD	P6	1

Note: SWD = student with special educational needs

Analysing the theme "Teaching Technology Use Skills to Teachers, Teaching Technology Use Skills for SWD, Sample interactive activities for SWD, Teaching technology skills to families, Solving Internet infrastructure problems, Technology equipment support, Support and Additional Services for SWD." Some of the sample responses from participants to these codes can be presented as follows:

However, many of my friends still cannot use this technology. We have always tried to help them, but there should be in-service training. This should be in the form of not only how to use "EIN" and "Zoom" but also the use of "Web 2.0" tools in the course (P4).

> If I did not know any better, there were not enough resources. For example, we were trying to produce resources ourselves in this process. However, we do not have a very high level of knowledge on this subject, such as creating a video, program, or presentation (P5).
>
> More exciting lessons can be taught, and SWD can be emphasised as much as possible (P2).
>
> Maybe richer in content, we can get bored just like children. You know, there may be activities in that style (P7).
>
> I can suggest especially informing the families and trying to show interest that the teacher cannot lead closely through the families (P3).
>
> Considering the rural problem, these network problems are enormous. Internet infrastructures should be organised (P8).
>
> I mean, for example, what we suffered the most at first was that we did not receive training on this subject. Maybe more effective in-service training for teachers, not online (P6).
>
> When the teacher assigns homework to other students, one-to-one attention time can be increased for SWD (P1).

CONCLUSION

As a result of the analyses conducted, the research findings were as follows: ERT practices in SIP: i. Facilitations and difficulties of ERT in SIP for teachers, ii. Facilitations and challenges of ERT in SIP for

SWD iii. Teaching academic skills through ERT in SIP, and iv. Expectations and suggestions for distance education in SIP and the following results were achieved:

In the SIP process, it was determined that ERT was advantageous for classroom teachers in terms of sustainability of the educational process, family support/participation, technological facilities, ability to use technology, peer teaching, use of methods/techniques/strategies attention span/activity participation time, effective and maintenance teaching, classroom management, synchronous/asynchronous teaching, feedback (feedback), IEP preparation and implementation, recognition of SWD and families, usefulness, providing healthy application opportunities. In this context, it is noteworthy that ERT has advantages such as preventing the interruption of the educational process, increasing the attractiveness of attention and thus the effectiveness of teaching by appealing to more than one sense in the teaching process; some families (parents and siblings) being more supportive to the SWD during the ERT process, protecting the health of the teacher while fulfilling their duty, and ERT being more economical than face-to-face education in terms of applicability. Similar to the research finding, Colombo and Santagati's (2022) study conducted in Italy during the first wave of the emergency closure period to analyse the teaching activities with SWD and the difficulties that arose in terms of school content shows that although there was a deterioration in school content in general, in some cases, teachers were indeed able to provide new, customised, empathetic and more attentive support to SWD and their families. In contrast, technological impossibilities, lack of feedback, lack of sustainability of the educational process, lack of peer teaching/support, synchronous/asynchronous teaching, lack of attention span/participation time, the problem of technology use skills, assessment problems, technology dependency, limitation of effective and permanent teaching, the issue of method/technique/strategy use. According to the classroom teachers, ERT has disadvantages in classroom management difficulty, the problem of effective and maintenance teaching, problem of method/technique/strategy use, lack of feedback, difficulty in activity tracking, attention span/lack of participation time, technology usage skills problem, lack of sustainability of the educational process, technological constraints, evaluation issues, inadequacy of textbooks and materials, synchronous/ asynchronous teaching, lack of social interaction, technology addiction, peer instruction/support missing, lack of family support/participation, the problem of teaching classroom rules and routines, lack of IEP preparation and implementation, lack of support and additional services. Similar to this result, Toquero (2021) conducted a study to investigate the difficulties, strategies, and expectations faced by teachers in inclusive education during the pandemic and found that teachers experienced educational concerns, intermittent virtual socialisation, and psychological crises. Similarly, Yong et al. (2021) found that teachers faced difficulties such as being unable to direct the gateway during the training, lacking knowledge and skills, not meeting all needs, not being able to attract students' attention, and not getting support from parents.

It was determined that ERT was advantageous for SWD in terms of technological facilities, feedback, sustainability of the educational process, peer learning, synchronous/asynchronous learning, attention span/activity participation time, technology usage skills, effective and permanent learning, family support/participation, most minor restriction, recognition of SWD and families, reduction of peer bullying/pressure and behavioural disorders. The most noteworthy of these advantages can be listed as the fact that SWD feels safer at home and participates more in the lesson, distance education offers better accessibility, especially for those with orthopaedic disabilities, they are less likely to be exposed to peer bullying, and peer pressure, they learn more efficiently by being exposed to more visual stimuli, and homework assignments can be followed up using some programs. Similar to this result, Parmigiani

et al. (2021) aimed to investigate how classroom and special education teachers organise inclusive online teaching/learning strategies and practices in the ERT process that emerged due to COVID-19. Similar to the result of the study, Pihlainen et al. (2023) focused on parents' perspectives on the basic psychological needs of their children with special needs, such as competence, autonomy, and relationships concerning the education of their children with special needs in the ERT process; it was concluded that some parents found the traditional school environment noisy and restless and that learning in a peaceful home environment supports children to concentrate, progress and learn at their own pace.

However, the analyses indicate that ERT has several drawbacks with regards to SWD in the SIP process, such as the challenges faced in education include technological barriers, feedback reception, sustainability of the educational process, facilitating peer support, balancing synchronous and asynchronous teaching, managing attention span and participation time, ensuring technology proficiency, preventing technology addiction, promoting effective and permanent learning, enhancing social interaction, instilling classroom rules and routines, assigning homework, engaging family support/participation, minimising restrictions, addressing peer bullying and pressure, managing behavioural issues, and providing additional services and support. Concentration, peer cooperation, socialisation, group work, screen addiction, opportunity inequality, family indifference, and behavioural disorders are listed as disadvantages of online learning. Similar to the research findings, Mengi and Alpdoğan (2020) concluded in their study that, similar to "screen addiction," long-term EIN connection of SWD increases technology addiction among SWD. In addition, the research by Başar Yüksel and Gündüz (2022) revealed that both families and SWD struggled to adapt to distance education, motivating their children and facilitating activities. The process added to their workload and caused stress.

Furthermore, the benefits and drawbacks of the ERT procedure in the SIP procedure were assessed by teachers in the areas of Turkish language, mathematics, life science, social studies, and science teachings. More specifically, in Turkish education, improvements have been made in visual reading; however, difficulties in reading aloud, such as slow reading, adding and subtracting, incomprehensible writing problems, and reluctance towards reading and writing, have been observed. In mathematics education, learning difficulties have been observed in basic arithmetic operations, rhythmic counting, problem-solving, pattern recognition, and abstract thinking. In teaching life science and social studies, participants encountered difficulties with daily practical skills, establishing causality, understanding chronology, comprehending rules, authentic learning, empathising, and socialising. While some participants in science teaching did not face any challenges, others noted disadvantages in group instruction, experimentation, and collaboration. As per the study conducted by Jothinathan et al. (2021), it was discovered that primary school teachers could not transfer teaching skills for academic subjects in general education classes to ERT as effectively as in conventional face-to-face education.

Finally, the classroom teachers' expectations and suggestions for making the ERT process more successful and even for using distance learning instead of ERT in the SIP process in the future, including sample interactive activities for SWD, teaching technology use skills to SWD, teaching technology use skills to teachers, teaching technology use skills to families, solving Internet infrastructure problems, providing technological equipment assistance, providing support and additional services to SWD, training teachers in distance learning technologies for SWD and families, and adapting EIN content for SWD. In parallel with the research findings, the study conducted by Woltran (2021) found that teachers had problems with lack of personal communication with students, additional workload and stress, lack

of technical equipment, lack of digital skills, and providing individual support for SWD. The study also suggested that sustainable working conditions should be created to counteract the long-term effects of heavy workloads on teachers. However, the difference between distance learning and regular online teaching during the pandemic should also be considered when developing and implementing policies (Slootman et al., 2023). In their study, Chatzoglou et al. (2023) concluded that an intensified, detailed teaching process should be included to compensate for learning losses related to SWD because of the pandemic. They also suggested that teachers should have the necessary pedagogical experience through synchronous and asynchronous teaching.

The research can be repeated for different courses (such as foreign language courses and art education courses), for different levels (secondary school, high school, and university), for teachers of various branches, according to the opinions of SWD and families, for administrators, for supervisors (education inspectors), for education policymakers.

The study was limited to Turkish, mathematics, life sciences, social studies, and science courses. To obtain more detailed data, it can be carried out in the context of other academic skills (foreign language, art education). In addition, collecting data from SWD and families as participants may contribute to a better understanding of the process.

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