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100th Anniversary of the Republic

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OJER is an online, open-access, international, peer-reviewed journal offering scholarly research articles on various topics in all areas of educational sciences.

All submitted manuscripts must be original, previously unpublished and not under consideration for publication in any type of publication outlet.

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“O rising new generation! The future is yours.

We founded the Republic; It is you who will raise and sustain it.”

(Mustafa Kemal Atatürk)

Dear Readers,

The Great Leader Gazi Mustafa Kemal Atatürk says in one of his aphorisms that the form of administration that best suits our character and customs as a nation is the republican administration. Republic is a form of government in which political power is shared by the people and their representatives, and in this sense it is known as the opposite of monarchy. Republic is defined as a form of government in which a nation holds sovereignty in its own hands and exercises it through elected representatives for certain periods of time. The Great Leader Atatürk said, “My humble body will surely turn to dust one day. But the Republic of Türkiye will live forever.” With these words, he stated succinctly that he wanted the Republic, declared on October 29, 1923, to live forever. Also, with his aphorism “The Republic requires generations with free thought, free understanding, and free conscience.” he emphasized that individuals should be free in thought, understanding and conscience for the continuation of the republican regime. In another of his aphorisms, "The new generation will learn the greatest lesson of republicanism from today's teacher community and the teachers they will train." he reminded the teachers of their responsibilities and importance as they entrust and educate the new generation for the continuation of the republic. Based on the fact that "the Republic wants strong and high-character guardians in thought, knowledge and health" and the awareness that it is "virtue", the qualitative improvement and quantitative increase of studies on teacher training and educational research are important in the context of increasing the quality of education.

Inspired by our history full of heroic epics, we live the honor and joy of reaching the 100th Anniversary of the founding of the Republic of Türkiye. The Republic is the most beautiful work of the unprecedented heroic struggle, the unique love of the homeland and the indispensable will for independence. On this occasion, we would like to express our gratitude to the Great Leader Atatürk, his fellow comrades, all our martyrs and veterans who contributed to the struggle for independence and delivered this gift to us. We congratulate our readers and stakeholders on the 29 October Republic Day with our sincerest wishes.

As the editors of OJER (Osmangazi Journal of Educational Research), the Journal of Eskişehir Osmangazi University Institute of Educational Sciences, we planned a special issue to celebrate the 100th Anniversary (October 29, 2023) of the founding of the Republic of Türkiye. For this purpose, a call for papers was announced for this special issue with the theme of "Current Research Trends and Innovative Applications in Education". Among the submitted articles, studies that completed the editorial and refereeing process positively were included in this issue.

As OJER, we envision to walk continuously to the goal of "reaching the level of contemporary civilizations" as pointed out by the Great Leader Atatürk by working, producing and contributing to science and education. We would like to thank all our researchers who submitted articles and our referees and editors who contributed with their valuable evaluations.

OJER is an online, open accessed, international, peer-reviewed journal that offers scientific research articles in all fields of educational sciences as published in English by Eskişehir Osmangazi University Institute of Educational Sciences. In this special issue of **OJER** titled "100th Anniversary of the Republic", 14 studies are presented, as introduced below:

The 1st article of this issue is entitled "Personal Writing Activity: Investigation of Students' Oldest Childhood Recollections" written by Ayşegül BAYRAKTAR, and Esin ACAR. In this study, middle school students' earliest memories and the kinds of remembered memories were investigated. The study also aimed to investigate which objects were remembered by students in a quick learning activity. The participants were 21 struggling middle school students participated into a summer project titled as "Let's Discover Our Thoughts: What Do I Know and How Do I Use My Knowledge?" Data was collected from students' writings reflecting their earliest memories and lists of remembered items' names. The findings showed that the most remembered feeling was being sad. Other reflected emotions were feeling happy, embarrassed, and tired. Also, the most remembered items were oranges, playing cards, and lemons. According to the memorization test, only two students had good memorization skills among struggling middle school students.

The 2nd article of this issue is entitled “Science Education Graduate Students’ Views towards Ethics of Science” written by Çağla BULUT ATEŞ, and Hilal AKTAMIŞ. The aim of this research is to determine the views of science education graduate students towards ethics of science. The data were collected through personal information forms and semi-structured interview questions and then analyzed. The views of participants were examined in depth within the scope of 8 themes. The results highlighted the significance of scientific ethics course integration to undergraduate and graduate level. Moreover, underlying reasons and preventive measures of unethical behaviors were detected from the graduate students’ perspective.

The 3rd article of this issue is entitled “The Effect of Technology-Enriched Foreign Language Teaching on Special Talented Individuals' English Attitude” written by Cavide DEMİRCİ, and Sedef ÇELİK. The purpose of this study is to determine the effectiveness of technology-enhanced foreign language teaching on the English attitude of special talented individuals. Activities were prepared and applied to teach the goals set for gifted individuals more efficiently and permanently with the help of various technical tools. The effects of these practices on students' English attitudes were examined. A total of 30 6th and 7th grade students studying at Bilecik Science and Art Center participated in the study. The Attitude towards English Scale developed by Orakcı (2017) was used to measure attitudes. The results revealed that technology-supported alternative teaching methods had a significant effect on increasing students' attitudes towards the English course in a positive way. It is emphasized that the technology-assisted language teaching method has the potential to be an important alternative to traditional teaching environments in English teaching in terms of students' vocabulary, grammar, listening, speaking, reading and writing skills.

The 4th article of this issue is entitled “An Analysis of the Transformation Geometry of the Primary School Mathematics Curriculum According to Levels” written by Gülsüm DEMİR, and Aytaç KURTULUŞ. The aim of this study is to examine the Primary Mathematics Curriculum (1-8th grade) according to the transformation geometry levels. The transformation geometry in primary and secondary school levels or the acquisitions related to this subject were determined. Then, the acquisitions were examined by considering the transformation geometry thinking levels defined by Soon. It was researched that the achievements in the curriculum are related to which level and whether this level provides the qualifications. It was determined that some gains were given in a way that was not very suitable for the hierarchical structure of the Transformation Geometry Levels. In the program examined, it was seen that the most striking shortcomings are that there is no gain at any level regarding the rotational transformation. The fact that there is no rotational transformation outcome in the mathematics curriculum at any level can be a challenging situation for the students in future learning.

The 5th article of this issue is entitled "Evaluation of the Effect of Educational Bureaucracy on School Administration: A Blunting School Climate for Teachers" written by Güler SHAIKH, and İlknur ŞENTÜRK. This study aims to determine the relationship between school climate, organizational commitment and educational bureaucracy (coercive and enabling) to examine it according to some variables. The data were collected from a total of 280 teachers working in public primary and secondary schools in Gebze during the 2022-2023 academic year. Based on the results of data analysis, it was concluded that there is a negative, low significant relationship between school climate organizational commitment and coercive bureaucracy. It was seen that there is a positive, moderate and significant relationship between school climate, organizational commitment and enabling bureaucracy. In addition, significant differences were found between the answers given to scale items according to teachers' gender, age, institution and field.

The 6th article of this issue is entitled "An Examination of the Relationship Between Social Studies Teachers' Environmental Knowledge and Sustainable Environmental Attitude" written by Oğuzhan YILDIZ, and Döndü ÖZDEMİR. This study was conducted to examine the relationship between environmental knowledge and sustainable environmental attitude levels of social studies teachers. The study group consisted of 136 social studies teachers. The data were gathered through "Sustainable Environmental Attitude Scale" developed by Yıldız (2011) and "Environmental Knowledge Test" developed by Karatekin (2011). The results revealed that social studies teachers have a high level of environmental knowledge and positively sustainable environmental attitude. Moreover, it was found that environmental knowledge and sustainable environmental attitude of the teachers did not significantly differ by gender and profession. Finally, there was no significant relation between environmental knowledge and sustainable environmental attitude of teachers. Consequently, it is recommended to increase in-service training to raise teachers' environmental knowledge levels.

The 7th article of this issue is entitled “Parents' Roles in Children's Games and Toys” written by Emre DAĞAŞAN. The aim of this study is to identify the roles of parents in the games that children play and in the toys they use. The data were collected using semi-structured interviews with 20 families with children who participated in the study. When the data examined, it was observed that parents paid attention to children's preferences, toy quality, and children's developmental level when choosing toys. The parents believe that these toys contribute to children's cognitive, emotional, and physical development. In addition, computer games, ball games, chess, hide-and-seek, and other games were among the preferred games parents play with their children. According to parents, these games increase children's happiness, strengthen family bonds, boost self-confidence, and contribute to their socialization.

The 8th article of this issue is entitled “What Geographical Skills do the International Geography Olympiad Aim to Measure? A Content Analysis of iGeo Questions” written by Leyla DÖNMEZ, and Eyüp ARTVİNLİ. The aim of this research is to analyze the questions asked in the Geography Olympiads organized annually between 1996-2022, according to geographical skills. The questions of the 18 years were decoded with descriptive analysis technique. The element that was searched in the analysis process was the eight geographical skills included in the curriculum of the Geography course of 2018. As a result, it was seen that all of the eight geographical skills were included in these questions.

The 9th article of this issue is entitled “Examining YouTube Videos with Counting and Numbers Content for Preschool Children” written by Şeyma ŞENGİL AKAR. There are many YouTube videos prepared for young children and many parents prefer to play them for their children’s entertainment and learning. Some of these videos include mathematical content and is mostly accompanied with children songs. The focus of this study was on those videos including number and counting content in Turkish language, and broadcast online at YouTube. These videos were examined according to whether they have proper mathematical content. As a result of the examination, it was observed that only a few videos were adequate in terms of mathematical language, content and number teaching, and almost all of the other videos included some incorrect or inaccurate mathematical representations. It was also observed that number symbols were used as "ordinal numbers". In addition, there were scenes where the amount counted and the number shown did not match. It is thought that these parts of the videos can lead to false learning of young children. Based on these findings, it can be concluded that the mathematical content used in these free YouTube videos is generally weak.

The 10th article of this issue is entitled “Examining the Studies on the Advantages of Rural Areas in Mathematics Education” written by Kürşat YENİLMEZ, Ayşe Nur GÜNAY. In this study, the advantages of rural education expressed in national and international literature were compiled using the document review model. As a result of the inductive content analysis, six themes expressing the educational advantages provided by the countryside were created as healthy environment and nutrition opportunities, local community values, the social function of the school is strong, teachers are effective in the local role, the number of students per teacher is low and a rich concrete living experience. The proposals expressed in the literature that will increase the use of the advantages provided by education in rural areas is presented by comparing them with village institutes.

The 11th article of this issue is entitled “Determining the Level of Computational Thinking Skills of Science Teacher Candidates” written by Mustafa Zafer BALBAĞ, Haluk ELBAHAN, and Meryem Hatun ELBAHAN. The aim of this study is to compare the computational thinking skills of science teacher candidates, according to some variables (gender, class level, having a computer, daily average computer usage time, following technological developments and monthly income level of families). The participants consisted of Science Teacher Candidates studying at the Faculty of Education of a state university in Türkiye during the 2021-2022 academic year. The data collection tool was the "Computational Thinking Skills Scale" developed by Dolmacı and Akhan (2020). As a result, it was seen that the computational thinking skills of teacher candidates were generally high. According to the gender variable, it was seen that the statistically significant difference in sub-factors was in favor of male teacher candidates. According to the family monthly income level variable, it was understood that the statistically significant difference was in favor of the teacher candidates whose income level is 8001 TL and above.

The 12th article of this issue is entitled “Should I Learn Division Algorithm? An Investigation of Elementary Students’ Solution Strategies on Division with Remainder (DWR) Problems” written by Osman BAĞDAT, and Ayşe BAĞDAT. This study aims to investigate elementary school students' solution strategies for division with remainder (DWR) type problems. In this line, the study was conducted to comparatively examine the strategies employed in division problems by 2nd-grade students who are familiar with multiplication operation, but has not yet learned division, and 3rd and 4th-grade students who grasped division but have not yet learned DWR problems. The data were obtained from 144 students in 2nd, 3rd, and 4th grades in a public primary school. A total of 6 different DWR problems were asked to the students, including the types of partition, addition or omission of remainder. The findings indicated that the methods used by 2nd, 3rd, and 4th grade students in solving DWR problems differed. While Grade 2 students prefer to use strategies such as repeated addition, repeated subtraction, and using models, it is noticeable that there is a tendency to use the division algorithm towards Grade 4. However, it was noticed that students were unable to interpret the remainder in a meaningful way, especially from the 3rd grade, when they started to learn the division algorithm. The study suggested that the transition to the division algorithm in division problems should not be rushed, multiple representations should be encouraged, and realistic contexts should be used more frequently.

The 13th article of this issue is entitled “Review of Studies on Feedback Types: Systematic Review Study” written by Ayhan DÖNMEZ, and İbrahim Seçkin AYDIN. The aim of this research is to determine how the studies conducted within the framework of teacher, peer and self-evaluation feedback types using the systematic compilation method are related to students' attitudes, motivation and success. The selected studies were included in the research through certain criteria depending on the systematic review method. A total of 2438 studies were reached in the research, and this number was reduced to 35 depending on the selection criteria. As a result of the research, it was determined that the studies conducted in this field increased the teacher, peer and self-evaluation feedback types and the students' attitudes, motivation and success towards the course.

The 14th article of this issue is entitled “Web 2.0 Rapid Content Development Self-Efficacy Perception Levels of English Teachers” written by Meryem ARSLAN, and Cavide DEMİRCİ. The aim of this research is to determine the Web 2.0 rapid content development self-efficacy perception levels of English teachers. For this purpose, "Web 2.0 Rapid Content Development Self-Efficacy Scale for Educational Purposes" was used to obtain quantitative data. The research group consisted of English teachers working at different schools and levels in Konya city center and its districts. According to the results, there was no significant difference in any of the Web 2.0 rapid content development self-efficacy perception levels of English teachers according to the variables of gender, working time and school level. In the results, it was seen that the English teachers were competent in developing content using Web 2.0 applications. In this context, it is important for curriculum developers to prepare programs in which technology-supported content can be integrated more when creating new curricula in order to achieve positive results in the field of education. To further the research, the working group can be expanded, and experimental studies with different variables can be performed.

See you in the next issue,

"Stay with Science, Stay with Us"

M. Zafer BALBAĞ, Ph.D.
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Acting Director of Institute of Education
Eskişehir Osmangazi University, Türkiye

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Personal Writing Activity: Investigation of Students' Oldest Childhood Recollections

***Ayşegül Bayraktar, **Esin Acar**

Abstract. The personal writing genre can provide valuable space for students to start from what they know best, themselves. In this qualitative study, middle school students' earliest memories and the kinds of remembered memories were tried to be investigated. Students' earliest memories were analysed based on their written personal writings. In addition, how well students remembered the names of the objects shown to them in a short time was analysed. Thus, the study also aimed to investigate which objects were remembered by students in a quick learning activity. The participants of the study were 21 struggling middle school students participated into a summer project titled as "Let's Discover Our Thoughts: What Do I Know and How Do I Use My Knowledge?" Data was collected from students' writings reflecting their earliest memories and lists of remembered items' names. The study's findings yielded that the most remembered feeling was being sad. Other reflected emotions were feeling happy, embarrassed, and tired. Analyses of the data also showed that the most remembered items were oranges, playing cards, and lemons. According to the used memorization test, among struggling middle school students only two students had good memorization skills.

Keywords. Personal writing activity, childhood recollections, children's visual memory.

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Writing plays an important role on students' academic achievement. Through effective writing skills, students not only express their learning but also have chances to communicate their feelings, ideas, desires, and experiences. In this sense, personal writing genre can provide valuable space for students to start from what they know the best, themselves. Additionally, even though it helps to encourage students composing freely and eagerly, personal writing as a genre is a neglected one in English classes. Gardner (2018) argues that since teachers do not feel comfortable about teaching writing and do not see themselves as writers, they usually ignore teaching it in their curriculum and focus teaching grammar instead. However, Gardner emphasizes that personal writing helps students to see themselves as writers and got engaged in this genre.

Personal writing activities encourage students to improve their writing skills by also highlighting important phases of their lives. In their case study, Li and Deng (2019) found out that struggling Chinese college students worked on finding out similarities and differences while composing their own life experiences and increased their academic writing skills. In a similar study, Griffith (2018) saw that eight grade students were able to compose successful texts after they wrote several personal writing topics in which they included dialogue and action. Through in-depth interview, the author found out that students who composed successful personal entries reconsidered and re-contextualized their past experiences during the pre-writing stage then shared their texts to gain peer feedback. Furthermore, reading and providing feedback about someone's experiences helps establishing a friendly environment in the learning community. Thus, student writers can practice and learn to be open, honest, and respectful (Martinviita, 2016).

Personal journals or entries allow students to see how their language and expressions affect their classmates. Additionally, having personal entries "suggested new writing possibilities to the students" (Fulwiler, 1982, p. 25). Fulwiler (1982) also stated that when students share their entries with each other they not only learn about others' experiences but also, they can work on peer education by giving feedback to each other. Pytash (2016) also emphasized that being able to write freely and explain their emotions helped adolescent students who had been suspended from school several times.

In this study, the author recommended educators to provide time for personal writing activities since these activities help students to cope with daily stress, to use it as a tool to communicate with others, and to develop their voices. Thus, for all these reasons personal writing was recommended to be used in language arts curriculum. For this reason, the purpose of this study was to see if children could express and share their childhood memories when they were encouraged to compose and given the opportunity to write about their previous experiences. Thus, researchers tried to determine the nature of the earliest memories of students. To motivate students to start writing, students were also asked to be involved in a memory game. By allowing them to participate into this game the researchers wanted students to be relaxed and feel comfortable. In such a small competition students became more familiar to each other, laughed a lot, started to share their ideas and strategies to remember certain objects and which objects were more meaningful to them. In other words, they became better prepared to freely express their earliest memories in written entries. Thus, the second objective of the study was to investigate which objects were remembered by students in a quick learning activity. Therefore, the below questions were the research questions of the study:

1. What is the content/subject of students' earliest memories that they can remember?
2. Which objects were remembered the most by the students?

Method

Research Model

In the study in which document analysis was used as a method, students' earliest memories and the kinds of these remembered memories are tried to be investigated. Like other analytical methods in qualitative research, document analysis examines and interprets data to elicit meaning, gain understanding, and develop empirical knowledge (Corbin & Strauss, 2008; Rapley, 2007; cited in Bowen, 2009). Document analysis is particularly applicable to qualitative case studies, which are intensive studies producing rich descriptions of a single phenomenon, or event when it is used as a research method (Stake, 1995; Yin, 1994; cited in Bowen, 2009). Studies investigating the quality of an interaction, event, action, a condition or material are accepted as the qualitative research (Fraenkel & Wallen, 2003).

Study Group

The participants of the study were composed of 21 at-risk middle school students participating in a summer camp for 10 days in summer season. Even though these students were in middle school they were specifically chosen because of their low academic achievement in reading and language arts. Students' grades showed that they were behind their peers in terms of their reading and writing performances. Shortly, their reading performances were in line with elementary school students. The study is part of a TUBİTAK project which was implemented to improve students' academic/non-academic knowledge and skills and aimed at thinking training. Half of the participating students are children living in 'Love Houses' established under the Ministry of Family and Social Policies. These children were recommended by an expert who knows them well and is experienced in the institution and was approved by the institution administrators.

Thus, the participants were struggling writers who resisted composing during a summer learning camp, as one of the out-of-school learning activities.

Data Collection Tools

Data of the study was collected through participating students' personal writing texts and testing memory worksheet used during the memory game, which was taken from the book titled as "Brainbox" written by Steven Rose and Alexander Lichtenfels, during the summer project titled as "Let's Discover Our Thoughts: What Do I Know and How Do I Use My Knowledge?".

Process

In this study, disadvantaged middle school students tried to be motivated to compose their childhood memories. To follow this aim, the visuals coming from a book titled as "Brainbox" which was written by Steven Rose and Alexander Lichtenfels, and a writing activity were used.

Students' earliest memories were investigated based on their written personal writings. Then, the students' expressions were analysed descriptively. Apart from the documents, some sources such as participant or non-participant observation, and physical artefacts (Yin, 1994) (objects in this study) were used to understand the students' expressions. The less structured literature, such as reports and internal correspondence, is a potential source of empirical data for case studies; for example, data on the context within which the participant operates (Mills, Bonner, & Francis, 2006; cited in Bowen, 2009).

In order to ensure the students were familiar with the targeted vocabulary, prior to the task, the researcher reviewed each item. During the data collection period, a worksheet with 20 objects was reflected on the board for students to look at for a minute.

Then, the researchers removed the reflected page and asked students to list as many numbers as the objects they remembered. Reflected objects were coins, clothes pins, electrical cables, keys, hazelnut, safety pin, brush, paint, rubber band, pill, feather, playing cards, seashells, lemon, oranges, leaves, crayons, buttons, sea stars, and match. The objects that children encounter every day or encounter more frequently in their lives were chosen because it was essential for them not to be forced during the warm-up activity and to be motivated for the actual work.

The used visual was given below:

How strong is your memory?
First take a pen and paper
Take a minute to view the picture on this page.
Then close the book and write down as many of the objects in the picture as you can remember...
...but no cheating!

Figure 1. Reflected Page.

Later, students were asked to write about their earliest memories. They were instructed to try to remember an experience and write about that event. According to Alvarez and Cavanagh (2004), one feature (e.g., colour or orientation) of up to four objects can be stored. Even two or four features for up to approximately the same limit and four objects are remembered. Luck and Vogel's claims emphasize that the capacity of visual short-term memory is set in terms of the number of objects that can be stored, and not the number of features as well (Alvarez and Cavanagh, 2004).

Data Analysis

Since the data of the study was obtained through the written personal writings and listed remembered words, the collected data was analysed through the document analysis method (Krippendorf, 2004). In document analysis, like other qualitative analytical methods, data is examined and interpreted to interpreted and elicit meaning, gain understanding and also develop empirical knowledge (Corbin & Strauss, 2008; Rapley, 2007; cited in Bowen, 2009). The written resources about events and phenomenon are investigated and analysed. The analytic procedure entails finding, selecting, appraising (making sense of), and synthesising data contained in documents. Document analysis yields data—excerpts, quotations, or entire passages—that are then organised into major themes, categories, and case examples specifically through content analysis (Labuschagne, 2003).

While analysing the data, first, a framework based on the research questions for data analysis was created. According to this framework, researchers determined under in which sub-categories data can be coded.

Later, collected data was read several times and coded under the related themes. Both researchers checked whether expressed memories were listed under the correct sub-categories or not. Data were evaluated after reaching a full consensus between the researchers. Each participating student (S) was labelled by a number (i.e., "S1" refers to the first participating student).

In the many research, overall, children's understanding of emotions has been reduced to their understanding of stereotypic situations that usually accompany certain emotions (Barden, Zelko, Duncan, & Masters, 1980; Fabes, Eisenberg, McCormick & Wilson, 1988; Gnepp, McKee & Domanic, 1987; Green, 1977; Harris, 1983; cited in Hadwin & Perner, 1991). In this study, the children's responses were scored to the type of emotions in the matching visuals. Stotsky (1995) also explained that shifting the concentration from reference books and textbooks to students' beliefs and feelings is important and necessary when teaching them language arts courses. For all these reasons, educators should be reminded that personal writing activities can encourage resisting and struggling students to talk about themselves, their likes, dislikes and memories. It allows students to write about the topics they know the best. Thus, it can eventually increase students' writing skills and fluency. Additionally, personal writing can be therapy for struggling students especially if they have chances to share and listen to each other's similar and different experiences.

The personal writings were coded under four themes, and their written memories were coded under subcategories including sad, happy, tired, and embarrassed memories. One student's written text did not reflect any emotions. Thus, that paper was coded as neutral and the remaining 20 papers were analysed.

Results

Overlapping with the purpose of this study, the first analysis results were about the children's expressions of their childhood memories. Researchers tried to determine the nature of the earliest memories of students. According to the analysis results, in which the students' personal writings were coded under four themes, the children's expressed emotions were stated. Only one student's written text did not reflect any emotions. To the analysis, while the most expressed emotion was 'feeling sad', the status statement only expressed once was 'being tired', which is not an emotion. The remaining 20 papers were listed at Table 1.

Table 1.

Kinds of Stated Emotions in Students' Personal Writings

Kinds of stated emotions	**(f)**
Sad	12
Happy	5
Embarrassed	2
Tired	1

As seen at Table 1, 12 students' written memory was about being sad. Other reflected emotions (and a statement) were feeling; happy (f=5), embarrassed (n=2), and tired (f=1). According to Table 1, the mostly remembered feeling was being sad. The emotion of feeling sad was described under four sub-categories. These sub-categories are having pain-crying, having an accident, making a mistake, and feeling scared-anxious. The kinds and frequencies of reflected sad feelings were given at Table 2.

Table 2.

Sub-categories of Feeling Sad in Students' Personal Writings

Sub-categories of Feeling Sad	**(f)**
Having pain-crying	6
Having an accident	3
Making a mistake	2
Feeling scared-anxious	1

The emotion of happy also had four sub-categories. These categories are being excited, being persistent, having fun, and being secretive as listed at Table 3.

Table 3.

Sub-categories of Feeling Happy in Students' Personal Writings

Sub-categories of Feeling Happy	**(f)**
Being persistent	2
Being excited	1
Having fun	1
Being secretive	1

The second objective of the study was to investigate which objects were remembered by students in a quick learning activity. Analyses of the data showed that the mostly remembered item was orange (f=19). The second mostly remembered item was playing card (f=17), the third one was lemon (f=15). The item that was remembered the least was hazelnut (f=2). According to the used memorization test the students remembered 15 or more objects have a good memorization. In this study only two students remembered 15 or more items (15 and 16 items remembered). Majority of the students could list 6 to 10 items (n=13). Only one student remembered less than five items (the total of two items).

Even though the researchers expected that the students who remembered the most number of objects could remember their earliest childhood memories easily, the students with the highest number of remembered objects could remember their childhood memory took place when they were seven years old. On the other hand, the students with the lowest number of remembered object (two objects) could write about a memory belongs to his/her fifth year. The earliest written memories occurred when students were three years old. Two students could remember their memories that belong to their age three. One of these students could remember seven items while the other students remembered eleven items from the memory test.

Discussion and Conclusion

The whole document analysis done in the study showed that the emotions being able to express in the writings is related with the students' very simple life experiences, feeling sad, happy and embarrassed. Also, we can figure out that some students are not aware of their emotions or cannot define them, because 'being tired' is not an emotion otherwise it is a physical or mental condition felt because of an activity. 'Being sad' is the most remembered emotion, so it is the most permanent one. When we examined the sub-categories of this emotion, we saw that it had felt at the end of a bad event or a mistake (having pain-crying f=6, having an accident f=3, making a mistake f=2, and feeling scared-anxious f=1). With this logic, it can be said that negative, bad events and mistakes made more permanent traces and easy to remember. When good and bad are presented equally, the psychological effects of bad ones outweigh those of the good ones (Baumeister, Bratslavsky, Finkenauer, & Vohs, 2001).

More than half of the students wrote about their sad memories as the earliest personal memory they remembered. Ruggles Gere (2001) argued that when students are asked to compose a personal writing, they feel that instead of focusing their word choice and expression, they concern that they need to write a dramatic event in their lives because they feel that they can gain higher scores with entries which have the most drama in. This might be one of the reasons for these participating middle school students to mainly focusing on their sad memories. Also, as Morgan (1998) stated, teaching content area knowledge is not the only responsibility teachers have, they also need to conform and support their students. Through reading their personal entries and providing them feedback or by simply listening to their memories teachers can provide informal counselling. The students also preferred to write about their happy experiences under four sub-categories, being excited, being persistent, having fun and being secretive. Interestingly, these categories contain another emotion (feeling excited), such behaviours (being persistent and secretive) are an activity. Therefore, we can see the students have some problems on defining their emotions.

At the beginning of the project, the participating students were asked to do different writing activities and tasks. From time-to-time students were resisting writing or sharing their texts. Through personal writing task, as the data collection tool for this study, the students seemed more motivated to compose and share their memories. Richardson (2001) stated that the meaning writers create for their lives connect them to others. In this study, a similar experience was observed and students became more connected to their peers through their memories. Students in this study not only learned about from each other but they also realised how they could write easily when it came to focus on their memories. After experienced composing personal writing, Banks (2003) showed disappointment for not composing personal texts before and wasting all those years. Participating students' personal entries show how undeveloped their texts were. Higgins and Brush (2006) also recommended using personal writing activities especially with writers whom texts are under elaborated or disconnected. The researchers also provided some suggestions to teach students to increase their personal writing skills. Some of their recommendations are asking students to use descriptive images and details, to explain reasons of their certain behaviours and to include dialogue so listeners or readers can see the whole picture. One of the reasons for having these less successful texts might be students having not enough instruction on how to develop their written personal entries.

According to another objective of the study, the objects remembered by students in the applied learning activity were determined to understand the nature of the earliest memories of students. It was seen that 'orange' (f=19), 'lemon' (f=15) and 'playing card' (f=17) were the mostly remembered objects from the visual cards presented to them. The least remembered object was hazelnut (f=2). Children's recall levels were determined in direct proportion to the number of objects recalled, after the used memorization test applied to them. According to the test evaluation criteria, remembering 15 or more objects is a good indicator of memorization. According to the research (Luck & Vogel, 1997; Vogel, Woodman & Luck, 2001), visual short-term memory is limited by the number of objects that can be stored, independently of the number of features probed for each object (Alvarez & Cavanagh, 2004). In this study, only two students' remembering 15 or more objects, give the impression that most of the students (n=13) lack the ability to code the objects shown to them by matching their emotions and experiences (they just could list 6 to 10 objects).

Fulwiler (1982) argued that since personal or journal writing seem too personal or informal majority of teachers prefer not to use them in their courses. Additionally, the author stated that some other reasons of not using this kind of writing activities is teachers do not know how to measure students' skills in personal writing or simply see these activities as waste of their time. Connor (1987) argued that asking students to compose on non-personal specific subjects was criticized in the past however, nowadays we may still see teachers asking students to write compositions in which they explain the meaning of proverbs and idioms (Aslan, 2010). On the other hand, Whitney (2009) highlighted the connection between personal and more formal writing called as professional writing by stating "personal writing has frequently been considered as a precursor to professional writing or to the essay" (p. 238). Williams Mlynarczyk (2006) also supported this view by stating "all students- and especially basic writers- need to reflect on their reading using personal, expressive language in order to acquire genuine academic discourse." (p. 4).

In this study, middle school students' earliest memories and the kinds of remembered memories were investigated. Then, their personnel writings were analysed to see earliest memories.

As a result of the study, the visual objects helped children remember their earliest memories and uncover their feelings related to the objects. The most remembered feeling was being sad. Other reflected emotions were feeling happy, embarrassed, and tired while the most remembered items were oranges, playing cards, and lemons. Additionally, the used memorization test results showed that among struggling middle school students only two students had good memorization skills.

Recommendations

The data of this study are limited to the personal writings of secondary school students who stay as boarders in a social institution under state protection in Aydın province and are nominated for additional education programs due to their low academic success. In other words, students in this study were struggling and at-risk students. Further studies can also include struggling students to increase their writing skills through letting them to be involved in personal writing activities. As Connor (1987) stated probably “Write what you know” has been the most common recommendation given to students (p. 179). In future studies, researchers can investigate mainstream students’ personal writing texts as well. In those studies, students can have more time to compose their texts and have opportunities to share their memories to get to know their classmates better. Furthermore, being exposed to others’ feelings and memories students can realize that they are not the only ones going through certain things in their lives and they can reduce the feeling of loneliness in the World (Ruggles Gere, 2001).

In this research, only the personal writings of at-risk students were examined as a connected text. In future studies, using other types of written texts by students as data collecting tools, such as stories, poems, and informative texts, can also be suggested. Additionally, the duration of the research can be kept longer by giving students feedback on what they have written, so that they can create many drafts in the process and learn to write more effectively. The duration of the training program that students attend is limited to one week. Therefore, events and training contents were planned intensively. Longer-term training events can be organized to monitor students’ development. In other words, researchers can design studies to collect data over a longer period longitudinally. Struggling students can take risks in a safe and friendly environment. To create such a learning environment, teachers should teach and use personal writing in groups/classrooms to celebrate students’ uniqueness, habits and skills. Thus, they can create an accepting learning environment. Being experienced on personal writing can encourage students to develop their writing skills in other genres including expository and persuasive writing as well.

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Conflict of Interest

It has been reported by the authors that 'There is no conflict of interest'.

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Science Education Graduate Students' Views towards Ethics of Science

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Abstract. The aim of this research is to determine the views of science education graduate students towards ethics of science. In the study, phenomenological approach was employed as qualitative research method. The data were collected through personal information forms and semi-structured interview questions that were formed in accordance with the research purpose and were analyzed by content analysis technique. The views of graduate students were examined in depth within the scope of 8 themes, which are the concept of ethics of science, scientific ethics course, unethical behaviours, underlying reasons of unethical behaviours, socio-cultural factors, conducting academic studies at schools, sanctions for unethical behaviours and the effect of unethical behaviours on science. The results highlighted the significance of scientific ethics course integration to undergraduate and graduate level. Moreover, underlying reasons and preventive measures of unethical behaviours have been detected from the graduate students' perspective.

Keywords. Science education graduate students, ethics of science, interview, phenomenology.

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In addition to clarifying the phenomena in the universe, science; due to its feature of guiding societies in many different fields, it imposes important moral responsibilities on people involved in science production (Erzan & Irzık, 2008). In recent years, the problems experienced in the fulfilment of moral duties in scientific research have become more visible, and this has led to the need for more studies on the relationship between science and ethics. According to Resnik (2000), the reasons for the increase in concerns about the relationship between science and ethics are the strengthening of the media about the visibility of ethical problems and the questioning of the integrity of scientific studies due to ethical abuses. It is thought that an important difficulty for people involved in scientific processes to undertake moral duties is the subjectivity of moral elements and the variability of rules according to a number of factors. At this point, it is important to understand these concepts in the best way.

It is seen that there are many different definitions in the literature on the concept of ethics, which comes from the Greek root "ethikos". The Turkish Language Association (Turkish: Türk Dil Kurumu, TDK) (2005) defines the concept of ethics as "the set of behaviours that the parties must comply with or avoid among various professions". On the other hand, science ethics; It is expressed as ethical and scientific criteria that must be complied with regarding the planning and conduct of scientific research (Ertekin et al, 2002). Similarly, Kök (2001) emphasizes the importance of scientists to act honestly towards societies and humanity and not to mislead them when it comes to complying with ethical rules. Regarding the implementation of these rules, Gören (2002 as cited in Bülbül, 2004) states that the duty of science ethics is to show researchers the moral path in the research process.

According to studies conducted throughout the country and the world (Barutçu & Erten Orhan, 2018), scientists and students at all stages of education may ignore these principles for various reasons (Ruacan, 2005). Unethical behaviours are grouped under different headings in different studies. These behaviors were grouped under the titles of duplication, forgery, falsification, fabrication, and plagiarism by Turkish Academy of Sciences (Turkish: Türkiye Bilimler Akademisi, TÜBA) (2002, p.37-39).

There are many studies in the literature on the reasons why students and academicians tend to unethical behaviours. For example, Newstrom and Ruttekinh (1976) and Greene and Saxe (1992) state in their studies that the reasons for students' unethical behaviour are heavy course loads, the desire to get good grades, and the lack of study time. İnci (2009), on the other hand, explains the reasons for unethical behaviour for both students and scientists, lack of education, criteria for academic appointment, attitudes of administrators, scientific culture, mental problems and external pressures. In general, the reasons for unethical behaviour; it is seen that it is gathered under two main headings as wrong research, ignorance and providing personal benefit (Ruacan, 2005).

Many studies report the reasons for students' unethical behaviour as lack of knowledge and lack of necessary education. An important innovation at this point is the 34/5 added to the postgraduate education and training regulation updated in 2016. It is the article: “At least one course including scientific research techniques and research and publication ethics must be given during graduate education”. (Graduate Education and Training, 2016).

Based on the updated regulation, it is seen that the “Scientific Research and Publication Ethics” course has been added to the graduate education programs of many universities. Although the name and scope of this course vary according to universities, the ethical scope of the course generally includes unethical behaviours in science, its causes, and ways to prevent it, ethical rules related to scientific publications, scientist-ethics-society relationship.

In order to prevent ethical violations in the scientific research process, ethical committees established within universities and general control mechanisms such as Council of Higher Education (Turkish: Yükseköğretim Kurulu, YÖK) and Turkish Academy of Sciences (Turkish: Türkiye Bilimler Akademisi, TÜBA) play a role. However, despite the existence of these institutions, it is revealed by many studies that behaviours cannot be prevented sufficiently (Demircioğlu, 2014, p.150). Various sanctions are also applied to prevent these behaviours. For example, ethical review boards have been established under the Presidency of YÖK, which are responsible for the detection and punishment of disciplinary acts in terms of publishing ethics. The duties of these boards are to examine the unethical acts, to present the results of the investigations made by experts/experts and the suggestions they have developed for the purpose of carrying out educational activities in cooperation with the relevant institutions to the Presidency. As a result of the investigations opened on the basis of the “Disciplinary Regulation” supported by constitutional provisions, various sanctions such as dismissal of people who commit ethical violations, cancellation of their titles, publication bans, warnings, not taking the associate professorship exam, imprisonment or judicial fines are applied (Demircioğlu, 2014).

Various studies are carried out, especially with case and phenomenological methods, in order to reveal the causes of behaviours at the point of preventing unethical behaviours. These studies are very important in gaining an insider's perspective and presenting preventive suggestions based on various parameters such as unethical factors, society and social factors. Conducting such studies at the master's level, where problems are most common in the scientific research process, can contribute to obtaining more realistic data and presenting suggestions, thanks to the students' reflection of their own experiences. Apart from this, as Resnik (2005, p.4) states, examining the ethical problematic in science education (STEM fields) is important in terms of providing a broad scope of laboratory studies on ethical rules.

Based on these views, the aim of this study is to reveal the perceptions of science education graduate students about the concept of science ethics, to determine the difficulties they experience during the scientific research process, and to determine their opinions and suggestions about sanctions for unethical behaviours.

Method

The type of research, the study group, data collection tools, validity and reliability, data collection techniques, analysis of the data are presented in this section.

Research Model

In this study, phenomenology design, one of the qualitative research methods, was used. Phenomenology requires an in-depth examination of the issues that we are aware of but do not have detailed information about (Yıldırım & Şimşek, 2008). Investigations on scientific ethics show that people involved exhibit unethical behaviours such as plagiarism and scientific fraud during the conduct of scientific studies. In revealing these situations, people's life experiences or observations are used. At this point, the phenomenology design was used, since it is important to examine the perceptions and experiences of the people involved in the process in detail, to discover the reasons for unethical behaviours and to offer suggestions.

The Study Group

The study group of this research consists of 5 people enrolled in the master's program of Science Education at 3 different universities in the Aegean Region. There are different opinions about sample size in phenomenological studies. It is stated in the literature that the number of items that will constitute the sample can vary between 5 and 25 items (Creswell, 2013; Neuman, 2014; Patton, 2005; Rubin & Babbie, 2016 as cited in Baltacı, 2018). As Coyne (1997) stated, the fact that the sample consists of few people who meet the objectives of the research makes it easier to obtain detailed data.

The study group of the research was selected by the criterion sampling method, one of the purposive sampling methods. Criterion sampling is the creation of the sample from people, events, objects or situations with the qualities determined in relation to the problem (Büyüköztürk, 2012). In the selection of the sample, the criterion was determined that all participants were enrolled in the master's program in Science Education.

In order to better examine the issue of ethics in scientific research, considering the possibility that they have not done an article/thesis study before, undergraduate students; PhD students were not included in the sample due to the thought that they could master scientific research methods. Therefore, in this study, graduate students were preferred in order to reflect their problems and life experiences related to scientific research methods. On the other hand, the relevance of the variables of university, registration year, being in the thesis-course stage were also investigated.

Responses of individuals who studied at the same university during the undergraduate period but attended different universities during the graduate period, similarly, who attended different universities during the undergraduate period but continued at the same university during the graduate period are considered useful in terms of making comparisons in points such as the ethics committee processes of universities, the processing of ethical issues in the teaching curricula. In addition to the university variable, it is anticipated that the answers of the students who are at the thesis stage and at the course stage will also contribute to the interpretation. In order to have information about plagiarism programs and to examine the subject of supervision of their work by the programs, it is thought that the start of the graduate education of the students is another important variable.

Information about the study group is summarized in Table 1.

Table 1.

The Study Group

Code (Participant)	**Code (University-BA)**	**Code (University- MS)**	**Master's Stage**
P1	A	B	Thesis
P2	B	B	Thesis
P3	B	D	Thesis
P4	C	E	Course
P5	B	B	Course

In order to ensure their confidentiality, the participants were given codes such as P1, P2, …, P5 and the universities as A, B. Below is information about the characteristics of the participants to associate with the study. The participant with the code P1 completed his undergraduate education at University A, registered at University B for graduate education and is in the thesis stage of his education. He worked as a teacher at a private school for two years. P1 with a good level of foreign language (English) (he took one year of English preparatory education in his undergraduate education), 28 years old and not working. The participant with the code P2 completed her undergraduate education at B university and started her graduate education at the same university and is currently in the thesis stage. P2, who has an intermediate level of foreign language (English), is 28 years old and has been working as a science teacher in a public school for 4 years. The participant with the code P3 completed his undergraduate education at B university and started his graduate education at D university and is currently at the thesis stage. P3, whose foreign language (English) is intermediate level, is 26 years old. P3, who worked as a science center supervisor for two years, has been working as a science teacher for 2 years at a private school. The participant with the code P4 completed her undergraduate education at C university and started her graduate education at E university and is currently in the course phase. P4, who has an intermediate level of foreign language (English), is 35 years old and works as a science teacher in a public school. The participant with the code P5 completed his undergraduate education at B university and started his graduate education at the same university and is in the course phase. P5, who has an intermediate level of foreign language (English), is 24 years old and does not work currently.

Data Collection and Analysis

In this study, semi-structured interview technique was used to collect data. In this technique, the researcher prepares the interview form that includes the questions that s/he plans to ask beforehand. Depending on the flow of the interview, it can affect the flow of the interview with different side or sub-questions and enable the person to open/detail their answers (Türnüklü, 2000). The questions in the semi-structured interview form (Appendix-1) were created by the researchers by scanning the domestic and foreign literature. After the preparation of the interview form, the opinions of 4 experts were taken in terms of the linguistically appropriateness of the questions and the situation to be determined.

Inductive content analysis was used in accordance with the qualitative research design for the analysis of the data. Content analysis is the objective, systematic and quantitative description of the presented content of the communication (Berelson 1952, p.17). In inductive analysis, the aim is to discover models, themes and categories of data (Patton, 2002). Within the scope of inductive analysis, a conceptual structure was created with the coding format (Strauss & Corbin, 1990) according to the concepts derived from the data.

Validity and Reliability

Information on ensuring the validity and reliability of the research is given below. In order to ensure the validity of the study, the method, process and results of the research are given in detail by adopting the understanding of in-depth research and examination (collection, analysis and evaluation of data), clearly and with direct quotations from the participants. Purposive sampling technique was preferred while determining the study group. The data collection tool, which was developed by examining the relevant literature, was presented to 1 Professor Doctor Lecturer working in the Science and Mathematics Education Department, 4 doctoral students from the Science Education Department, and 1 Associate Professor doctor working in the Education Programs and Teaching Department, and suggestions were made, and its final version was formed. The interviews lasted between 30 and 40 minutes. In order to prevent data loss in the interviews, a voice-recorder was used with the permission of the participants and the data were tried to be transcribed on the day of the interview.

The reliability of the study was calculated using the “percentage of agreement” formula suggested by Miles and Huberman (1994). The percentage of agreement is formulated as (Agreement) / (Agreement + Disagreement) x 100. Accordingly, it is stated that interview data can be used in cases where the percentage of agreement in the studies is 70 and above (Yıldırım & Şimşek, 2008). In this study, the intercoder reliability coefficient was calculated as .84.

Results

Findings obtained from the interview with graduate students about science ethics were gathered under 8 themes which are the concept of scientific ethics, science ethics course, unethical factors, the causes of unethical factors, the relationship of sociocultural level and unethical factors, studies in schools and the permission process, sanctions against unethical factors and the effect of unethical factors on science. The findings regarding the analysis of the data are given below.

Findings Regarding the Views of the Participants on the Concept of Ethics of Science

A theme related to the concept of ethics of science emerged. The responses of the participants to this theme are given in Table 2.

Table 2.

Categories and Codes Related to the Concept of Ethics of Science

	Categories	Participants
	Occupational ethics	P1, P2
	Morality in scientific studies	P1, P2, P3, P4, P5
Codes	obeying the rules	P1, P2
	the good and bad behaviors of academics	P2
	Appropriate citation	P2, P3, P4, P5
	entering the data correctly	P4
	not doing any unauthorized work	P4, P5
	not making plagiarism	P5
	ethical committee process	P5

Table 2 presents the answers of the participants about the concept of scientific ethics. When the table 2 is examined, it has been seen that there are two categories as occupational ethics and morality in scientific studies. The category of morality in scientific studies are gathered in 7 codes, which are obeying the rules, the good and bad behaviors of academics, appropriate citation, entering the data correctly, not doing any unauthorized work, not making plagiarism, and ethical committee process.

Below are sample expressions from the opinions of the participants on this subject.

"…it was associated with being ethical in terms of **professionalism**, being ethical in the academic field in scientific studies as **obeying the rules**" (P1, interview notes).

"...96% of the theses in Turkey were said to be **stolen**, not quoted from each other. Scientific ethics is the state of being moral in science. Conducting moral behavior in scientific matters. I can think of things that **academics** should do right or not do wrong" (P2, interview notes).

"When it comes to ethics... For example, when quoting a study, specifying that quote, **citing** in accordance with the rules to use in the study. That is, to specify the rules and from whom it is taken from that person without stealing. It may include **plagiarism**" (P3, interview notes).

"When we say ethics, **morality** recalls in my mind. **Citation**, getting **permission**, **entering data properly**" (P4, interview notes).

"**Morality**… That's what **the ethics committee** is for… in scientific research, not to **plagiarize**, to choose the words we use carefully in scientific research, for example, to choose the words we use in theses, or to do everything with **permission** in the state or in private sector" (P3, interview notes).

Findings Regarding the Views of the Participants about the Science Ethics (SE) Course

A theme related to the science ethics (SE) course emerged. The responses of the participants to this theme are given in Table 3.

Table 3.

Categories and Codes Related to Scientific Ethics (SE) Course

	Categories	Participants
Codes	**SE Course Content**	
	concepts of ethics / scientific ethics	P3
	morality / moral system	P2
	reasons for unethical behavior	P2, P4
	penalties for unethical behavior	P4
	principles of scientific research	P2, P3, P5
	scope of plagiarism	P1, P3, P4, P5
	use of subjects/participants	P1
Codes	**SE Course Benefits**	
	qualified scientific publications	P3, P5
	the researcher's self-confidence increase	P3
	the decrease of unethical behaviors	P2, P3, P4

When Table 3 is examined, it is seen that the answers of the participants about the science ethics course are gathered in 2 categories: the content of the science ethics course and the benefits of the course. The category of the content the scientific ethics course is gathered in 7 codes: concepts of ethics / scientific ethics, morality / moral system, reasons for unethical behavior, penalties for unethical behavior, principles of scientific research, scope of plagiarism, use of subjects/participants. The category of benefits of scientific ethics course is gathered in 3 codes: qualified scientific publications, the researcher's self-confidence increase, and the decrease of unethical behaviors.

Some of the participants' views on this issue are given below.

> "Our undergraduate professors talked about this subject for a long time, not under the name of science ethics. Our teacher in research methods course also mentioned it in graduate school. But it was not mentioned as scientific ethics. Plagiarism... I think a more **particular course** should be reserved for this because it was under the initiative of the teacher. The content…maybe it had something to do with the **subjects' use**" (P1, interview notes).

> "…I remember it was mentioned in the course content. But I definitely don't remember talking about ethics during my graduate course. Yes it should. Anyway, I don't know how useful the work of a person who doesn't have the concept of ethics in his head can be. First of all, we have to deal with the **moral** system or **why people show these behaviors**. If the person is given **enough scientific research**

knowledge and knows how to do it, unethical behavior and stealing will not be resorted to" (P2, interview notes).

"I think it is **necessary**… I think that the studies will be of **better quality** and their reliability will increase. I could have had clearer ideas and better knowledge. First of all, what ethics is scientific ethics, what should be considered?. Here, citing the bibliography, paying attention to **the rules when quoting**, and even stating that they should be paid attention to in oral expressions, too" (P3, interview notes).

"...scientific ethics was mentioned as a subject in master's degree. The researcher should be ethical, should not plagiarize, there are plagiarism programs, the data should be entered as it is, not according to the result we want. We should get **permission** before doing research. It is sufficient if it is mentioned as a subject, not as a course, but it needs to be emphasized more. With concrete examples, it would be better if those who acted unethically before and were **punished**, what are the legal **sanctions** of this and its place in our culture, it would be better if it is **exemplified**" (P4, interview notes).

"Yes, it is **necessary**. In fact, it is covered in scientific research and publication ethics, but it is not enough. Even if it is **a separate course**... the course is mixed. While the issue is about quantitative research, the teacher mentions ethics. If it were a separate course, what would the **rules** be? It would be better" (P5, interview notes).

Findings Regarding the Views of the Participants about Unethical Behaviours

A theme related to unethical behaviours emerged. The responses of the participants to this theme are given in Table 4.

Table 4.

Categories and Codes Related to Unethical Behaviours

	Categories	Participants
Codes	**problems related to assignments/theses**	
	stealing any study	P1, P2, P3
	having the thesis/articles written by others	P2, P4
	having the statistics done by others.	P2, P3
Codes	**problems related to scientific publications**	
	non-authentic studies	P1, P2, P3
	not citing	P1, P2
	translating without citing the source	P3
	copying the author's sentence exactly	P1, P3, P5
	manipulating the data	P2, P4
	paid journals	P4, P5
	not using plagiarism programs	P2, P5
Codes	**permission problems**	
	conducting study before ethical committee decision	P2, P5
	conducting study without applying ethical committee	P2, P3
	unauthorized use of students' photos.	P2, P5

When Table 4 is examined, it is seen that the answers of the participants regarding unethical behaviours are gathered in 3 categories: problems related to assignments/theses, problems related to scientific publications, and permission problems. Participants defined unethical behaviors related to assignments and theses as stealing any study, having the theses or articles written by others, and having the statistics part done by others. Problems with scientific publications are non-authentic studies, not citing, translating without citing the source, copying the author's sentence exactly, manipulating the data, paid journals, not using plagiarism programs. Permission problems defined by students are conducting study before ethical committee decision, conducting study without applying ethical committee, and unauthorized use of students' photos.

Below are sample expressions from the opinions of the participants on this subject.

> "I mean, the assignments given were searched and brought from the internet like this old-fashioned **copy-paste**. Many teachers were not paying attention… I witnessed a lot in my friends" (P1, interview notes).

> "...no one writes publications in an **original way**. By making additions to existing studies, or without even quoting. We weren't doing our homework through research. We found what we were asked to research and presented it as if it were our own homework" (P2, interview notes).

> "…some parts of different sources can be taken and expressed as if their own... they can take the English source from **someone else's work** and **translate** it into Turkish and use it without referencing. A friend of mine started to implement **without getting (ethical committee) permission** to speed up the process. I think it is unethical behavior to have the **statistics** parts of the theses done by others, to have the theses written completely by others, to turn this into a market" (P3, interview notes).

> "…with the data, one can **manipulate** it as s/he pleases. It appears in **advertisements** on the internet. Even if you are preparing the thesis, there are those who edit and prepare it according to its format..." (P4, interview notes).

> "For example, **the use of photos of students** without permission in the school environment. For example, it is plagiarism to **copy an author's sentence**. …we didn't know how to do it (cite properly) during university years" (P5, interview notes).

Findings Regarding the Views of the Participants on the Underlying Reasons of Unethical Behaviours

A theme has emerged regarding the underlying reasons of unethical behaviors. The responses of the participants to this theme are given in Table 5.

Table 5.

Categories and Codes Related to Underlying Reasons of Unethical Behaviours

	Categories	Participants
	External factors	
Codes	Lack of education at undergraduate level	P2, P3
	Lack of knowledge	P2, P3
	Manipulative factors	
	Personality	P1, P2, P3, P4, P5
Codes	Popularity ambition	P3, P4, P5
	Ethical committee process*	P1, P2, P3
	Timing problem	P2, P3

When Table 5 is examined, it is seen that the answers of the participants regarding the causes of unethical factors are gathered in 2 categories as external factors and manipulative factors. Participants expressed the reasons for unethical factors as lack of education at undergraduate level and lack of knowledge as external factors. The manipulative reasons of unethical behaviors stated by the participants are personality, popularity ambition, ethical committee process*, timing problem.

Below are sample expressions from the opinions of the participants on this subject.

"A little **carelessness**, **laziness**, I guess. I mean, they don't care about the work done. They just do it to get it done. I think it's about the **personality**" (P1, interview notes).

"**Ignorance** is in the first place. For example, now I am trying to write a master's thesis, I am researching it with my own effort. I have difficulties due to lack of lessons, **time** factor, being in a different city. It may also be due to the person's upbringing in the **family**. This is how he saw it in the family, nowadays the **ambition** factor is very important. I guess that's where the trouble comes from. I think **not knowing how to do it basically** comes from the **education** at the university" (P2, interview notes).

"I think the most basic thing is to be fast or **not want to waste too much time on something**. Or rather, to do it for the sake of doing it. Articles gain points as they are published, for dissertations, to say for publications. So it's about not wanting to deal with a little **laziness**. People don't want to deal with, they don't want to work, but they want to get somewhere after a while **without making any effort**. The **lack of information** is also important here. Maybe it should be one of the **compulsory** courses when you are in the first year. Ethics is science, what ethics is. He does it unknowingly, maybe that too" (P3, interview notes).

"When the things they think do not match with the data, people are in favor of their opinions, rather they want the result they want, not the data. The data may be wrong, but s/he **does not want to admit his mistake and does not want to deal with it again**. ... s/he may be immoral, there may be a problem with his **character**, he wants to be **promoted quickly in the job**… " (P4, interview notes).

"For example, s/he may have liked his ideas very much but **could not interpret them in his own way**. His ability to interpret may not be very developed. Or, for example, he liked an idea very much, but wanted to use it as his own word" (P5, interview notes).

*Participants were also asked whether they had their own experience with the ethics committee process, the problems they experienced, and how they described the ethics committee process. Participants stated that the ethics committee process is slow (P1, P2), the criteria are high (P2, P3), and it is problematic (P1, P3), and the process of obtaining permission takes a long time (P1, P2, P3). On the other hand, they expressed their opinions that they personally witnessed or heard about the problems experienced by the ethics committee in their environment, without waiting for the approval of the ethics committee (P2, P3) or without the permission of the ethics committee (P2, P3). P4 and P5 coded participants stated that they have not applied to the ethics committee yet, but they have heard from their environment about the troublesome process.

Below are sample expressions from the opinions of the participants on this subject.

"The procedure regarding the ethics committee is a bit **slow**. Even for something very unimportant, I have to fix it and give it back. Again, it creates a **waste of time**. I had a lot of trouble with it myself. Maybe the process should go a little **faster**" (P1, interview notes).

"...a doctorate friend did his research at schools **without any permission** last year. Afterwards, the ethics committee took the permission while the student was away. The time should be waited, the **person should plan himself accordingly**. But there is a **really long procedure** in that regard as well. There is a slow process caused by the officers, correspondence takes too long" (P2, interview notes).

"…I couldn't start the implementation without getting permission. It's getting **tight**. The scientific research ethics committee of X University convenes in the last week of every month and it was supposed to be sent 10 days before this last week, so we sent it on the 10th day, but if we couldn't, we would have to wait for 1 month" (P3, interview notes).

Findings Regarding the Views of the Participants on the Relationship of Sociocultural Level with Unethical Factors

A theme has emerged regarding the relationship of the sociocultural level with unethical elements. The responses of the participants to this theme are given in Table 6.

Table 6.

Categories and Codes Regarding the Relationship of Sociocultural (Social Factors) Level with Unethical Factors

	Categories	**Participants**
Codes	Education level	P1, P2, P3, P4, P5
	Social status (academic title)	P5
	Economic reasons	P4, P5
	Values (individual-family)	P1, P2, P3, P4, P5

When Table 6 is examined, it is seen that the answers of the participants regarding the relationship between their sociocultural levels and unethical factors are gathered in 4 categories as education level, social status, economic reasons and (individual-family) values. All of the participants reported that they thought that the level of education was not a factor that directly affected unethical behaviours and emphasized that value judgments gained from individual, or family were effective.

Below are sample expressions from the opinions of the participants on this subject.

"...anyone who came to the postgraduate doctorate stage should know about these and pay attention to them. I think it's about the level of **education** and personality" (P1, interview notes).

"I attribute it more to familial **sociocultural** situations. If **ethical awareness** was formed in people with a high level of **education**, those who publish scientific publications would not be people with a very high level of education" (P2, interview notes).

"I think it is more about the person's own content, not the title or title of the education level. Information content, awareness content" (P3, interview notes).

"I can't say that **educated** and rich people don't do such a thing, or poor ignorant people cannot be called immoral, it is **a personal trait** rather than a socio-economic aspect. It is personal, I think we cannot generalize" (P4, interview notes).

"...it happens that the teachers do it too. Maybe it's a bit of **personality**. It may also be related to the **economic** dimension. Some just to make money. They can also do more work to be **popular** in the social circle for being recognized **socioculturally**" (P5, interview notes).

Findings Regarding the Views of the Participants about Conducting Academic Studies at Schools

A theme emerged related to conducting academic studies at schools. The answers of the participants to this theme are given in Table 7.

Table 7.

Categories and Codes Related to Conducting Academic Studies at Schools

	Categories	Participants
Codes	**Permit process**	
	Must be compulsory	P1, P2,
	Long duration	P1, P2, P3, P5
	MONE regulations	P2, P3, P4, P5
	Teacher's not apply for permission for self-study	P4
Codes	**Attitudes of administrators**	
	Unnecessary	P2, P4
	Anxious	P4

As can be seen in Table 7, this theme has been examined in 2 categories: the permit process and the attitude of the administrators. The participants emphasized that the permit process should be compulsory, that it is a long procedure for the implementation of the studies in schools, and that Mone regulations are considered troubles. On the other hand, one of the participants (P4) stated that a teacher sometimes have tendency not to apply for permission for his/ her own academic study. The participants expressed their opinions as unnecessary and anxious about the attitudes of the administrators towards the scientific studies that are desired to be done in schools.

Below are sample expressions from the opinions of the participants on this subject.

"…there should be an **obligation** to get permission, **a reviewing committee**. Because of its own class... I think it should not be able to implement it without going through a board. **Parent consent form** may also be requested for certain age groups in the permissions of the ethics committee. If I were a parent, I might not have wanted to if I did not know the content of the study. But I do not find it right that it is so difficult to practice in private schools or public institutions. The process should be **fast** and **facilitated** for people doing academic studies" (P1, interview notes).

"Obviously, schools in national education find it **unnecessary**, rather than a restriction. Let it be done, but there is the logic of what is needed. In national education, all academic studies are regarded as unnecessary. Both teachers and administrators. It's usually based on volunteerism anyway. Anyway, something done **without the permission of the children probably does not reflect the correct results**. …scientific studies **must have parental permission and student permission**. There are no such rules directly in schools. …but the student says share at that moment, then a friend makes fun of his photo. Then an investigation is opened about the teacher. But if there is written permission, it is okay to say that the parent signed it" (P2, interview notes).

"...we do not take **permission** during the period. At the beginning of the semester regarding the sharing of photos of students, sometimes it may come out. He thinks that individual photos will be shared, so he does not allow it. When I talk to my advisor about this, it will not be ethical... even now I am working with teachers, we will work with teachers in public schools, not teachers in my own school. ...it's easy for me to interfere with data at the beginning, I don't give direction, it changes shape. ...we did not select the data of the study as it may change" (P3, interview notes).

"So my friends have surveys**, I do them myself, I do the ones related to my course**. **I do not get permission for my own studies**. When someone else comes from outside of school, they also get a little nervous, they have such a concern as to whether I will take responsibility. Because they do not understand, principals may perceive it as something different if they have not done academic work. And when they hear that it will be recorded, they are afraid of what will happen. ...Mone has already sent a circular. So that you do not share pictures of children on social media without permission. That's why I cover children's faces when sharing photos. Or I don't take pictures of children in experimental videos or something. It can happen once (permission can be obtained). In general, in the form of a petition saying I give permission" (P4, interview notes).

"…first going to the institute... and then **getting approval from the national education**. Then I know that permission will be taken from the school administration, teachers, parents and students themselves. There was such a **long process**" (P5, interview notes).

Findings Regarding the Opinions of the Participants on Sanctions Regarding Unethical Behaviours

A theme has emerged regarding sanctions against unethical elements. The responses of the participants to this theme are given in Table 8.

Table 8.

Categories and Codes Related to Sanctions against Unethical Behaviors

	Categories	Participants
Codes	**Students aspect**	
	Warning	P3, P5
	Cancellation of handed assignments/theses	P1, P2, P5
Codes	**Academics aspect**	
	Dismissing from profession	P2, P3
	Cancellation of academic title	P3
	Cancellation of relevant publication	P5
	Imprisonment-litigation	P1, P4
	Social exclusion	P2
	Temporarily ban of publication	P3
	Control mechanisms	P1, P4

As can be seen in Table 8, the answers of the participants regarding the penalties (sanctions) for unethical factors are divided into 2 categories to be analyzed separately for students and academics. The sanctions that should be applied to students for unethical behaviors reported by the participants are warning students and cancellation of their assignments and theses. Sanctions that can be applied to academics are stated as dismissing from profession, cancellation of academic title, cancellation of relevant publication, imprisonment-litigation, social exclusion, temporarily ban of publication and control mechanisms.

Below are sample expressions from the opinions of the participants on this subject.

"...the assignment may be **cancelled**. …can **sue** people who commit plagiarism legally. …it would be better if there is something like an **audit commission** within the university or the government about this" (P1, interview notes).

"I think that a person who constantly engages in unethical behavior will not be able to **take much place in academics** and people will turn their backs on him. Exclusion but **social exclusion**. …you know, I said, until I get **banned from the profession**. It should be for students too" (P2, interview notes).

"It could be a **warning** for a college student. But an academic who has a doctorate or a research assistant may be **prevented from publishing for a year or a month**. As long as this process continues, a publication ban of 3 months and then 6 months, if necessary, can be taken. …certain punishments such as **warning** and **reprimand** must be given and followed by **exclusion from the profession**…" (P3, interview notes).

"There should be heavy **sanctions**. ... you take the university exam, you cheat, 2 years is not enough punishment for me to take the exam, I think he should not take the exams for life and he should be sentenced to **prison**. In other words, there are institutions and ethical committees that will regulate **penalties**, for example, it seems that it is not enough to prevent them" (P4, interview notes).

"...I think, for example, that **publication should be removed**. If he wrote an article or thesis about a topic, it should be removed. … first ... if there is a deficiency, then it can be said to be corrected as a warning ...then if it comes back when he is on the defensive, I think that broadcast should be **cancelled**. As a result, people will not be discouraged if it is a direct **warning** and then a punishment instead of giving punishment first" (P5, interview notes).

Findings Regarding the Views of the Participants on the Effect of Unethical Behaviours on Science

The participants were asked whether unethical factors have an effect on science and (if any) what these effects are/could be, and their answers are presented in Table 9 with frequency values.

Table 9.

Categories and Codes Related to the Effect of Unethical Behaviours on Science

	Categories	Participants
	Affecting aspects	
Code	change in the results of the studies	P1, P3, P4, P5
	decrease in the original inventions	P2, P4
	chain chaos	P3, P4
	poor quality of the publications	P2, P5
	delay in the emergence of the facts	P1, P3, P4
	Not affecting aspects	
Code	Transparency of science	P3, P4
	Universal laws	P3

According to Table 9, it is seen that the answers of the participants regarding the effect of unethical behaviours on science are gathered in 2 categories as affecting and not affecting aspects. The aspects that are thought to affect the science of unethical factors are expressed as the change in the results of the studies, the decrease in the original inventions, the chain chaos, the poor quality of the publications, and the delay in the emergence of the facts. On the other hand, it has been emphasized by the participants that the transparency of science and universal laws are the aspects that unethical behaviours cannot affect.

Below are sample expressions from the opinions of the participants on this subject.

> "The **results** of studies **may vary**. It can **mislead** science" (P1, interview notes).

> "...constantly circulating from the same sources and using them, such a thing cannot be **discovered**" (P2, interview notes).

> "...Perhaps the people who will do that work after me will be guided by what I wrote. Therefore, it can also **disrupt** that person's work. Or ...it can lead to the person's work. ...**universal laws** may not affect the laws of physics. But perception, vision awareness are things that are studied very often. Since we work with the person, we can change his direction" (P3, interview notes).

> "...the most beautiful thing about science is that it is **transparent**. They take risks, that is, those who play with the data. Sooner or later, the facts come out. …it is impossible to determine the accuracy

of the studies of each new article. ...he refers to it as a chain because it is accepted as true. He refers to it, all of them refer to the same, but the source is wrong... **chain reaction**... so ...it can delay the emergence of facts, lead to wrong practices while developing programs while a new education model is being made" (P4, interview notes).

"The publications made by people just to be **popular** or just to improve their economic situation are not enough. I don't think those people do it to do scientific studies... Let's do it **quickly**, then we will spread it as if we did it for 5 weeks, so they can do such a method" (P5, interview notes).

Discussion and Conclusion

In this study, the opinions of the students enrolled in the graduate program were consulted in order to obtain in-depth information and analyze the subject of science ethics, which has been emphasized with the increase of unethical factors recently. As a result of the data obtained, the emphasis has been placed on giving more importance to ethical issues in general, making ethics committee documents mandatory in every institution, adding courses such as professional ethics and scientific ethics to teacher training higher education undergraduate programs.

In the study, 8 themes obtained as a result of content analysis were created in order to create a wide scope unlike other studies conducted with science ethics. The themes obtained within the scope of this study are the concept of scientific ethics, science ethics course, unethical elements and their reasons, the effect of sociocultural level, studies in schools, sanctions against unethical elements and the effect of unethical elements on science; It is thought that a comprehensive examination has been made in terms of the answers obtained both containing information about K-12 and higher education education stages and having a wide content such as from concept definitions to permission processes, and it is thought that the analyzes will contribute to the literature in emphasizing the deficiencies in the relevant subjects.

Responses of the participants to the themes were reduced to as many sub-categories and codes that provide common meanings as possible in order to make more specific and clear comments. The comments on the basis of themes, in which the results obtained from the findings are also associated with the demographic characteristics of the participants, are presented below.

Theme 1: The Concept of Science Ethics

During the interview, the participants were asked separately about the concepts of ethics and scientific ethics, but since the answers were generally for the concept of scientific ethics; In the first theme, the concepts of ethics and scientific ethics were evaluated in the same category. In addition, it was concluded that there was a problem in terms of conceptual understanding in all of the participants associating the concept of ethics with morality. Although the terms "ethics" and "morality" are used synonymously, they have different meanings. While morality expresses the widely existing values and codes of conduct in a society or culture; ethics, on the other hand, is not content with making an unbiased description of how and according to what people behave in the society they live in; it aims to find the principles, rules, norms and values of moral life (Irzık, Ercan, 2008, p.1). As an explanation of the concept of ethics in the study, only the participant with the code P2 responded as "ethics is something that deals with good and evil" and made a suggestion for the concept of scientific ethics with the expression "things that academicians should do right or not do wrong". Opinions about the concept of science ethics were generally gathered at the point of "being ethical in the academic field in scientific studies" (P1), and it was seen that there was no emphasis on the pre-university education period. From this point of view, it can be interpreted that the subjects of "doing science" and "observing ethical elements" in these processes are not given enough importance in the pre-university education period.

Theme 2: Science Ethics Course

It can be thought that one of the reasons why comprehensive answers about science ethics could not be given in the first theme is that all of the participants did not take science ethics courses during their undergraduate and graduate periods. Participants mentioned that the concept of ethics was mentioned in the course content (P2), not as "scientific ethics". However, the participant with the code P5 stated that "in fact, scientific research and publication is handled in ethics, but it is not sufficient". Similarly, participant P1 said, "Only for the ethical part, plagiarism was mentioned. I think a more specific lesson should be devoted to this; because it was at the initiative of the teacher." He referred to the inadequacy of the concept of scientific ethics given in the graduate period. Indicating that, unlike the other participants, the subject of scientific ethics was mentioned during the undergraduate period, the participant with the code P1 said, "Our instructors during the undergraduate period were very meticulous about this." As it can be understood from the expression, it can be considered that it is an advantage to have an undergraduate education at a university providing education in a foreign language and to use foreign language resources. In addition, the participant coded P2 said that "some teachers were talking". Based on the expression, it can be interpreted that if the science ethics course is not integrated into the curriculum, the students who take courses from academics who do not show initiative will be disadvantaged if the subject of ethics is handled depending on the "initiative" of the academicians.

On the other hand, P4 and P5 coded participants, who started their master's program in 2018, mentioned that they were given more comprehensive information about scientific ethics, although they thought that it was not enough. The subjects mentioned in the scientific research course in the participant master's program coded P4 were as follows: “The researcher should be ethical, not plagiarism, that there are plagiarism programs, that he/she detects it, that the data should be entered as it is, not according to the result we want while observing, that we should get permission before doing research.” sorted. P4, who was the only participant who stated that there was no need for a scientific ethics course to be a separate course, said, “There should be more emphasis on... With concrete examples, it would be better if those who acted unethically before and received penalties, what are the legal sanctions of this, and its place in our culture.” He emphasized that “examples from real life experiences” should be added to the subject of science ethics, which is covered in the curriculum. P4 supported this view with the idea of “Punishment should be a deterrent” and drew attention to the effectiveness of concrete examples in preventing unethical elements. Regarding the scope of a science ethics course to be integrated into the curriculum, it is concluded that the emphasis of the participants on the steps of creating scientific publications (see Table-3) is not sufficient despite taking a scientific research course during the graduate course. From this, it can be interpreted that although there are various publications on scientific ethics or scientific ethics, unless there is a compulsory course, the tendency of people to refer to these publications to obtain scientific ethics information is low. Similarly, in the study conducted by Özden and Ergin (2013) to determine the opinions of the participants with a master's degree in science teaching on the ethical rules applied in scientific research, the importance of adding the science ethics course to the curriculum and the students' need for guidance in the process of conducting scientific studies were revealed. In fact, a course on scientific research and ethics should be added not only to higher education but also to K-12 level.

As a result of the higher education program regulation updated in 2006, it is thought that it is important to examine the efficiency of the lesson, depending on the difficulties experienced by the students enrolled in the institute programs that added ethics courses to the curriculum, and the ethical violations they witnessed or committed, depending on the ethics course variable. For example, within the scope of this study, the views of students who took and did not take courses related to ethics were compared on various themes. Students (P4, F5) who received publication ethics, especially on scientific research methods, reported that they considered themselves more competent, but still lacked ethical aspects. More studies are needed with a larger sample on the subject.

Theme 3: Unethical Factors, Theme 4: Reasons, Theme 5: Social Factors

The themes of unethical factors and their reasons will be evaluated together in this section, as the participants simultaneously respond to their views on what unethical factors are and the reasons that lead people to these behaviors.

The subjects that the participants emphasize the most about unethical behavior are scientific publications, articles, assignments, thesis, etc. relates to the rules violated at the time of writing. They also stated that their level of knowledge on citation and writing bibliography is lacking. Participants with the code P2 and P5 emphasized that they violated these rules "unconsciously" due to their lack of knowledge during the license period. The participant coded P2 said, "We were finding the things we were asked to research from a ready-made place and presented it as if it were our own homework." The statement of the participant with the code P5 and "We used to put the word of an author or academician exactly and give references under it, for example, we put it without changing it. For example, it was plagiarism, but we didn't know". His statement explains the reasons for "plagiarism" due to "lack of knowledge". However, P5 stated that they received information about these rules in the "scientific research and publication ethics" course during the graduate period; P2 stated that he did not receive any information during the graduate period. P2 "I definitely don't remember talking about ethics during my master's course". With his statement, he supported that he did not acquire knowledge during the graduate course; He even stated that he is currently experiencing "difficulty in learning". It can be interpreted that the lack of knowledge of P2 and P5, who studied at the same university during the undergraduate period, is "related to the university they studied at during the undergraduate period". It is concluded that the participant coded P2, who continues to the master's program of the same university, started his education in 2013 and the registration of P5 in 2018 was effective in benefiting from the contents of the updated curriculum during this 5-year period. As an opinion against the stated views; considering that although students are not given information, they can acquire information with individual effort, it can be argued that lack of knowledge does not constitute a "just cause" for plagiarism.

When the results of the studies on the subject are examined, it is seen that the lack of knowledge is one of the most important factors that lead students to plagiarism. For example, Hamutoğlu, Akgün, and Yıldız (2013) stated in their study with educational sciences graduate students that the problems experienced while writing the thesis are not knowing how to cite, not being able to access the source, and not having knowledge about ethics. In the study conducted by Can and Ceyhan (2015) to determine the proficiency of graduate students in writing scientific reports, it was found that they thought that “master's courses are not sufficient to have knowledge about scientific report writing”.

Another important issue that the participants focused on regarding unethical factors is “to have the statistics departments of the theses done by others, to have the theses written, and to turn this into a market (P3)”. On the subject, P2 said to a friend of his, “She had her second thesis done by paying a friend and she graduated.” gave an example. P2 said that his friend's behavior “He did his second master's degree so that I can go to the university as a social activity.” interpreted as. At this point, it draws attention to the extent to which the knowledge proficiency of a student who does not prepare his/her master's thesis is examined by the student's advisor and other jury members, and how this behavior of the student is not revealed. A similar situation encountered by the participant coded P2 is an unethical suggestion offered by a counselor to his student. P2's words about the teacher's offer to his student are as follows:

A friend called his teacher and said, “I don't have much free time to write the thesis. You give me the past theses and I'll turn it into a master's thesis”. His teacher agreed. His teacher then called my friend and offered him if he wanted to, “Let's do the same for you, I'll give you one of your undergraduate thesis, you change it to a master's thesis”. My friend replied, “No, sir, since it's happened, we've waited this long”. His teacher said, “You cannot write, I told you to help you” (P2, interview notes).

Based on these views, the following statements of the participants with the code P2 and P5 are supportive about the fact that “individuals' education levels are not effective in developing unethical behavior”:

“It happens that teachers do it too” (P5, interview notes).

“If ethical awareness was formed in people with a high level of education, people who publish scientific publications would not be people with a very high level of education” (P2, interview notes).

It is a point emphasized by all participants that unethical elements are "related to character" rather than individuals' academic titles and education levels. Examples of the features detailed about the character structure are “carelessness, indolence” (P1), “doing for the sake of doing it” (P1 & P3). In addition, at the point of social status, reasons such as “to get somewhere” (P3), “to rise fast” (P4), to “increase points” (P3, P4 & P5), which is one of the criteria for promotion in a job for academicians, lead academics to behave unethically elements appear. Some academics' making agreements with “journals that write for money" by publishing “3-4” (P4) instead of "publishing one study in a year” is an example of these behaviors. Similarly, in the study of Aydın, Şahin, and Demirkasimoğlu (2014) on the causes of ethical violations, it was found that economic concerns override scientific thinking, anxiety for academic advancement, and self-interest are factors that lead academics to behave unethically. On the other hand, participants with the code P4 and P5 shared their information about the new regulations about these journals. It can be interpreted that such regulations are promising in terms of the emergence of "quality publications" and "plagiarists getting ahead of those who really work" (P4).

The common point of the studies on the causes of unethical behavior is the "character traits" of people. Even if the necessary training is provided, ethical violations will be inevitable due to the influence of character traits. As a matter of fact, the social environment, social values, social sensitivity, social conditions, etc. variables also affect the ethics of science (Erdem, 2012, p. 30; citing from İnci, 2008, p. 109; Yaşar, 2018). Therefore, at this point, it is thought that the studies to be carried out by considering the social factors will offer more permanent solution suggestions.

Theme 6: Studies in Schools and Permission Process

The participants attribute the difficulties of researchers in conducting scientific studies in schools affiliated to the Ministry of National Education to the "long and troublesome" permission process required from the relevant institutes and within the Ministry of National Education. In this regard, the participant with the code P5, in addition to official permissions; as stated in the graduate course, he also emphasized the point of taking permission from the school administration, teachers, parents and students themselves. It is seen that there are "differences of opinion" among the participants about getting permission to practice if the researcher is a teacher in charge at the school. Regarding the subject, P1 said, "Any research that he/she wants because of his/her class or maybe wrong, may not even be suitable for his/her age group." expressed an opinion. On the other hand, the participant with the code P4 said, "I do not take permission because I am myself." shared his knowledge. In addition to the troublesome leave process, he suggested the negative attitude of the participant administrators with the code P4 about the difficulty of conducting scientific studies in schools as the reason. The information P4 shared about the attitude of his school administration is given below:

"When someone else comes from outside the school, they (the school administration) get a little nervous too. It is in the style of "I wonder what he will do, what he will ask, if there is a problem, will we go to the newspaper and television". Here I am, you will do a research on whether there is sexual abuse in the family, you went and looked, and it turned out to be true. This; The principals get scared when you say “there was such a thing at that school, his father was abusing him” the next day. “What will I allow now, do I take responsibility”; they also have such concerns. If they did not do academic work because they did not understand, the principals may perceive it as something different, when the journalists say that I will interview as if they are going to ask questions. And when they hear that it will be recorded, they are afraid of course, “what will happen, what will happen”. .. They also worry about the future for themselves. “So that I don't get into any trouble” (P4, interview notes)

It can be interpreted that the reason why P4 does not take permission while doing his own studies is the “tense” and “anxious” attitude of the school administration, as mentioned above. In addition, P4 said, “I don't need permission since the subjects in our lessons are related to the lesson.” added the information. As P1 said about doing scientific work in schools, “The process should be fast and facilitated for people who do science studies.” It is concluded that it is very important to make some arrangements so that the negative attitude of the school administration does not reduce the motivation of the researchers and scientific studies can be carried out without disrupting the functioning of the curriculum.

Theme 7: Sanctions against Unethical Elements

As a result of the answers given about the sanctions, which is the theme that the participants focused on the most, it was revealed that the participants were in agreement with the existing sanctions, and they presented it as a suggestion because they were not aware of some sanctions.

It can be argued that the reason why the participants evaluate the penalties for unethical factors separately for students and academics is that students may commit plagiarism "unknowingly" (P3). Emphasizing that penalties such as “warning” for undergraduate students and “invalid homework or thesis” for graduate students, the participants agree that there should be “heavy sanctions” (P4) for academics. Some participants' proposals such as “cancellation of academic title” (P3) and “disbarment from profession” show that they are not aware of these sanctions currently applied. At this point, as P4 stated, “Adding concrete examples to the science ethics course” can contribute to the fact that people have easier knowledge and ideas with sanctions. Because it can be interpreted that the tendency of developing unethical behavior will not decrease with the thought that there will be no sanctions for individuals who do not personally witness the sanctions imposed on unethical behaviors around them or who do not obtain information through regulations.

The primary reason for staying away from unethical behavior is "the unethical nature of not being subject to sanctions" is also a paradox that needs to be discussed. The main reason why individuals do not tend to these behaviors is "unethical" and the importance of educating individuals from the first steps of education in internalizing individual/societal ethical norms is striking. In this context, it can be suggested that more emphasis should be placed on ethical issues in the "Religious Culture and Moral Knowledge" course in the K-12 curriculum of the Turkish Education system. It can be interpreted that individuals who internalize ethical norms at an early age will decrease their tendency to develop unethical behavior in scientific studies.

Theme 8: Impact of Unethical Factors on Science

The answers of the participants about the effect of unethical factors on the direction of science were gathered around the idea of "misleading science" (P1). However, when the answers are examined specifically, the point emphasized here is not the nature of science, but that the new contents developed by researchers based on previous studies will have inauthentic, incorrect and poor quality qualities as a result of misconceptions. On the other hand, as stated by participant P3, "unethical behaviors do not affect universal laws" and participant coded P4's views that "the truth will come out sooner or later" may reveal an optimistic dimension in terms of science confirming itself over time. On the other hand, when unethical factors are considered in a social context, it is important to strengthen serious and deterrent inspection mechanisms within the state as a result of unethical gains among individuals, damage to the general value judgments of societies, and the inability of states to keep up with scientific and technological innovations in the global sense.

Appendix-1. Sample Semi-Structured Interview Form

1. How would you define the concept of ethics of science?
2. Have you taken any courses related to the science ethics? If not, do you think such a course would be necessary (eg.content, benefits)?
3. What sorts of behaviours would you define as unethical behaviours? Have you encountered any of them?
4. What do you think the underlying reasons of unethical behaviours could be?
5. Do you think there is a relationship between social factors and unethical factors?
6. What do you think about conducting academic studies at schools? (permission procedure, attitudes of authorities)
7. What kind of sanctions should be applied against unethical behaviours
8. Do you think unethical behaviours affect science? In which aspects?

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The Effect of Technology-Enriched Foreign Language Teaching on Special Talented Individuals' English Attitude

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Abstract. The purpose of this study is to determine the effectiveness of technology-enhanced foreign language teaching on the English attitude of special talented individuals. Within the framework of the research, activities were prepared and applied to teach the goals set for gifted individuals more efficiently and permanently with the help of various technical tools. Also, the effects of these practices on students' English attitudes were examined. In the research mixed method was carried out. In line with the purposeful sample selection for the research, a total of 30 6th and 7th grade students studying at Bilecik Science and Art Center participated. In the study, the Attitude towards English Scale developed by Orakcı (2017) was used to measure the English attitude of gifted individuals. The SPSS program for the analysis of quantitative data, paired sampled t-test analysis, totals and averages and for the analysis of qualitative data, induction and content analysis were used. The results of the research reveal that technology-supported alternative teaching methods have a significant effect on increasing students' attitudes towards the English course in a positive way. It is emphasized that the technology-assisted language teaching method discussed within the scope of the study has the potential to be an important alternative to traditional teaching environments in English teaching in terms of students' vocabulary, grammar, listening, speaking, reading and writing skills.

Keywords. Special talented individual, English, technology, technology-enriched foreign language teaching.

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A foreign language is learning or knowing a language other than one's mother tongue by one's own will. Unlike mother tongue learning, foreign language learning is a complex process involving the target language environment, students, teachers and teaching-learning environments (Dinçer, 2014, p. 1). For this reason, if a person chooses the target language as a tool and not as the goal of using the language in the process of learning another language, it complicates this process and makes the target language an unnatural and difficult process unlike learning the mother tongue. A person's purpose for participating in learning a new language can be professional and cultural requirements as well as personal preferences.

In the process of learning foreign languages, individual differences are another important point to consider. Not all individuals have the same learning pace or style. Within this process, there is a group that must be taken into account in this education system, which aims to provide each individual with the desired language learning process without being left behind, regardless of their characteristics; gifted individuals. Since gifted individuals are more advanced than their peers in developing their talents, educational environments designed for average students are not sufficient for them (Beşkardeş, 2007, p. 2). Programs and practices designed for the education of gifted individuals should include new activities that emphasize the creativity and unique ideas of these individuals beyond mere knowledge transfer or rote learning (Ersoy & Avcı, 2004, p. 206). Considering the status of language learning for gifted individuals, it is necessary to use different methods and techniques. It is known that these students learn quickly and in different ways. In this context, it should not be forgotten that when the target group of language teaching is gifted individuals, this group has a high learning motivation, is curious and has the ability to learn quickly. In a globalizing world, learning foreign languages, one of the most important needs, is especially important for gifted individuals. Given the potential of talented individuals, they have a say in this global world with the professions they hold in the future. In this global structure, where they'll have a say, it becomes necessary to know a foreign language that is spoken in common. In this regard, for our country, which has significant deficiencies in the teaching of foreign languages, learning and using a foreign language permanently is indispensable, considering that these students will have a say in both national and international fields of science and science (Beşkardeş, 2007, p. 5). In fact, the number of studies in the literature on foreign language teaching to gifted individuals is limited. With the research done, it contributes the field of teaching foreign languages to gifted individual.

It is undoubtedly one of the best choices to implement foreign language teaching for the mentioned target audience using the latest technology and applying different methods. Technology offers a wide range of language learning opportunities for teachers and students thanks to its deep database and wide range of materials. However, the development of technology and its entry into the field of education has caused difficulties in determining in which field and how technology should be used (Farr & Murray, 2016, p. 1). Furthermore, a study conducted by Mohammed (2015, p. 6) found that although the research on technology-assisted language teaching received positive responses, many teachers did not tend to increase the integration of technology into their teaching processes.

As a result of the literature studies, it has been seen that although there are studies on the importance of technology-supported foreign language education, there are not enough studies on foreign language education for especially talented students. In a study conducted by Kaplan Sayı (2013) on the development and implementation of an English language program that meets the academic and intellectual needs of gifted students, testing the effectiveness of the program and revealing the results, it was seen that the English language education program for gifted students significantly increased students' achievement, critical thinking and creativity. On the other hand, Beşkardeş (2007) investigated the effect of applying metaphor technique in foreign language teaching to gifted students on student achievement. According to this study, the average academic performance of the students in the experimental group in which metaphor technique was applied was higher than the students in the control group in which traditional teaching was applied. An Example of Using Technology as a Material in Language Teaching by Temizyürek and Ünlü (2015): "Flipped Classroom", the studies conducted in Turkey and abroad on this subject were examined and the benefits of using this application in language classes were revealed by reviewing the activities of the applications. Moreover; Mohammed (2015), in his study aiming to reveal students' and teachers' perceptions of the advantages and obstacles of a technology-assisted program in foreign language teaching, found that although both teachers' and students' perceptions of integrating technology into foreign language teaching were negative, these schools lacked technology or faced obstacles due to students not using the available technology. In this regard, it is aimed to shed light on how the integration of technology into a foreign language can be offered to instructors or operators in the field.

Finally, the study presents content in the field of foreign language teaching and brings a new perspective to teaching foreign languages to gifted individuals. Also, it reveals these individuals' perceptions of English both by teaching a foreign language with the inclusion of technology in the language learning process and by looking at the effects on the English language attitutes of gifted individuals. In this way, the research contributes to the understanding of a less researched area, the the gifted individuals' English-speaking attitudes and to creating a desired change in these attitudes.

The aim of the research is to reveal how teaching English to gifted students with the help of technological online tools affects students' English language attitudes. In this context, the goal of the research is to prepare and implement activities for the students of the ITRP (Individual Talent Recognition Program) group to teach the English language learning outcomes of the curriculum more efficiently and permanently using technological online tools and to observe the effects of the prepared programs on students' English language attitude. Depending on the main problem, the sub-problems to be answered in the study are the following:

1. What are the students' attitudes towards English within the framework of the study?

2. What are the activities carried out by students with the technological tools for technology-supported language teaching within the scope of the study?

Method

Research Model

In this study mixed method was used to investigate the effect of technology-assisted foreign language teaching on the English-speaking attitude of gifted individuals. Creswell (2002) defined mixed methods research as a research model in which both qualitative and quantitative data are collected, evaluated and analyzed together to answer research questions. In the study, embedded planning, which is one of the mixed methods was preferred. A feature of this design is that one of the quantitative or qualitative methods is more prominent than the other, but also information collected in alternative ways is needed to support, generalize or explain the information obtained (Yıldırım & Şimşek, 2013, p. 322). The relevant qualitative data for this study were collected through the students' works obtained from teaching English with technological online tools and the quantitative data for the supporting role were collected using a pre-test-post-test without a control group.

In the study, a one-group pre-test-post-experimental design without a control group was chosen. In this and similar studies, the lack of sufficient sample student groups for the control group of gifted individuals and the problems in organizing groups and class order in the science and art centers were effective in the selection of the single group design without a control group. In the pretest-posttest study of an individual group without a control group, the effect of the experimental procedure was tested with the application on one group. The test measurements of the group participating in the study regarding the dependent variable are determined by repeating the measurements with the same measurement tool, as a pre-test before the application and as a post-test after the application (Büyüköztürk et al., 2012).

Study Group

Bilecik Borsa İstanbul Science and Art Center was chosen as the application site of the research. ITRP (Individual Talent Recognition Program) students, who are registered at the research institute and benefit from the educational activities, were defined as the group and the environment in which the application will be made, according to a purposeful sample selection. Purposive sampling enables a comprehensive study by selecting situations that are believed to contain a wealth of information depending on the purpose of the study (Büyüköztürk et al., 2012; Yıldırım & Şimşek, 2008). Students educated at the ITRP (Individual Talent Recognition Program) group in the science and art center are included in the study, because they are the most suitable work group in terms of their English language level and age group by completing support training. In the framework of the study, the real names of the students were hidden due to research ethics and the students were given code names. The demographic information of the participants is presented in Table 1.

Table 1.

Demographic Information of the Participants

Variables	***Categories***	***Frequencies***	***%***
Gender	Boys	14	46.6
	Girls	16	53.4
	Total	30	100
Age	11	11	36.7
	12	10	33.3
	13	9	30
	Total	30	100

Looking at the table, out of the 30 students who participated in the study, 14 (46.6%) were male and 16 (53.4%) were female students. In addition, 11 (36.7%) of the students who participated in the study were 11 years old, 10 (33.3%) were 12 years old, and 9 (30%) were 13 years old.

Data Collection Tools

As the study is based on mixed methods, a variety of quantitative and qualitative data collection tools were used throughout the process. The study used the "Attitude Scale Towards English Lesson" developed by Orakci (2017), which measured the attitudes of gifted individuals towards English lessons. In addition, studies were conducted using various online tools during the eight-week technology-supported English teaching period.

Attitude scale towards english lesson. The "Attitude Scale Towards English Lesson" structured and developed by Orakcı (2017) was used to determine and measure students' English language attitudes at the beginning and end of the technology-supported English teaching process. The scale used in the study consisted of 16 parts, 10 of which measure affective characteristics and 6 behavioral characteristics. These scale items include responses such as "never", "rarely", "sometimes", "often", and "always". When scoring the scale items, positive and negative attitude expressions were taken into account; positive opinions are scored 5-4-3-2-1 and negative opinions 1-2-3-4-5.

As a result of the reliability study of this scale conducted by the researcher, the reliability value of the first subdimension of the scale was determined to be 0.911 and the reliability value of the second subdimension was determined to be 0.887. If the reliability coefficient values of the scales are above 0.70, it is accepted as high reliability (Özdamar, 2013). In this study, the internal consistency coefficient of the general attitude score was found to be 62.

Process

In this study, technology-assisted English language activities were prepared and implemented to investigate the effect of technology-assisted English teaching on the English language attitude of gifted individuals. The research was carried out in the Physical Appearance, Transportation, Animal Kingdom, Nature and Environment, Free Time Activities, Storytelling and Universe units of the Science and Art Center of the General Department of Special Education. The achievements of these eight units were reviewed. In order to achieve these outcomes, lesson plans were prepared that included technology-supported English language plans. This study lasted 10 lecture weeks in the second semester of the academic year 2021-2022. In the first week of this field study, students took pre-tests. Information was given about answering the English attitude scale and the students answered the attitude scale. Once these processes were completed in the first research week, technology-supported English teaching began. The teaching lasted eight weeks and technology-supported English lesson plans were applied. In ITDP (Individual Talent Discovery Programme) groups with 2 lessons per week, 2 hours of the English lesson are reserved for technology-supported English activities. The applications followed the stages; preparation-warm-up, teaching the target structure, main task and assessment for teaching English with technology. Each week, according to the theme, a different preparation-warm-up, goal structure, main task and assessment activities were taught. Every week, different technical tools were used, with which technology promotes the learning of English.

Technical tools used weekly were Storybird, Voscreen, Wordart, Quizziz, Lyricstraining, Cram, Storyjumper and Mentimeter websites. At the end of the tenth week, it was decided that the activity process of the study was completed and the attitude scale used as the first test was applied again to the students who participated in the study afterwards.

Data Analysis

Since the study used a mixed method, data analysis was performed in two different ways. In the analysis of quantitative data, t-test analysis of the sample was used, total and average values were used with the SPSS program, and in the analysis of qualitative data, induction and content analysis was used. Descriptive statistics were also used in the analysis of the pre- and post-test results of each student regarding the dimensions and total number of the attitude scale toward the English lesson. All results were both tabulated and expressed graphically. In addition, the studies obtained as a result of the activities carried out with the students were both tabulated and conveyed descriptively.

Results

In this section, the pretest and posttest results of the scale that determine the students' English language attitudes and the results of the eight-week technology-supported English activities applied to the ITDP (Individual Talent Discovery Programme) group students were given.

Findings on Attitudes towards English Lessons

In this section, related sample t-test analyzes were conducted to describe students' attitudes towards the lesson before and after the technology-supported English teaching application, and the results were presented in Table 2. In addition, descriptive statistics of factor scores and scale sums were calculated and the results were shown in Figure 1.

Table 2.

English Attitude Scale Related-Sample t-Test Results

Factors	n	$\bar{X}$	S.s	sd	t	p
Affective pre-test	30	26,03	2,76	29	-1.975	0.058
Affective post-test	30	27,60	2,73			
Behavioral pre-test	30	22,00	4,46	29	0.567	0.575
Behavioral post-test	30	22,53	3,91			

Looking at Table 2, the pre-test mean of the affective component of the scale is $\bar{X}$=26.03, the post-test mean is $\bar{X}$=27.60. While the pre-test mean of the behavioral sub-factor of the scale is $\bar{X}$=22.00, the post-test mean is 22.53. According to the results of the t-test analysis of the related sample, there was no significant difference in the pre-test and post-test averages of the students' attitude scale towards the English lesson. [$t(29)=-1.975$, $p>0.05$ ve $t(29)=0.567$, $p>0.05$]. However, it was found that the post-test averages and scale sum obtained from the factors are higher than the pre-test averages.

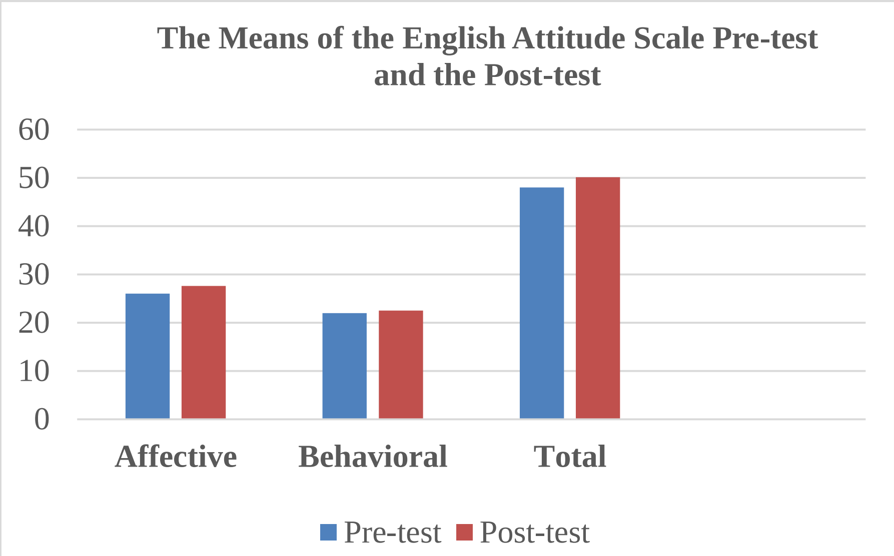


Figure 1. The Means of the English Attitude Scale Pre-test and the Post-test.

Findings on the Technology Supported English Activities

This section presents the online technological tools used in the application process for technology-supported English teaching and evaluations of the information obtained in the application process. Technical tools: storybird, voscreen, worart, quizziz, lyricstrainings, cram, storyjumper and mentimeter were used in technology-supported English teaching with students. The products obtained with the mentioned online technological tools were presented accordingly.

Storybird

Firstly, the "Storybird" technological tool was used in technology-supported English language teaching for gifted individuals. It was aimed to provide students with grammar, vocabulary, speaking, writing and reading skills by using the storybird website for physical appearance and personality traits topic. In line with this aim, the digital stories created by the students on this site about "physical appearance and personal quality" as a result of the warm-up, language focus, main task and evaluation processes were shown in Table 3.

Table 3.

Digital Stories Created by Students on the Topic of 'Pyhsical Apperance And Personal Quality'

Students	**n**	**Title**
Ö6,Ö5	2	Super Child
Ö18,Ö11	2	Hiking
Ö2,Ö7	2	Little Fox and Bear go camping
Ö20,Ö12	2	In the Space
Ö9,Ö8	2	A lion and its Cub
Ö14,Ö13	2	Zombie's Physical Appearance
Ö21,Ö22	2	Animals and Their Family
Ö19,Ö16	2	Appearance of Animals
Ö23, Ö24	2	At the Zoo
Ö15,Ö17	2	Play with Me
Ö25,Ö26	2	Future City
Ö29,Ö30	2	Sweety Boy
Ö27,Ö28	2	Scary Night
Ö1,Ö4	2	King of Mice
Ö3,Ö10	2	Libery War
Total	**30**	**15**

Table 3 shows 15 different digital stories covering target topic created by students as a result of forming groups of two. The name of digital stories are; Super Child, Hiking, Little Fox and Bear Go Camping, In The Space, A Lion and its Cub, Zombie's Pyhsical Appearance, Animal and Their Family, Appearance of Animals, At the Zoo, Play with Me, Future City, Sweety Boy, Scary Night, King of Mice and Liberty War.

Voscreen. Secondly, the technological tool "voscreen" was used in the process of technology-supported English teaching for gifted individuals. It was aimed to provide students with grammar, vocabulary, speaking, writing and reading skills by using the voscreen website for transportation topic. In accordance with this goal, as a result of the warm-up, language focus, the main task and the assessment process, it was ensured that the students get to know the topic of transportation through the activities on this site. The points obtained by the students as a result of the activities performed at the site were shown in Figure 2.

Observee	Success	Fails	Score	
Ö1	72	36	1663	×
Ö2	129	61	1412	×
Ö3	53	37	959	×
Ö4	137	51	1230	×
Ö5	46	9	777	×
Ö6	28	4	425	×
Ö7	39	20	295	×
Ö8	72	36	1663	×
Ö9	129	61	1412	×
Ö10	53	37	959	×
Ö11	213	62	6013	×
Ö12	177	39	4054	×
Ö13	141	25	2083	×
Ö14	81	25	1738	×
Ö15	41	10	524	×
Ö16	18	15	145	×
Ö17	10	4	54	×
Ö18	60	16	1016	×
Ö19	43	38	508	×
Ö20	17	3	384	×
Ö21	96	19	2210	×
Ö22	143	49	2089	×
Ö23	86	37	1412	×
Ö24	58	22	1201	×
Ö25	56	33	965	×
Ö26	526	87	11046	×
Ö27	220	39	3061	×
Ö28	51	11	1089	×
Ö29	64	34	965	×
Ö30				

Figure 2. Students' Points from Voscreen Activities Related to Transportation.

Figure 2 shows the results of the students' activities on the voscreen website. The reason for the difference in scores shown in Figure 2 is that the person who translated the videos shown on the site the fastest scored them differently in terms of timing. In addition, students' practice of using this site outside of school, after the class application process, is another reason that explains the difference in their results.

Wordart

In this part it was aimed to teach gifted students about health and disease using Wordart technology tools. In this context, warm-up, language focus, main task and assessment processes and activities were applied to teach health and illness topic supporting grammar, vocabulary, speaking, writing and reading skills by using a wordart website. Figures 3 and 4 show some of the visuals created as a result of the activities done by the students on the wordart website.

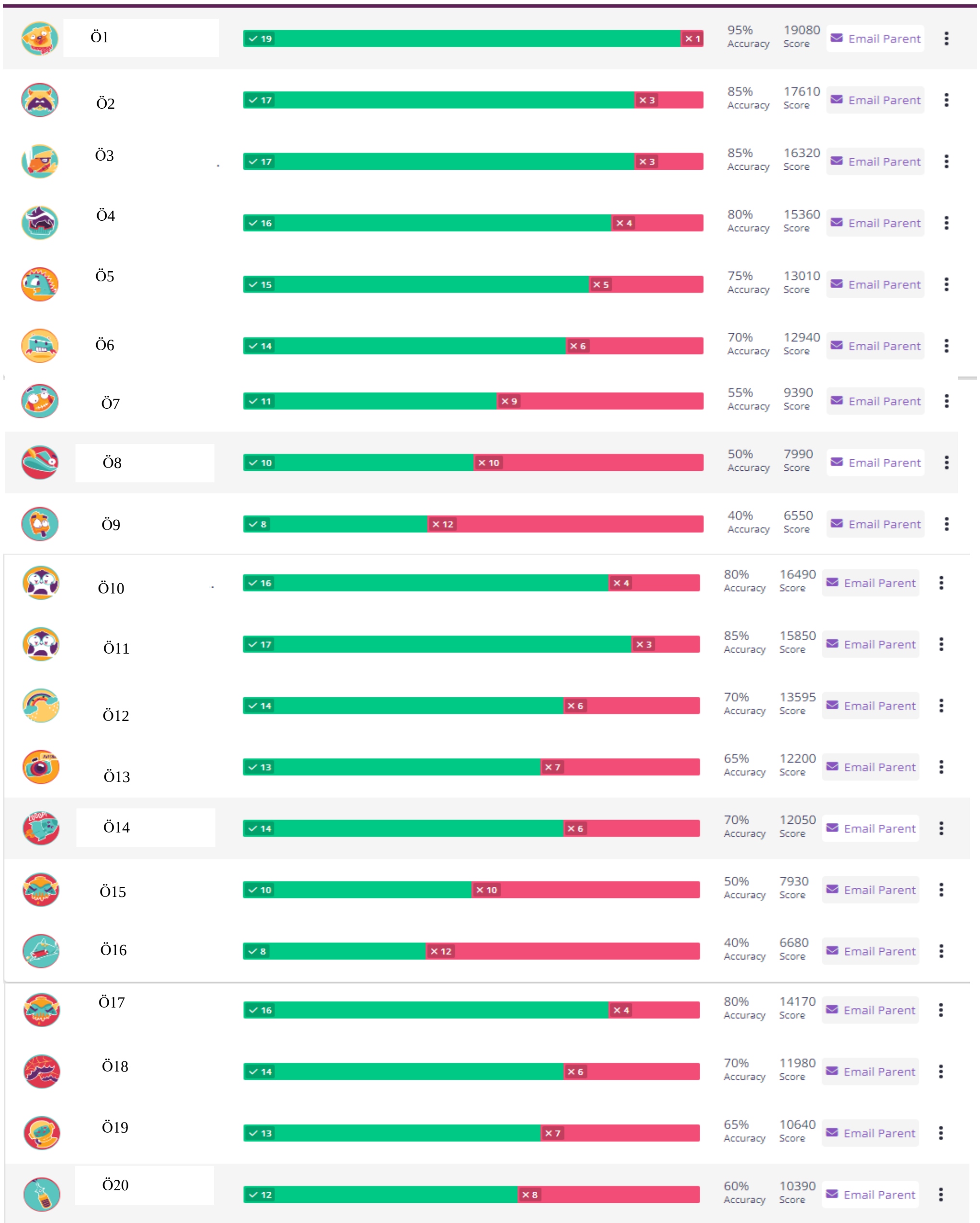
*Figure 3.*Wordclouds Created by Students on 'Health And Illness'.

Figure 4. Wordclouds Created by Students on 'Health And Illness'.

In Figure 3 and 4, the words that the students wrote on the pictures about "Health and Illness" on the Wordart site are as follows; health, measles, sneeze, cut, flu, cold, backache, hurt, pain, cough, stomache, toothache, söre throat, broken arm/leg, breeze, nurse, headache, medicine, fever, mask, home, covid, life, vomit, pill, fruit, illness, apple, dead, orange, heal, sick, dizzy, earache, doctor, virus, vegetable, runny nose, heal, tissue, syrup, painkiller ve chicken pox.

Quizizz

The fourth technological tool in the application of technology-supported English teaching to gifted students was a Quizizz. With the help of this site, warm-up, language focus, main task and assessment processes and activities were applied to teach animal kingdom, endengared animals topic supporting grammar, vocabulary, speaking, writing and reading skills by using a wordart website. As a result of the implemented activities, the score of the 20-question test on the quiz website for Animal Kingdom, Endangered Animals, is shown in Figure 4.



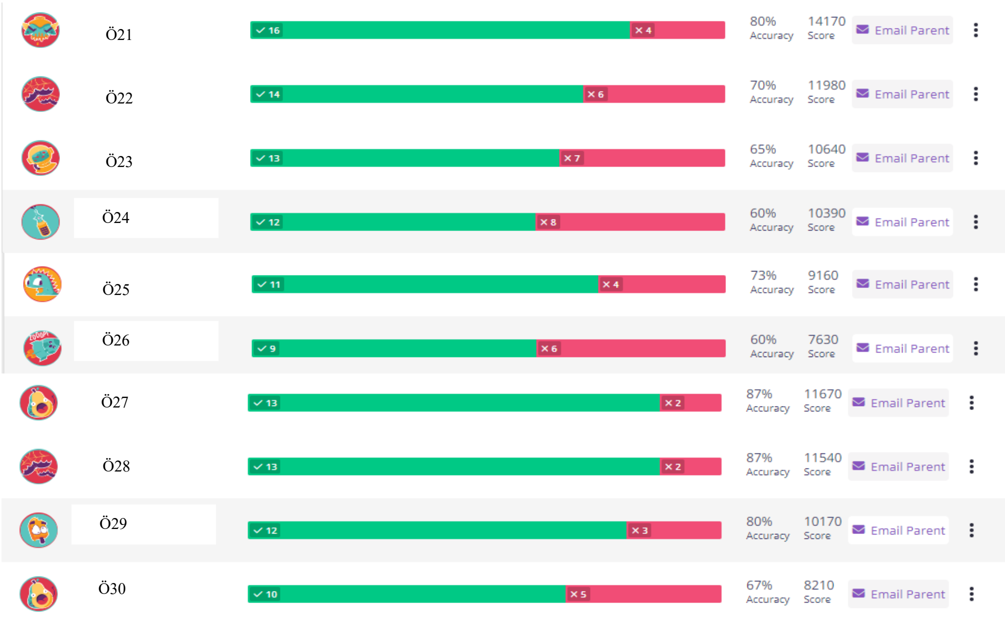


Figure 5. Scores of the 20-Question Test on the Quizizz Website for Animal Kingdom, Endangered Animals.

Figure 5 shows the results of online tests done by students on the quizizz website. The best result obtained as a result of the exam belongs to the student coded Ö1 with 1 error. According to the test results, 11 students gave more than 80% correct answers, 14 of them more than 60% and 4 more than 40% correct answers. Since more than half of the students gave more than 50% of the correct answers, it can be said that the activity was successful. The reason for the difference in the scores the students received was the speed at which the students answered the questions, the additional points offered in the test, such as various bonus points, were effective.

Lyricstrainings

The fifth technological tool used in the application of technology-supported English language teaching to gifted students has been lyricstrainings. With the help of this site, warm-up, language focus, main task and assessment processes and activities were applied to teach nature and environment topic supporting grammar, vocabulary, speaking, writing and reading skills by using a wordart website. As a result of the implemented activities, Figure 5 shows the result of searching words activities on the "Happy World Environment Day" video for the main task about Nature and environment topic in the lyricstraining website.

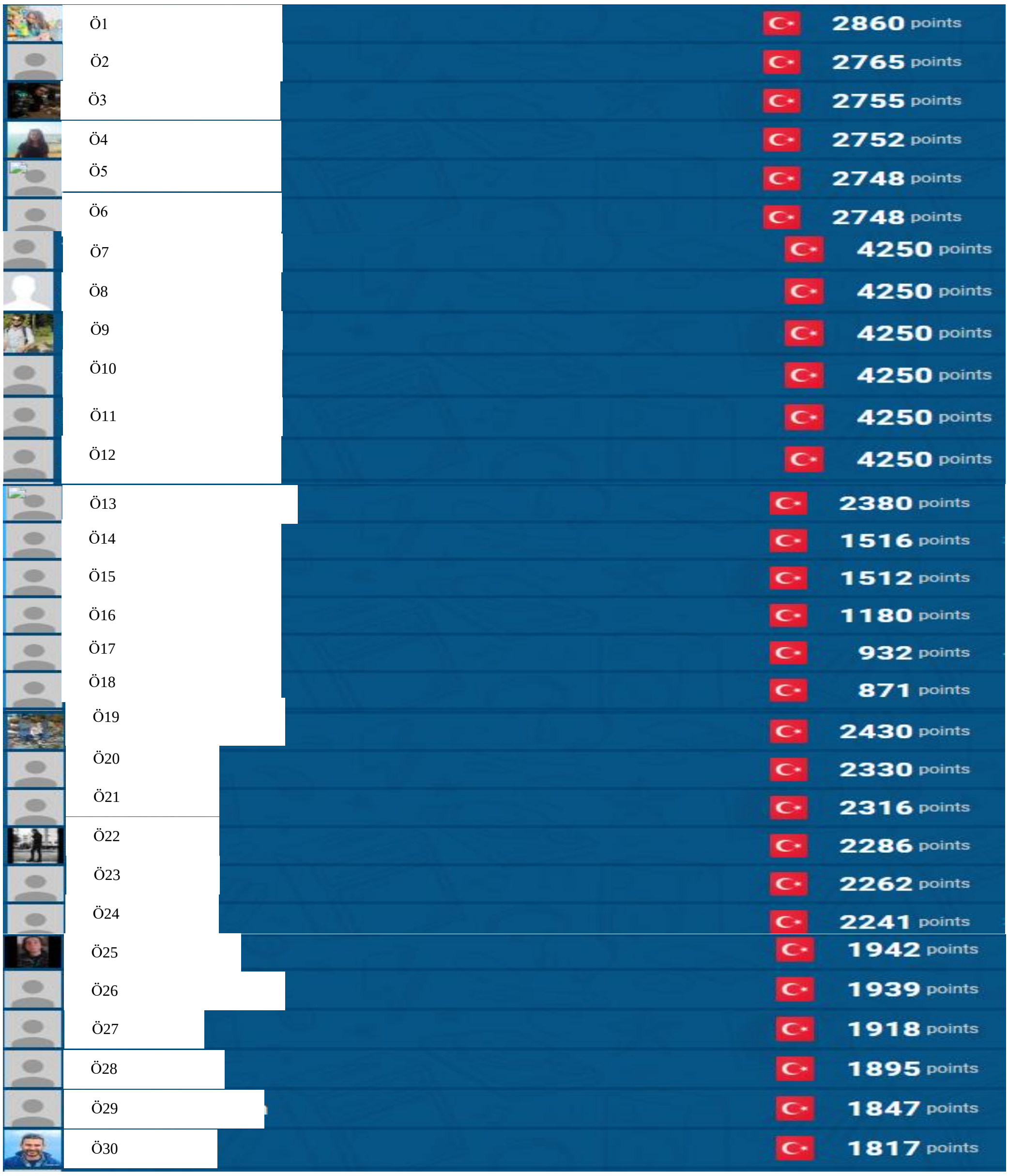


Figure 6. The Result of Searching Words Activities on the "Happy World Environment Day" Video For the Main Task About Nature and Environment.

Figure 6 shows the results of the activity related to the 'Happy World Environment Day' video on the students' lyricstraining website. During the exercise, students received different scores because the scoring was done according to each student's response speed. The students' highest score was 4250 and the lowest was 871. It would be more accurate to say that the student with the lowest score has a low response rate instead of that the student failed.

Cram

The sixth technological tool that has been used in the application of technology-supported English teaching to gifted students has been cram website. This site has taught students both vocabulary and comparative grammar on the topic "Free Time Activities". With the help of this site, warm-up, language focus, main task and assessment processes and activities were applied to teach free time activities topic supporting grammar, vocabulary, speaking, writing and reading skills. The activities performed at Cram's site are shown in figure 6.

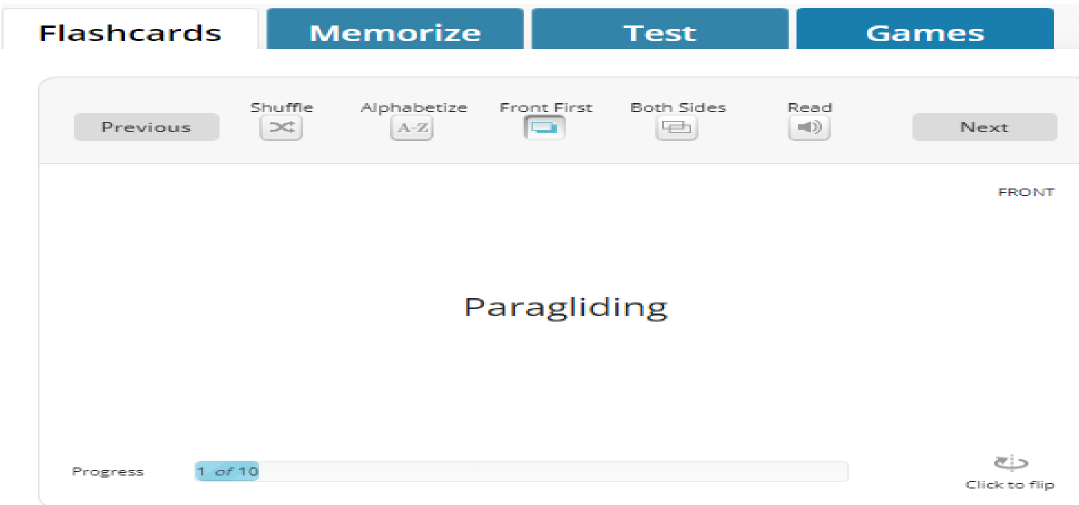


Figure 7. The Flashcard Activity on the Cram Site about ‘Free Time Activities’.

In Figure 7, it was presented as a part where students prepare flashcards for the topic of free time activities either in Turkish or visually based on the English. On one side of the cards can be written in English and on the other side in Turkish. It is also possible to add images related to the word.

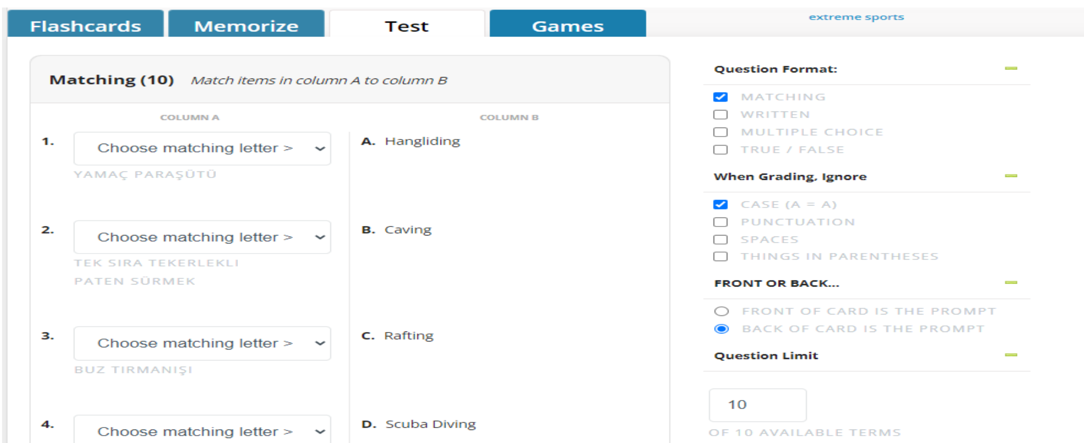


Figure 8. Test Exercise About ‘Free Time Activities’ on Cram.

Figure 8 shows that the students created a test about free time activities words prepared the tests in any format they wanted. The Cram site has activities to help students memorize free time activities word.

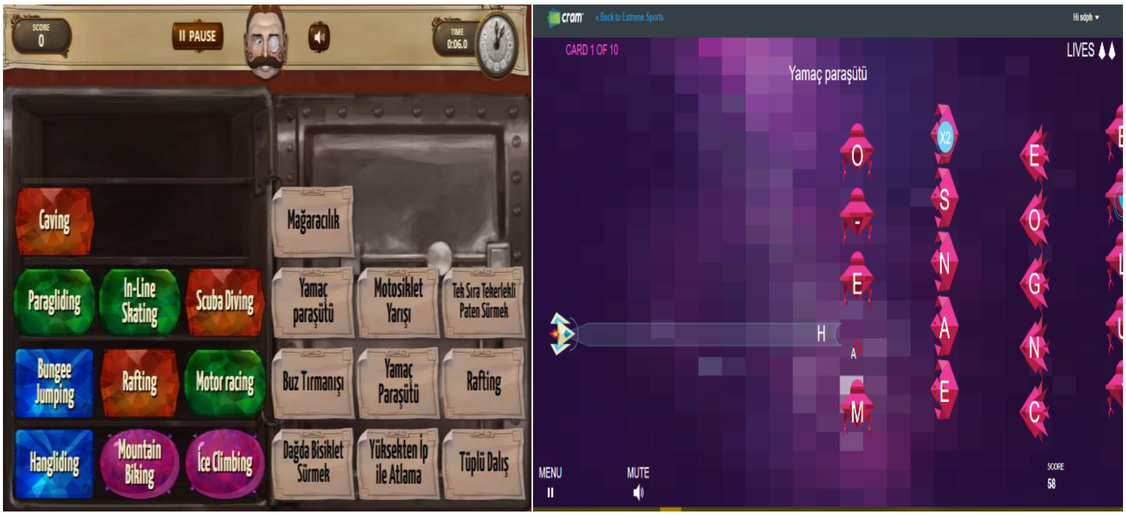


Figure 9. Games about 'Free Time Activities' on Cram.

Figure 9 shows two different games that students can prepare for the words learned in the 'free time activities' topic using the cram technology tool. The students have played these games with word sets they have prepared, but if they wish, they have the opportunity to play two different games with word sets made by different users. In the first game shown in Figure 8, students scored by matching the English and Turkish words of the words 'free time activities'. In the second game, they tried to collect English words about "free time activities" that were given in Turkish with incoming letter sets and were scored for their performance. It can be said that Cram website provides students with an opportunity to memorize new words, practice with them and play games in a fun way.

Storyjumper

The seventh technological tool used in the application of technology-supported English teaching to gifted students is the storyjumper website. On this site, students completed activities related to "Narration". On this subject warm-up, language focus, main task and assessment processes and activities were applied to support grammar, vocabulary, speaking, writing and reading skills. The stories that the students have written as a result of the story creation activity on the Storyjumper website are shown in Table 4.

Table 4.

Stories Written About ‘Narration’ on Storyjumper Site

Students	n	Title
Ö6,Ö5	2	My Childhood Dreams
Ö18,Ö11	2	Minecraft
Ö2,Ö7	2	Fortnite
Ö20,Ö12	2	Valorant
Ö9,Ö8	2	The Exam Guy
Ö14,Ö13	2	Butterflies
Ö21,Ö22	2	Halloween
Ö19,Ö16	2	Big Kingdom Wars
Ö23, Ö24	2	Barbie in the 12 Dancing Princess
Ö15,Ö17	2	Best Icon Players’ Lifes
Ö25,Ö26	2	Predatory Animals
Ö29,Ö30	2	The man and his Fault
Ö27,Ö28	2	Evils at Harry Potter
Ö1,Ö4	2	The World of Wizard
Ö3,Ö10	2	K-Pop Group
Toplam	**30**	**15**

Table 4 shows a total of 15 digital stories created by students on the Storjumper website. The names of the stoies that created in pairs are; My Childhood Dreams, Minecraft, Fortnite, Valorant, The Exam Guy, Butterflies, Halloween, Big Kingdom Wars, Barbie in the 12 Dancing Princess, Best Icon Players’ Lifes, Predatory Animals, The man and his Fault, Evils at Harry Potter, The World of Wizard ve K-Pop Group.

Mentimeter

The latest technological tool used in the application of technology-supported English teaching to gifted students is the Mentimeter website. The subject "Universe" was studied with the students through the Mentimeter website. On this subject warm-up, language focus, main task and assessment processes and activities were applied to support grammar, vocabulary, speaking, writing and reading skills. Universe-related activities done with students on the Mentimeter website are shown in Figure 9.

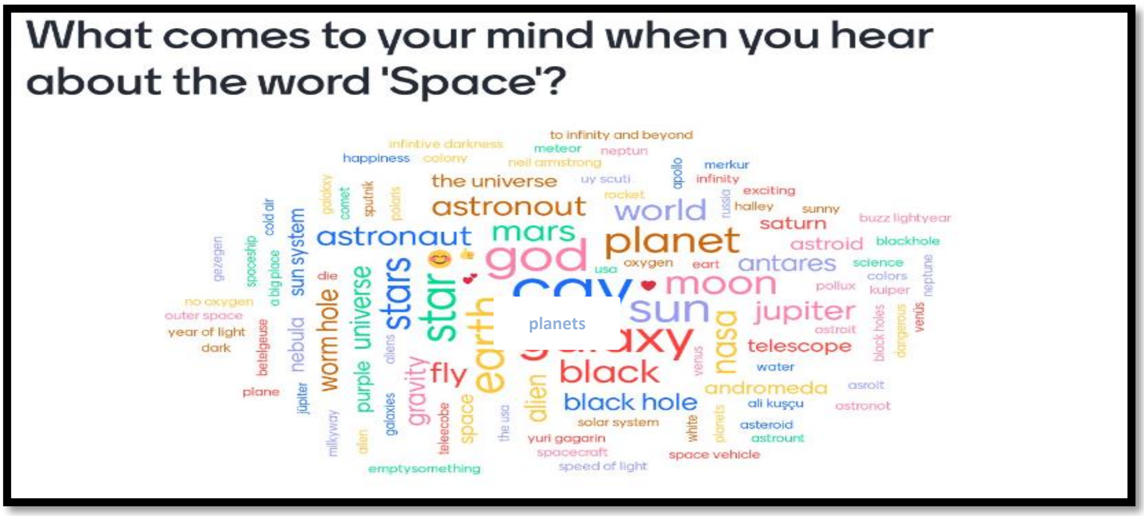


Figure 10. Students' Activities on the Mentimeter Website about the Topic of "Universe".

Figure 10 shows the answers of the students about the question 'What comes to mind when you hear the word "Space"? Although there are many different words which the students mentioned in the results of the brainstorming activity, they said the most; galaxy, earth, planet, astronaut, star, black hole ve world.

Figure 11. Activities about 'Universe' on Mentimeter Site.

Looking at Figure 11, the question 'It would be fun to be an open astronaut guided to students on the mentimeter website. What do you think?' was asked and the answers of the students collected through the system are shown. The answers are as follows;

"It would be both fun and a little scary because it involves eternity"

"It's scary because there's nothing in space"

"It wouldn't be enjoyable because it's possible to get lost in space and die"

"I find it scary because there is nothing around you"

"I think it's a bad idea because this kind of darkness is scary and dangerous"

"I think it's a good idea because it's fun to discover something new".

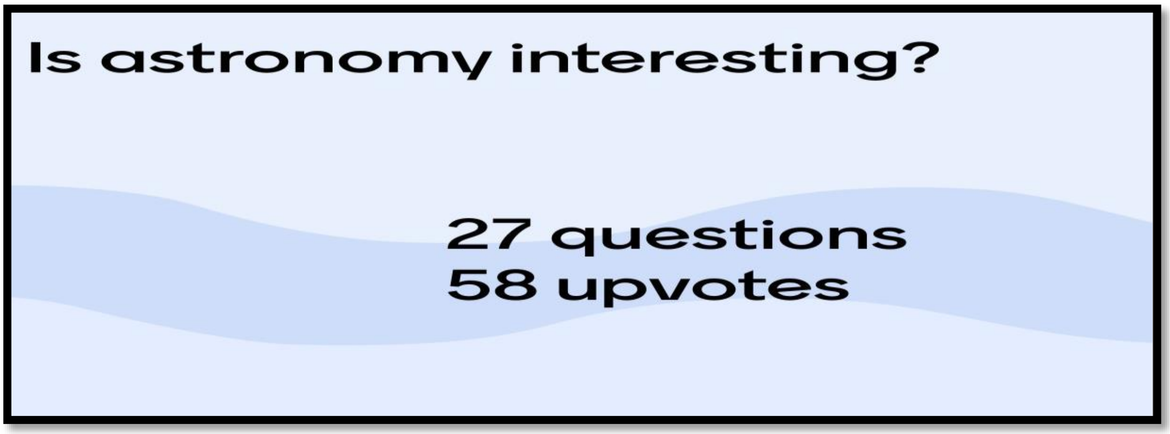


Figure 12. Activities about 'Universe' on Mentimeter Site.

In the Figure 12, vote was taken by the question 'Is astronomy interesting?' and the result was shown. 27 students participated in voting. Looking at the analysis of the responses on the Mentimeter website, 15 students answered yes, 9 answered no, and 3 were unclear.

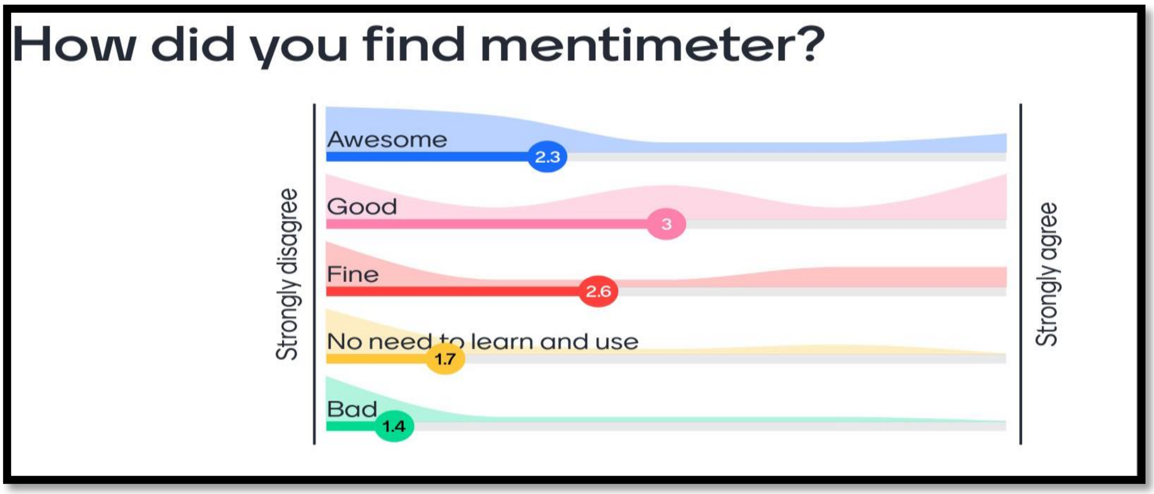


Figure 13. Activities about 'Universe' on Mentimeter Site.

In Figure 13, students were asked to rate how they found the mentimeter site and the scoring results were presented. Based on the average of the results, the students rated the Mentimeter position as mostly good. By looking at this result, it can be said that the students see the Mentimeter website as a positive tool in the foreign language teaching process supported by technology.

Figure 14. Activities about 'Universe' on Mentimeter Site.

Students were asked to classify the online tools used in technology-supported English teaching on the Mentimeter website, and the results are shown in Figure 14. According to the results, the students placed lyrics trainings in first place, voscreen in second place, quizizz in third place, wordart in fourth place, cram in fifth place, mentimeter in sixth place, storyjumper in seventh place and storybird in eighth place. Based on these results, it can be said that the students liked the lyrictraining website the most, but the storybird website the least.

Discussion and Conclusion

This study was conducted to investigate the effect of teaching English on the English attitudes of English students through online technological tools. For this purpose, the English language acquisitions of the ITDP (Individual Talent Recognition Program) group students in the curriculum were implemented in an 8-week program with the help of technological online tools. At the end of the application, according to the average of the students' English attitude pre and post-test results the average of the pretest results of the affective subfactor of the students' English attitude scale was $\bar{X}$=26.03, the posttest result was $\bar{X}$=27.60 while the average of behavior subfactor on the English attitude scale was found to be the $\bar{X}$=22.00, the posttest results was found to be $\bar{X}$ =22.53 (Table 2).

According to the results of the sample t-test analysis of the students' attitude scale towards the English lesson, there was no significant difference in the pre-test and post-test averages of the students' attitude scale towards the English lesson [$t(29)=-1.975$, $p>0.05$ ve $t(29)=0.567$, $p>0.05$]. However, according to the arithmetic mean results, technology-assisted English activities improved the English attitude of gifted individuals in a positive way.

In terms of the first question of the study, the results of the study are similar to previous studies on the effect of technology-supported English teaching on students' attitudes. As a result of his research on the advantages and barriers of technology-assisted language learning, Ali (2010) found that most teachers and students develop positive attitudes towards language teaching and learning. Likewise, there are many studies show that most teachers and students are positive about technology integration (Albirini, 2006; Brantmeier, 2003; Bulut & AbuSeileek, 2007; Eswaran, 2008; Teo, 2008). However, in Dinçer's (2014) study on the effect of media and technology-supported vocabulary teaching in foreign language classes, it was found that there was no significant change in students' attitudes towards vocabulary learning via Facebook.

When looked at the findings obtained during the application process for technology-supported English teaching, it is seen that the students created 15 English stories on the storybird website. The names of the stories are; Super Child, Hiking, Little Fox and Bear go camping, In the Space, A lion and its Cub, Zombie’s Physical Appearance, Animals and Their Family, Appearance of Animals, At the Zoo, Play with Me, Future City, Sweety Boy, Scary Night, King of Mice, Libery War. As a result of using the Voscreen website, the highest score the students got for the site's operation was 6013 and the lowest score was 54. The reason for the difference in scores between the students is due to the difference in the time-based scores of the person who translated the site's videos the fastest. Furthermore, after the evaluation process, students' practice of using this site outside of school is another reason that explains the difference in their scores. On the Wordart site, students created different word clouds containing words related to the topic health and illnesses (Figure 2 & 3). As a result of the 20-question test made on the Quizizz site, it was seen that 11 of the students answered more than 80%, 14 of them gave more than 60% correct answers and 4 of them gave more than 40% correct answers. Since more than half of the students answered more than 50% of the correct answers, it can be said that the activity was successful (Figure 4). The Results of the activity on finding the words in the 'Happy World Environment Day' video in Lyricstrainings site according to their levels, the students' highest score was 4250 and the lowest was 871 (Figure 5). The reason for the high score difference between the students was the response speed and how many times they found the correct answer to the scoring task. Given these factors, it would be more accurate to say that the student with the lowest score had a slow response time or had difficulty finding the correct option the first time, rather than failing. On the Cram site, students prepared flashcard related to the topic free time activities, created different activities with the words they learned (multiple choice, matching, etc.) and played two different games with the words they learned (Figure 6, 7 and 8). On Storyjumper, they wrote stories about narration. The stories that the students created in pairs are as follows; My Childhood Dreams, Minecraft, Fortnite, Valorant, The Exam Guy, Butterflies, Halloween, Big Kingdom Wars, Barbie in the 12 Dancing Princess, Best Icon Players' Lifes, Predatory Animals, The man and his Fault, Evils at Harry Potter, The World of Wizard, K-Pop Group. The students created a total of 15 digital stories (Table 4). Finally, brainstorming was done on the topic "Universe" on the Mentimeter website and the most mentioned words were generated as; galaxy, earth, planet, astronaut, star, black hole ve World (Figure 9). In addition, various activities were organized with open questions and voting (Figure 10, 11, 12 and 13). In the final activity, which was held as a voting on the Mentimeter website, it was concluded that the students ranked lyricstraining, voscreen and quizizz in the top three during the 8 weeks of technology-supported English teaching application process. Based on this result, it can be said that the site that the students liked the most during the process was the lyricstrainings site.

In terms of the second question of the study, previous studies on tasking gifted individuals with technological tools are compatible with the results obtained. Zakaria et al. (2016) have come to the conclusion that using Storybird in the lesson helps students to acquire reading habits, improve their writing skills and active learning among students. Similarly, there are other studies showing the positive effects of technological applications (Voscreen, WordArt, Quizziz, Lyricstrainings, Cram, Storyjumper & Mentimeter) in teaching and learning processes (Ekinci & Ekinci, 2020; Taylan, 2018; Yücetürk & Bergil, 2021; Nezhyva, Palamar & Marieanko, 2022; Babushkira et al., 2022; Inayati & Waloyo, 2022; Fakhuriddin, Nurhidayat & Rof's, 2022; Musadiq, Kamaluddin & Mursalim, 2021; Garcia, 2015; Ezeh, 2020; Muhtaris & Ziemke, 2015; Picardo et al., 2021). However; as there are no studies on the Cram site in the literature, this study will be a source to literature in this sense.

Recommendations

As it has been found that technology-supported foreign language teaching has a positive effect on the English language attitude of gifted individuals, it is recommended to use technology-supported activities in teaching English to gifted individuals in order to have a positive effect on their foreign language attitude.

In general, this study shows that technology-based and supported language learning methods are better in studies where technology is a goal rather than just a tool. For this reason, it is recommended that English teachers who are practitioners enrich their lessons with technology. In our era, it is important to incorporate technology into educational models.

As a result of the study, when evaluating the students' studies and products on listening, speaking, reading, writing and grammar skills by using technological tools, it shows that English teachers can benefit from these methods to improve their students' listening skills, speaking, reading, writing and grammar. In this direction, the use of technology within the framework of listening, speaking, reading, writing and grammar skills can significantly increases student success.

The English curriculum developed in the study was implemented in a science and art center in Bilecik province. In future researches similar studies can be applied with different groups of gifted students or in different educational institutions in different provinces and regions of Turkey.

The participants of the study were 6th and 7th grade students diagnosed as gifted. Similar studies can be conducted with gifted students at different grade levels.

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Conflict of Interest

There is no conflict of interest.

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Ethical Standards

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An Analysis of the Transformation Geometry of the Primary School Mathematics Curriculum According to Levels

***Gülsüm Demir, **Aytaç Kurtuluş**

Abstract. In this study, it is aimed to examine the Primary Mathematics Curriculum (1-8th grade) according to the transformation geometry levels. In this context, the transformation geometry in primary and secondary school levels or the acquisitions related to this subject were determined. Then, the acquisitions were examined by considering the transformation geometry thinking levels defined by Soon. It has been researched that the achievements in the curriculum are related to which level and whether this level provides the qualifications. As a method, document analysis was carried out. In the research, it was determined that some gains were given in a way that was not very suitable for the hierarchical structure of the Transformation Geometry Levels. The program is examined, it is seen that the most striking shortcomings are that there is no gain at any level regarding the rotational transformation. The fact that there is no rotational transformation outcome in the mathematics curriculum at any level can be a challenging situation for the student in future learning.

Keywords. Transformation geometry, translation, reflection, rotational transformation, transformation geometry level.

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Geometry instruction is an essential and integral part of mathematics education. In mathematics instruction, geometry can be associated with many learning areas such as algebra and numbers, leading to more effective teaching (Özpınar, 2012). In this context, special attention should be given to geometry instruction and the development of geometric thinking in children. Geometric thinking in individuals can be said to begin at an early age with experiences such as getting to know their surroundings, observing objects, and examining them (Baykul, 2009). The development of geometric thinking in individuals continues as they start formal education in schools, where geometry concepts covered in mathematics lessons are introduced in the curriculum. Therefore, an increase in geometric thinking levels is observed based on these experiences (Zeybek, 2019).

Van Hiele (1986) introduced the levels of geometric thinking, which provide a hierarchy of the knowledge to be given to students in geometry learning. Van Hiele's model outlines five levels of development in geometric thinking for individuals (Paksu, 2016). Van Hiele categorizes geometric thinking in individuals into five levels: visualization, analysis, informal deduction (experience-based deduction), formal deduction, and the most advanced level (Fidan, Türnüklü, 2010). These levels are general and can be used in teaching or planning instruction in the targeted topics in geometry. Furthermore, transformation geometry, which is an important learning area in geometry instruction, deals with transformations such as translation, reflection, and rotation. These transformations are not only encountered frequently in everyday life but also serve as fundamental concepts required in other learning areas in mathematics education. In this context, when reviewing the literature, Soon (1989) examined the Van Hiele levels in teaching transformation geometry to middle school students. In this research, soon determined the levels of Transformation Geometry Thinking within the scope of her doctoral thesis, taking into account the Van Hiele levels. In accordance with this, the first three levels to be addressed in the research and their characteristics are presented in Table 1 below.

Table 1.

The characteristics of Van Hiele levels

Van Hiele Levels	The Characteristics
Basic Level	• Recognizes transformations in shapes or movements. • Describes transformations in simple drawings and images in daily life situations. • Defines transformations through actual movements. • Describes transformations using standard or non-standard names and definitions such as rotation and translation.
Level 1	o Defines transformations using the properties of transformations. o Draws the image or pre-image of a given transformation using the properties of transformations. o Discovers properties of transformations through applied transformations. o Uses appropriate terminology for transformations and properties. o Identifies the symmetry axis of reflection and the direction of translation. o Relates transformations using coordinates. o Solves problems using the known properties of transformations. o Composes simple transformations. o Creates patterns using transformations.
Level 2	• Relates properties of transformations to each other. • Modifies situations after creating transformations. • Describes shapes using coordinates. • Relates properties of transformations to each other. • Defines transformations as combinations of basic transformations.

When Table 1 is examined, it can be observed that students at the basic level generally have a simple understanding of transformations between geometric shapes, which can be recognized in everyday life. Students at Level 1 are seen to understand what changes are made to geometric shapes and what characteristics they possess. At Level 2, they are able to perform compound transformations.

When the Van Hiele geometric levels are organized according to transformation geometry, the characteristics of the levels are defined as follows. The topics covered by transformation geometry include reflection, translation, and rotation, which are fundamental concepts within geometry. To teach these concepts, the National Ministry of Education has included specific learning objectives in the Mathematics Curriculum. These objectives aim to provide students with an understanding of these transformations and their intended outcomes. The curriculum is a government-mandated program that clearly outlines the objectives, goals, content, methods, and assessment elements, serving as a guide for instructional planning. These learning objectives specified in the Mathematics Curriculum are delivered to students in primary and middle school according to the prescribed plan. Additionally, as learning tools prepared by considering the curriculum, textbooks are made available to teachers and students for free. Additionally textbooks are fundamental learning tools for both teachers and students, serving as resources that are freely accessible (Seguin, 1989) and have important functions in structuring learning, providing guidance, and supporting self-learning (Erkılıç, Can, 2018). Moreover, textbooks are considered reliable because they are prepared based on the curriculum, which is approved by the Ministry of National Education and includes the outcomes aimed to be achieved by students.

In Buyruk-Akıl's (2020) study, the relationship between the achievement in transformation geometry and the Van Hiele geometric thinking levels of 8th-grade students was examined. According to the research results, the Van Hiele geometric thinking levels of the participating students were found to be below the expected level. Additionally, a significant relationship was found between the Van Hiele geometry test and the transformation geometry test, and this relationship did not vary when considering school and gender factors.

Demir and Kurtuluş' study (2019) was conducted with the aim of determining the impact of 7th-grade students on Van Hiele transformation geometry thinking levels. The research was carried out with a 7th-grade class consisting of 28 students. The topic of transformation geometry was taught over a period of 4 weeks using action plans prepared in accordance with the 5E model. At the end of the implementation, the results showed that the action plans conducted using the 5E model increased the students' Van Hiele transformation geometry thinking levels.

In this study, the achievements in transformation geometry within the Primary School (1-8th grade) mathematics curriculum, which was published by the Ministry of National Education in 2018 and used in schools in Turkey, were examined, taking into account the Van Hiele transformation geometry thinking levels. It was investigated whether the transformation geometry levels and the expected characteristics at these levels are addressed by the curriculum. Subsequently, examples and activities through which these achievements are presented in textbooks were provided. In the literature review, there are studies that combine transformation geometry and Van Hiele levels; however, these studies are conducted with a focus on specific grade levels. These studies generally concentrate on academic achievement of students. This study, on the other hand, is a comprehensive examination of the primary school mathematics curriculum in line with these levels. It aims to identify the areas where the curriculum falls short at these levels and intends to bridge this gap in the curriculum by highlighting the deficiencies to practitioners.

Method

Research Model

In this research, a qualitative research approach was used to examine the outcomes of transformation geometry covered in the primary education (grades 1-8) mathematics curriculum, taking into account Van Hiele's levels of geometric thinking. Qualitative research can be defined as a research process that utilizes qualitative data collection techniques such as observation, interviews, and document analysis to present perceptions and events in a natural and comprehensive manner in their natural environment (Yıldırım and Şimşek, 2008, p. 39). Document analysis was used as the research model in this study. Document analysis is a scientific research method that involves collecting, examining, questioning, and analyzing various documents as the primary source of research data (Sak et al., 2021).

Data Collection Tools

In this research, the updated 2018 Primary Education (Grades 1-8) Mathematics Curriculum and the 1-8 Grade textbooks used in the year 2022, published by the Ministry of National Education (MoNE), were used as the primary sources.

Process

During this study, the first step involved an examination of the Primary and Elementary School Mathematics Teaching Program published by the Ministry of National Education. In the course of this examination, evaluation criteria were initially established, taking into consideration the Geometric Levels. When observing the topics taught to elementary school students, it was evident that they should possess the first three levels (Basic level, Level 1, Level 2) of Geometric Levels. Since this study primarily focuses on transformation geometry, only the achievements related to this topic were examined.

After determining the achievements related to transformation geometry at the elementary school level, criteria established by Soon (1989) were utilized. Soon had assessed the Van Hiele levels of students' geometric thinking in middle school while determining the Transformation Geometry Thinking Levels as part of his doctoral thesis, taking Van Hiele levels into account.

Following the examination of the mathematics curriculum, textbooks, which represent the practical implementation of the curriculum, were analyzed using the same criteria. Initially, the textbooks were examined, and examples related to transformation geometry were identified. These examples were further evaluated based on the criteria set forth by Soon. As a result of these analyses, it was determined which grade levels provided examples at which levels. These findings were presented to the readers in the findings section and were subject to analysis.

Data Analysis

In this research aimed at examining the outcomes of transformation geometry in the primary education (grades 1-8) mathematics curriculum, taking into account Van Hiele's levels of geometric thinking, the indicators progressing hierarchically at these levels were first determined. These indicators were created based on the Transformation Geometry Thinking levels defined by Soon (1989), as identified in the literature review. Accordingly, characteristics defined for Basic Level, Level 1, and Level 2 were determined as indicators. These defined indicators were used as criteria in the comparisons made during the examination of the mathematics curriculum and mathematics textbooks. In the second stage, all outcomes specified in the mathematics education program under transformation geometry were classified according to their compatibility with the levels. In this context, transformation geometry outcomes were categorized according to the levels covering translation, reflection-symmetry, and rotation transformations. The mathematical tasks determined in the curriculum and textbook were examined separately by the researchers, and the Van Hiele transformation geometry thinking levels of the textbook contents were determined by considering the indicators presented in Table 1. After these determinations were made by the researcher, the results were discussed with the field education expert and the discussion continued until a consensus was reached among the researchers for differing decisions. In the analysis of the data, Miles & Huberman (1994) reliability formula Reliability = Consensus / (Agreement + Disagreement) was used and the agreement rate between the coders was found to be 90%. Additionally, the textbooks, which represent the implemented version of the education programs, were presented with examples of mathematical tasks that address these outcomes.

The numbering system is used to simplify the presentation of the findings in the table and explanations. It's based on the first letter indicating which subject the achievement belongs to. For example, if it's a mathematics achievement, it starts with the letter "M". The first number next to the letter indicates which grade level the achievement belongs to. The second number shows which learning area it belongs to. The third number indicates the sub-learning area, and the last number represents the achievement number. For example, the schema M.6.3.3.2. means: It represents the first achievement in the "Circles" sub-learning area in the "Geometry and Measurement" learning area for the 6th grade. The descriptions for these learning areas and sub-learning areas can be found in the curriculum. The number written in the 6th section represents the description of that particular achievement.

This study only includes primary education, and therefore, the examination was conducted only for the first 3 levels of geometric thinking.

Results

In the study that examined the outcomes of transformation geometry in the primary education (grades 1-8) mathematics curriculum, taking into account Van Hiele's levels of geometric thinking, the findings were categorized into Basic Level, Level 1, and Level 2. The findings are presented under the following headings:

Findings on the Distribution of Mathematics Curriculum Transformation Geometry Outcomes to Levels

The examination of the outcomes covered under the title of transformation geometry in the mathematics education program from grades 1 to 8, including translation, reflection-symmetry, and rotation transformations, and the determination of the levels of transformation geometry resulted in data presented in Table 2, organized according to outcome numbers

Table 2.

Distribution of Mathematics Curriculum Transformation Geometry Attainments to Levels

Transformatio	Levels of Transformation Geometry		
	Basic Level	**Level 1**	**Level 2**
Translational	M.1.2.2.1. M.2.2.2.1. M.8.3.2.1.	M.8.3.2.3.	It is not directly stated as an outcome to be achieved on the coordinate plane. However, in the explanation sections, it is required to perform translation on the coordinate plane.
Reflection- Symme	M.2.2.2.2. M.3.2.2.1. M.4.2.2.1.	M.8.3.2.2. M.8.3.2.3.	There is no direct attainment to be achieved on the coordinate plane. However, in the explanation sections, performing a translation on the coordinate plane is required."
Rotation	There is no specific attainment.	There is no specific attainment.	There is no specific attainment.

According to Table 2, the topic of translation is first introduced in the description section of a attainment under the heading 'Position' in Grade 1. However, conceptually, learning for all three levels takes place in Grade 8. Symmetry/reflection transformation is hierarchically presented up to the 4th grade of primary school. In Grade 8, there are outcomes provided for other levels, but there is no direct attainment for Level 2. Instead, the provided outcomes are given in the description sections. As for rotation transformation, it is observed that there is no attainment related to it.

Findings on Mathematics Textbooks Transformation Geometry Outcome Examples

Transformations for Basic Level Thinkers

Attainments aligned with this level in the primary school mathematics curriculum and their implementation in textbooks:

When examining the 1st-grade mathematics curriculum and the way it is implemented in textbooks, it is observed that there is no direct attainment explicitly related to transformation geometry. However, indirectly, there are outcomes related to position that can be considered fundamental for transformation geometry.

M.1.2.2.1. Expresses spatial (position, place, direction) relationships.

a) Conducts activities related to the use of expressions indicating place and direction (under, over, around, left, right, between, in front of, behind, high, low, far, near, inside, outside) in daily life situations.

b) Pays attention to determining the reference point when expressing relationships.

c) In addition to daily life examples, activities can also be carried out on models.

The explanation in part b of this outcome is related to position but is of a nature that could serve as a foundation for translation. There is no attainment related to reflection and rotation in the curriculum.

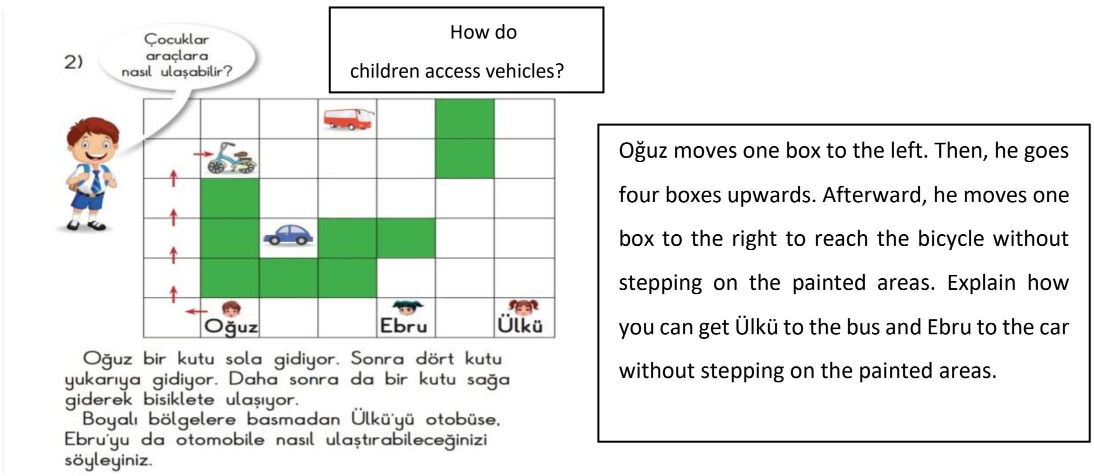


Figure 1. Implementation of Translation Transformation in the 1st Grade Textbook.

In Figure 1, an example from the textbook under the heading of 'Position' has been taken. Upon examination of this example, it is evident that students are instructed in a basic-level translation movement (The English translations of the descriptions in Figure 1 are provided on the side).

The transformation geometry attainment given in the 2nd grade is as follows:

M.2.2.2.1. Mathematical language to specify location, direction, and movement.

a) Mathematical language is used to describe location, direction, and movement along a straight line.

b) Interactive activities involving appropriate information and communication technologies may be included.

M.2.2.2.2. Recognizes symmetrical shapes in the surroundings.

a) The mathematical definition of symmetry is not introduced.

b) Square, triangle, rectangle, and circle are once folded appropriately to divide them into two equal parts, and it is emphasized that there are shapes that cannot be divided into two equal parts.

The concept of symmetry is first introduced at this grade level. Here, students are expected to understand conceptually what symmetry is. When encountering any symmetrical object, they are expected to recognize it as symmetrical. The provided examples are suitable for this level, including symmetry examples with irregular shapes (Figure 2). However, it can be considered a limitation that the symmetries given this level are limited to regular polygons.

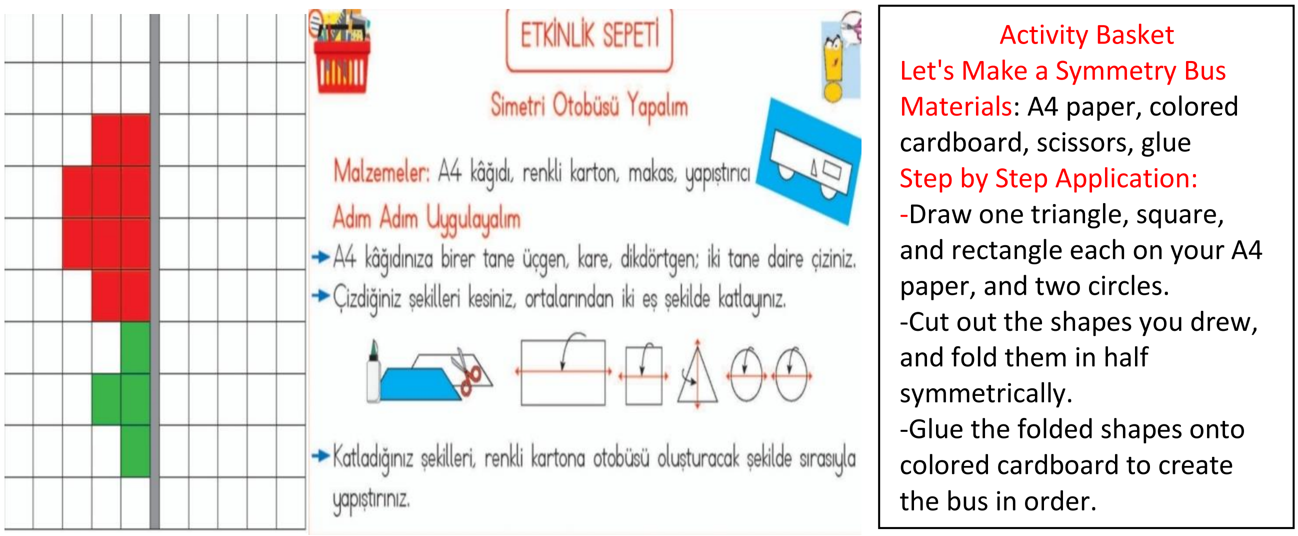


Figure 2. Symmetry Example of Irregular and Regular Shapes.

In Figure 2, two visuals are provided, each representing an example of the two types of reflection required by the attainment. The concept of translation is not introduced in the 2nd grade. However, under the topic of 'position,' students are actually performing translations (The English translations of the descriptions in Figure 2 are provided on the side).

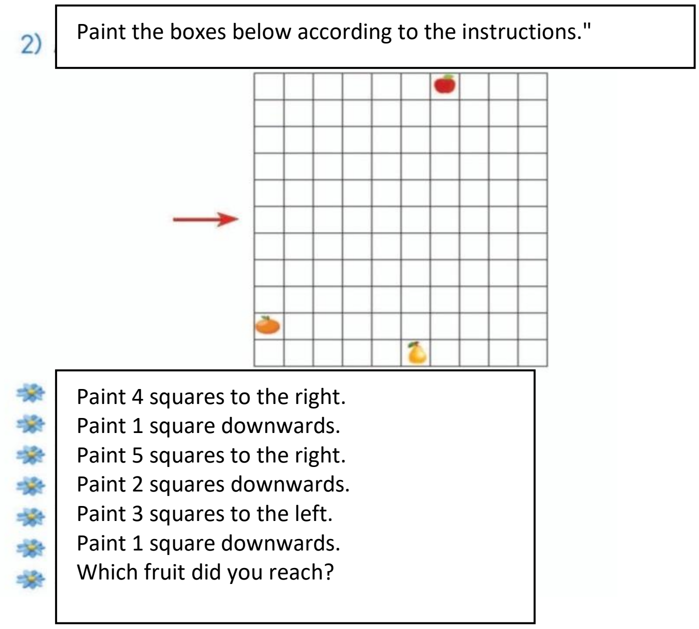


Figure 3. An Example Given in the Textbook Suitable for Position Attainments.

The example provided in Figure 3 can be related to translation. It is observed that the student is performing a translation using the concepts of place and direction. There is no attainment related to rotation at this grade level. Only one activity related to rotation was encountered when examining the textbook:

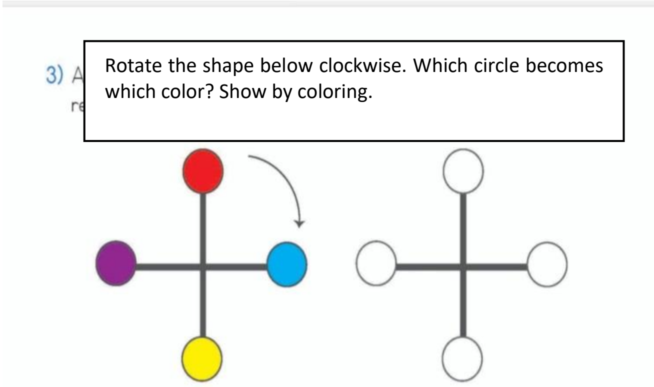


Figure 4. Rotation Activity Included in the Textbook.

Figure 4 features an example provided under the title 'Fractions.' Here, the student is required to rearrange the given colors through a rotation movement as many times as desired. Although the topic is directly related to fractions, the student is asked to use a rotation movement to achieve the desired transformation. However, it is observed that there is no prior explanation related to rotation.

The transformation geometry attainments for the 3rd grade are provided below. The symmetry topic is further elaborated, and the concept of the symmetry axis is introduced in this grade level.

Terms or concepts: axis of symmetry

M.3.2.2.1. Determines that shapes have multiple axes of symmetry by folding the shape.

a) Limited to square, rectangle, and circle.

b) Emphasizes that the diagonal is not an axis of symmetry in the rectangle.

M.3.2.2.2. Completes a symmetric shape given a part of it with respect to a vertical or horizontal axis of symmetry. Examines, correlates, and notices the properties of symmetric shape's matching parts.

At this level, students are expected to use the axis of symmetry both horizontally and vertically. It is important for correct or complete learning that the provided examples include not only regular polygons. Our textbook pays attention to this aspect and asks students to find the symmetries of both regular and irregular shapes.

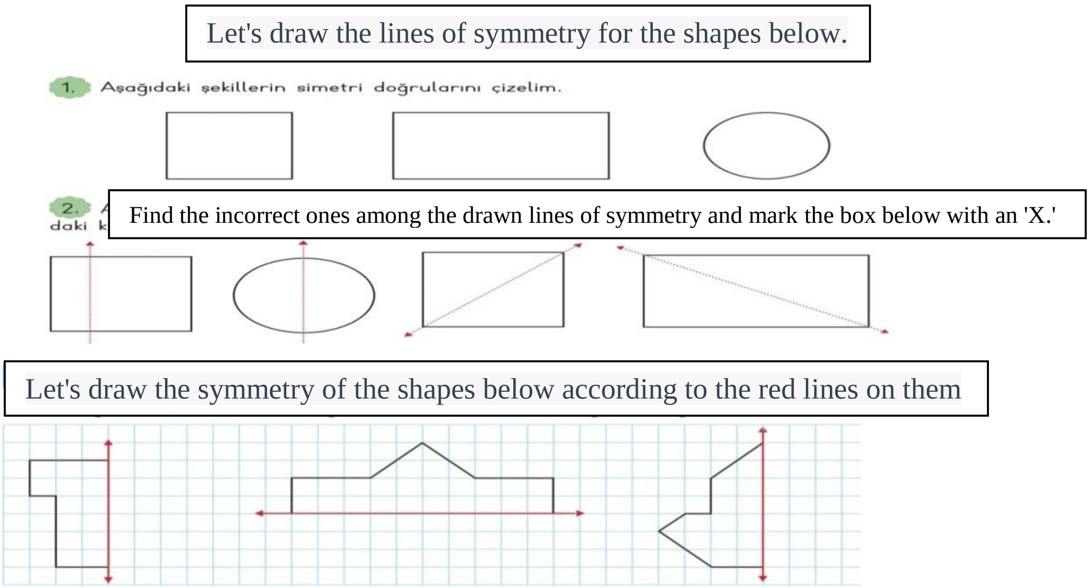


Figure 5. Activity for Finding the Symmetry of Symmetric Polygons and Irregular Shapes.

In Figure 5, two different examples are provided from the textbook. The aim is to find the symmetry of the shapes in accordance with the attainments of this grade. It is observed that selecting shapes that have symmetry in multiple directions and not providing only one-sided shapes as examples help prevent potential learning errors. In the 3rd grade, there is no coverage of translation and rotation. The 4th grade represents a level slightly higher than the previous grades, and the achievements related to transformations in this grade can be considered as the end of the basic level and the beginning of level 1.

Terms or concepts: Mirror symmetry

M.4.2.2.1. Explains mirror symmetry by drawing the symmetry line on geometric shapes and models. It emphasizes that objects such as butterfly wings, flowers, leaves, fabrics, rug patterns, letters, etc., can be observed to have symmetry by placing a mirror in suitable positions and observing identical parts. It highlights that this type of symmetry is called "mirror symmetry" or "symmetry with respect to the mirror" or "symmetry with respect to the line."

M.4.2.2.2. Draws the symmetry of the given shape with respect to a line.

The Van Hiele levels progress hierarchically, and this grade level allows us to see that it includes examples that could be considered as the end of the basic level and the beginning of level 1.

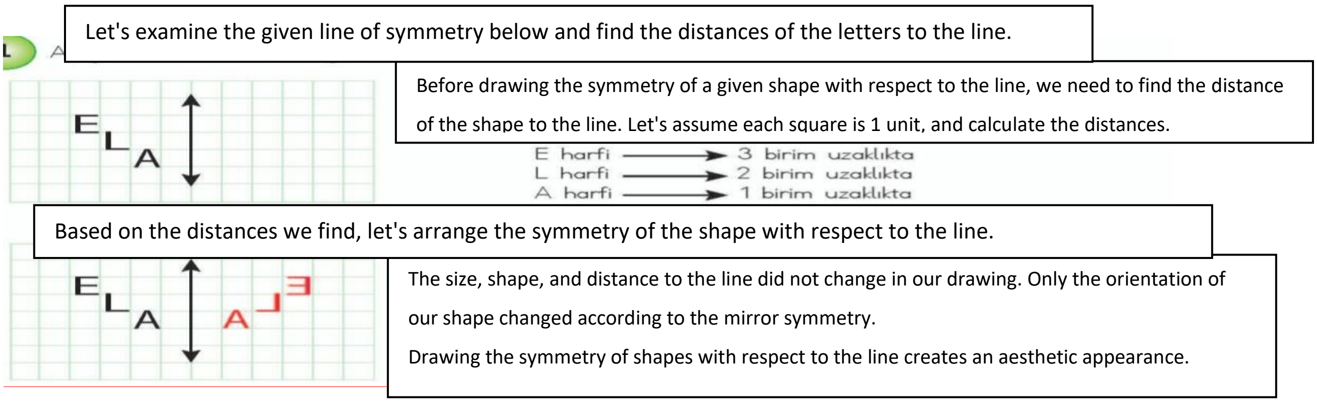


Figure 6. An Example at the End of the Basic Level and the Beginning of Level 1 in Symmetry.

Figure 6 illustrates that in 4th grade, which is the final stage of elementary school, there is a transition from the Basic Level to Level 1 in reflection transformation.

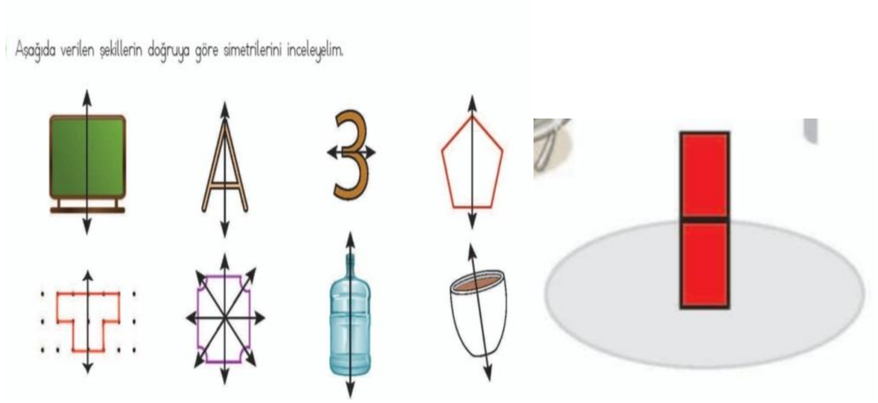


Figure 7. Examples Given for the Symmetry Line and Symmetry Mirror.

In Figure 7, when examining the examples provided, it can be observed that the shapes given are somewhat different from other levels, and the symmetry axis is presented with slopes and also in horizontal shapes. The transitions between levels are not sharply delineated. The end of the Basic Level can form the beginning of Level 1. This can be seen in the symmetry section, but in the other two sections (translation and rotation), the information required at the levels is quite lacking. It does not meet the competencies of the levels.

Transformations for level 1 thinkers

The achievements in transformation geometry topics given at the primary school level are suitable for the Basic Level. When examining the achievements in secondary school, there are no achievements related to transformation geometry in grades 5, 6, and 7. After primary school, students encounter their first geometric transformation topics in the 8th grade.

8th Grade:

The achievements for this grade level are provided below. When these achievements and their explanations are examined, it can be seen that there are achievements suitable for the level in the translation and reflection sections of transformation geometry. However, there is no achievement related to rotation.

M.8.3.2. Transformation Geometry Terms or concepts: reflection, translation, image, symmetry axis

M.8.3.2.1. Draws the images of points, line segments, and other shapes after translation.

a) Work is done on graph paper or dotted paper, and coordinate system activities are performed.

b) Interactive geometry software may also be used for activities.

c) In translation, it is emphasized that each point on the shape moves in the same direction, and the shape and its image are congruent.

Let's examine the symmetries of the shapes given below with respect to the line.

Let's draw the shape given on the checkered background by shifting it 9 units to the left and 2 units up.

Let's shift the polygon on the checkered background in the figure 9 units to the left and 2 units up. By shifting all the corner points of the shape 9 units to the left and 2 units up, let's connect the corner points and obtain the image resulting from the translation. The shape and image are congruent.

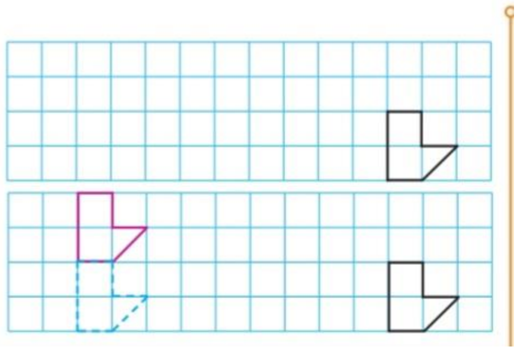


Figure 8. Example Provided in the Textbook Regarding Translation Transformation.

Figure 8 shows a shape that has been translated. In other grade levels, examples of displacement were provided, but they were presented under the "position" heading. It is observed that for the first time, displacement is performed under the "translation" heading.

M.8.3.2.2. The student creates the image resulting from reflection for points, line segments, and other shapes.

a) Work is carried out on squared or dotted paper, and on coordinate systems.

b) Interactive geometry software may also be used for these activities.

c) In reflection, the student is made aware that points corresponding to each other on the shape and its image are perpendicular to the line of symmetry, and the distances between them are equal, which is why the shape and its image are congruent.

d) Activities with shapes on the lines of symmetry are also conducted.

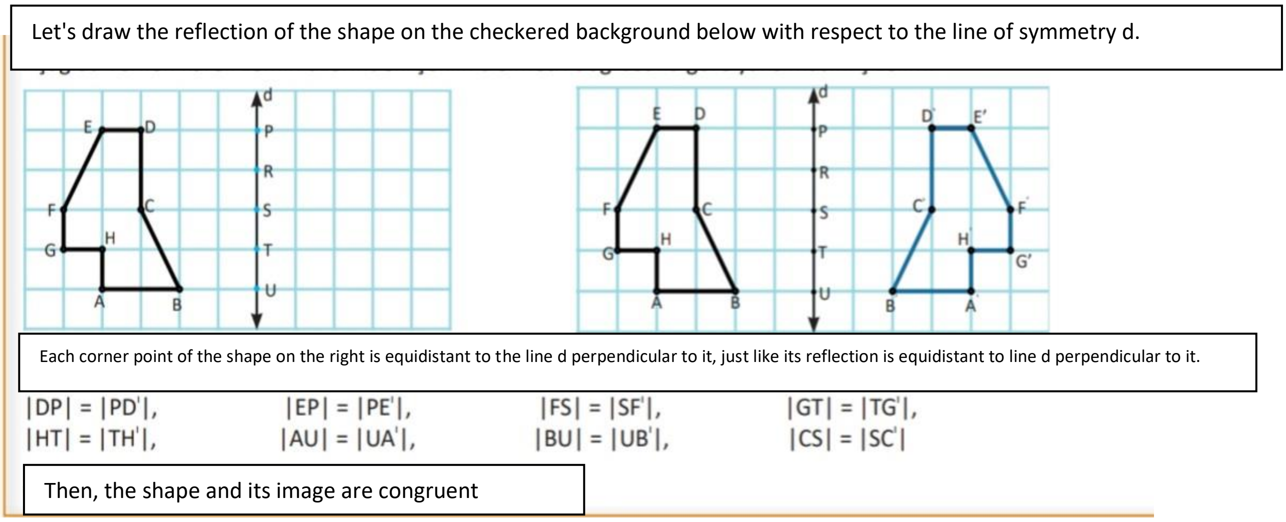


Figure 9. An Example of Reflection in the Textbook.

Figure 9 shows a reflection example in the textbook, and upon examination, it is noticeable that it differs from examples in other levels. While examples in other levels are more suitable for the Fundamental Level and consist of everyday life examples, the example in this level utilizes analytical representations and the properties of symmetry.

M.8.3.2.3. It creates the images resulting from translations and reflections of polygons.

a) Up to two consecutive translations or reflections are included.

b) Work related to determining translations or reflection transformations in patterns, motifs, and similar visuals is included.

c) Examples from our traditional arts (ceramics, weaving, etc.) are also taken into account.

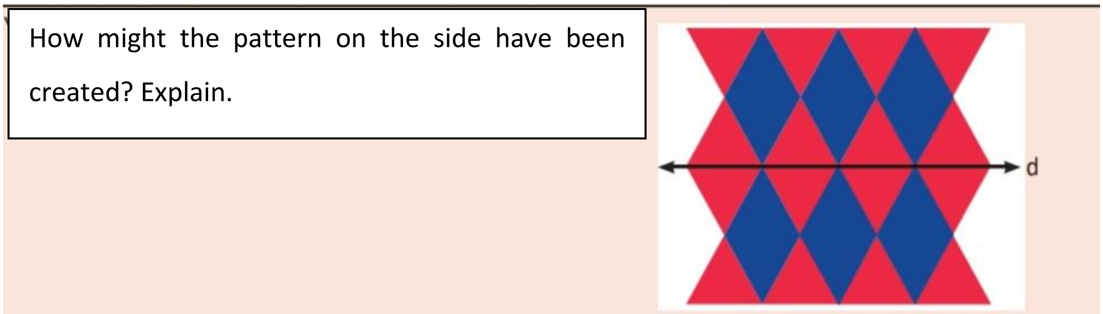


Figure 10. Example of Multiple Transformation Provided in the Textbook.

In Figure 10, a motif is created using reflection and translation. The use of composite transformations is a desired feature at Level 1. However, it also contains the requirement of Level 2, which is to "identify which transformations the given shape underwent to reach its initial and final states." When looking at the provided example, it can be said that it serves as an example bridging Level 1 and Level 2.

When examining the examples provided in the textbooks, it is observed that the selected objects are not limited to regular shapes. The chosen decorations are selected in a way that allows the student to see that only the position or location of the shape changes when these transformations are applied. Selecting decorations from ceramics that students can encounter in their daily lives is seen as a facilitator of learning.

Transformations for level 2 thinkers

At this level, students are expected to use the knowledge they have learned in a higher-level coordinate system. The curriculum for this level is provided only in the 8th grade.

8th Grade:

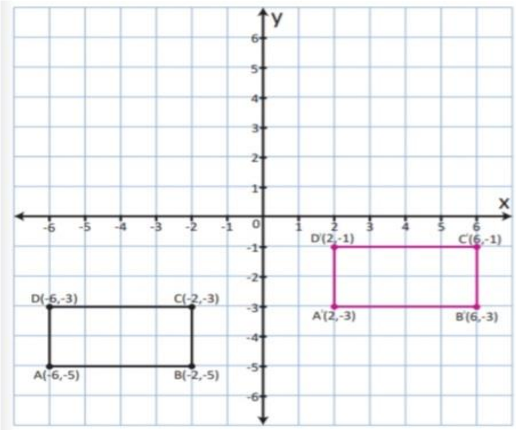
In the 8th grade curriculum, the provided learning outcomes are not limited to a single level. A learning outcome can encompass both Level 1 and Level 2. Below are the parts suitable for Level 2:

M.8.3.2.1. Draw the images resulting from the translation of points, line segments, and other shapes.

a) Work on squared or dotted paper, and perform activities on a coordinate system.

b) Interactive geometry software can also be used for these activities.

c) Emphasize that in translation, every point on the shape moves in the same direction, and that the shape and its image are congruent.



Let's draw the rectangle ABCD with corner coordinates A (-6, -5), B (-2, -5), C(-2, -3), and D(-6,-3), by shifting it 8 units to the right, parallel to the x-axis, and 2 units upward, parallel to the y-axis.

When we translate the ABCD rectangle in the figure 8 units to the right along the x-axis, the first term of the ordered pair increases by 8 units. When we translate it 2 units upward along the y-axis, the second term of the ordered pair increases by 2 units.

(x, y)	(x + 8, y + 2)
A(-6, -5)	A'(2, -3)
B(-2, -5)	B'(6, -3)
C(-2, -3)	C'(6, -1)
D(-6, -3)	D'(2, -1)

In translation, every point on the shape moves in the same direction. The shape is congruent to its image."

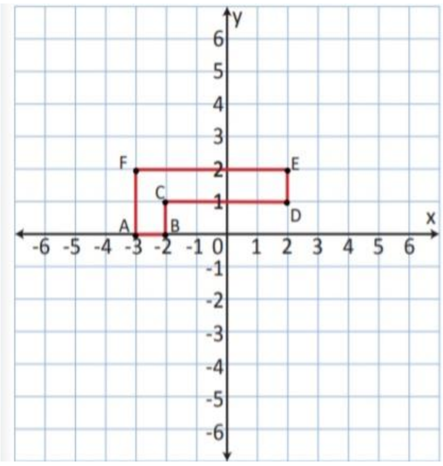
Figure 11. Translation Movement on the Coordinate Plane.

M.8.3.2.2. It creates the image resulting from the reflection of points, line segments, and other shapes.

a) Work is done on graph paper or a dotted grid on the coordinate system.

b) Interactive geometry software may also be used for these studies.

c) In reflection, it is emphasized that there are points on the shape and its image that are perpendicular to the line of symmetry and their distances are equal, thus showing that the shape and its image are congruent.



"Let's find the coordinates of the corner points of the shape obtained as a result of its reflection over the x-axis.

We can determine the image point resulting from the reflection over the x-axis of a point A (x, y) using the rule A (x, y)-> A'(x, -y).

A(-3, 0) → A'(-3, 0)
B(-2, 0) → B'(-2, 0)
C(-2, 1) → C'(-2, -1)
D(2, 1) → D'(2, -1)
E(2, 2) → E'(2, -2)
F(-3, 2) → F'(-3, -2)

For points on the x-axis and their reflections over the x-axis, the coordinates of the points remain unchanged.

Figure 12. Reflection Movement on the Coordinate Plane.

In Figure 12, an example of reflection transformation suitable for Level 2 is provided. When examining the achievements in the Primary School Mathematics Curriculum, it is observed that a direct achievement suitable for Level 2 is not provided. When the explanations under the given achievements are examined, it is seen that some of them are suitable for this level.

In this study, the findings were obtained by examining the Mathematics Curriculum (1st-8th grade) and Mathematics Textbooks for all levels (1st-8th grade) published by the Ministry of National Education (MoNE). The data obtained from the analyses are presented under two headings below.

Discussion and Conclusion

In this study were obtained by examining the Mathematics Curriculum (1-8th grade) and Mathematics Textbooks of all levels (1-8th grade) published by the Ministry of National Education (MoNE). The data obtained from the analyses conducted are presented below under these two headings.

Examination Based on Attainments

The achievements related to transformation geometry in the 1st to 8th-grade mathematics curriculum and their contents have been examined, taking into account the levels of transformation geometry. As a result of this examination, it is observed that the achievement related to translation appears for the first time as a content under the "Position" heading in the 1st grade, but it is not conceptually explained here. Conceptual explanation of translation under the title of "Translation" is first given to students in the 8th grade. The achievements in the 8th grade are in line with Level 3. It is not in line with the Van Hiele philosophy for translation to be given to students for the first time in the 1st grade, not to be given in other grades, and to be directly given at Level 3. It can be argued that translation is not hierarchically provided to students. In the studies conducted by Fidan and Türnüklü (2010) with 5th-grade students, it was found that 47.9% of students were at Level 0, meaning they could not be assigned to any level, 29.3% at Level 1, 16.7% at Level 2, and 6.1% at Level 3 in terms of their geometric thinking levels. This indicates that a significant portion of students' geometric thinking levels is at Level 0, meaning they cannot be assigned to any level. As seen in this study, even though students are in the 5th grade, they have not reached the desired level. Distributing these levels hierarchically and equally between classes is an important issue.

When the achievements up to the 4th grade of primary school are examined, it is determined that the hierarchy of symmetry/reflection transformation is given appropriately. In other grades (except for the 8th grade), there is no achievement related to transformation geometry. In the 8th grade, it is inferred that achievements in line with Basic Level and Level 1 are provided, but there is no direct achievement related to Level 2. When all grade levels are examined, it is seen that there is no achievement related to rotation transformation. Without a hierarchical, well-planned education program, students, including future teachers, may not achieve the desired Geometric Levels. In Erdogan's (2020) study with prospective middle school mathematics teachers in the 3rd grade, it was concluded that their geometric thinking levels and problem-posing abilities were low.

In the study conducted by Kılıç (2015), a significant difference was found in the academic achievements of students between the experimental group, where geometry instruction was conducted according to Van Hiele levels, and the control group, where geometry instruction was not based on Van Hiele levels. This difference favored the group where geometry instruction was carried out according to Van Hiele levels. Therefore, it can be concluded that geometry instruction based on Van Hiele levels in the 5th-grade mathematics class of primary education improves students' academic achievements and is more effective than traditional instruction. As seen in the results of this study, education that takes into account geometric levels leads to higher student success. To support and guide this type of education, instructional programs should be prepared accordingly.

Analysis of Textbooks

In the examination of textbooks across all grade levels for transformation geometry, it was observed that reflection transformation includes activities at the Fundamental Level for primary school (grades 1-4). However, for those thinking at Level 1 and Level 2, it is noted that the achievements are presented with numerous items in the 8th grade. The Van Hiele philosophy advocates the hierarchical presentation of levels. In this section, examples for primary school are provided in accordance with the hierarchy. However, what is provided for middle school level is not in line with the hierarchy. It would be more appropriate to distribute Level 1 and Level 2 to other classes instead of giving them only in one class.

Regarding the translation transformation, it was found that it is only included in the mathematics curriculum for the 8th grade. Upon examining the textbooks, it was found that some activities under the "position" heading involve translation transformation. However, it is observed that the main purpose of these activities is not to teach translation transformation conceptually. Therefore, students learn translation transformation as a change in position without understanding its conceptual basis. In this context, the conceptual learning of translation transformation, which should be learned at the Fundamental Level, has not been directly addressed until the 8th grade. When examining the mathematics curriculum, it is seen that translation transformation is taught with characteristics of Fundamental Level, Level 1, and Level 2, all together with numerous achievements.

This can be considered as an inappropriate approach according to the Van Hiele levels, as students are expected to progress hierarchically, and presenting all levels at once may result in a lack of deep understanding.

The final part of transformation geometry is rotational transformation. Upon examination of the mathematics curriculum, it is observed that there are no achievements related to rotational transformation. When analyzing the textbooks, it is noted that rotation is used under different headings but is not presented as a separate topic. In a study conducted by Temur and Tertemiz (2012), it was observed that teachers did not use activities related to establishing relationships between shapes in the 1st, 2nd, and 3rd grades. In the 4th grade, however, teachers were observed solving problems related to geometric shapes, and students asked questions to both their peers and teachers about the properties of shapes and their relationships, trying to discover these relationships. When examples/activities that support hierarchical geometric learning are not provided to students in previous grades, they may encounter difficulties in later stages and higher levels. Likewise, in the 5th-grade study, it was observed that the teacher had difficulty in having students establish relationships between shapes. Overcoming this problem is easier when learning is done in accordance with the levels.

When examining the Van Hiele levels, it is expected that a student who completes secondary education should be at Level 2. However, when considering the levels of transformation geometry, it is observed that there is no content related to rotational transformation in the textbooks and the Mathematics Curriculum. When reviewing the transformation levels, it is recommended that translation, reflection, and rotational transformations should be taught simultaneously in the first three levels. In the mathematics curriculum, while translation transformation is only introduced in the 8th grade, there is no mention of rotational transformation. In this context, considering the significant practical applications of rotational transformation in daily life and other subjects, it would be appropriate to add achievements suitable for grades 1-8, taking into account the levels of geometric thinking.

Recommendations

- As evidenced by the results of this study, educational approaches that consider students' geometric thinking levels lead to increased student success. To promote and guide this type of education effectively, it is advisable to develop instructional programs that align with these levels.

- When students are not exposed to examples and activities that support hierarchical geometric learning in earlier grades, they may encounter challenges as they progress to higher levels. For instance, during the 5th-grade study, it was observed that students had difficulty establishing relationships between geometric shapes. Addressing this issue becomes more feasible when learning is structured in accordance with the levels of geometric thinking.

- In the mathematics curriculum, while translation transformation is introduced only in the 8th grade, there is no mention of rotational transformation. Considering the practical applications of rotational transformation in daily life and across various subjects, it would be advisable to incorporate achievements suitable for grades 1-8, while also aligning them with the levels of geometric thinking.

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Evaluation of the Effect of Educational Bureaucracy on School Administration: A Blunting School Climate for Teachers

***Güler Shaikh, **İlknur Şentürk**

Abstract. This study aims to determine the relationship between school climate, organizational commitment and educational bureaucracy (coercive and enabling) to examine it according to some variables. In the study, relational research model, which is one of the quantitative research methods was used. The data were collected from a total of 280 teachers working in public primary and secondary schools in Gebze during the 2022-2023 academic year. Statistical analysis of the data was carried out with SPSS 26.0. Annova and t-tests were applied to the items to test the effect of dependent variables. Kolmogorov-Smirnov test statistic were applied and it was found that the answers given by the participants showed homogeneous distribution ($p>0.05$). Skewness and Kurtosis values were evaluated to obtain normal distribution values. Based on the results it was concluded that there is a negative, low significant relationship between school climate organizational commitment and coercive bureaucracy. It was seen that there is a positive, moderate and significant relationship between school climate, organizational commitment and enabling bureaucracy. In addition, significant differences were found between the answers given to scale items according to teachers' gender, age, institution and field.

Keywords. School climate, organizational commitment, educational bureaucracy, teachers' views.

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The history of bureaucracy dates back to the emergence of societies. As human communities began to form, the concept of democracy has deepened and its impact on the functioning of daily life has increased. On the other hand, the complex bureaucratic structure has been a recent phenomenon that was popularized by Max Weber (Schott, 2000; Darren, 2021). Bureaucracy is a structure based on rules and order (Beetham, 1997). Therefore, it has become a preferred method in organizational management (Lennon, 2010). Even though bureaucracy emerged from government and public organizations, it has been implemented in educational and private organizations to maintain hierarchy and order. Thus, it has led to different ideas and theories regarding bureaucracy. Researchers have begun to investigate the effect of bureaucratic structure on the functioning of organizations (Mcneil, 2000; Dutta, 2006).

A phenomenon affected by the bureaucratic structure is its effect on the organizational culture and climate. Bureaucratic structure has been implemented in educational institutions as it enables schools to run effectively. School's organizational culture and climate consist of beliefs, assumptions and values shared by a group of people (Schein, 1992). Therefore, the effect of bureaucratic structure on organizational culture and climate caught the attention of educational scientists, and it has led to a significant amount of research on functionality and performance of bureaucratic structure (Bjork, 2005; Firestone & Wilson, 1985; Franks, 1989; Harber & Davies, 2005; Hightower, 2002; Hunter, 2020). Some studies have emphasized the hierarchical power of bureaucratic structure that prevents a positive and democratic atmosphere in educational institutions that hinder the school culture and climate (Díaz de Rada, 2007; Thompson, 2004). On the other hand, some suggest that bureaucracy has enabled the schools function better (Gay, 2009; Hightower, 2001).

School culture and climate are multidimensional phenomena that affects the school stakeholders' behaviors and opinions. Research indicates that the factors affecting school culture and climate affect teachers' perceptions of the school. In addition, a positive school climate and culture should lead to a shared sense of purpose and value, continuous learning between teachers and school administration. It is argued that a positive school culture and climate provide an opportunity for development, collaborations, problem solving, experience sharing, and strong school commitment (Cherubini, 2009; Lee & Louis, 2019; Page, 1987; Reaves & Cozzens, 2018). This study intends to explore the differences in perception between primary and secondary school teachers concerning the implementation of educational bureaucracy. Moreover, it will investigate the influence of educational bureaucracy on variables related to school climate and organizational commitment. Additionally, it will explore the enabling and coercive effects of educational bureaucracy and the relationship between these two distinct concepts, as perceived by teachers and school administrators. The findings will furnish insights to the education sector on how educational bureaucracy influences teachers' perceptions and organizational allegiance toward the school administration. Such insights will also help comprehend how these perceptions overarch the overall school climate and organizational commitment. Therefore, the following hypotheses were sought to be answered within the scope of the research.

H^1: Coercive bureaucracy has a significant effect on school climate & organizational commitment

H^{1a}: Coercive bureaucracy affects school climate in a negative & significant way.

H^{1b}: Coercive bureaucracy affects organizational commitment in a negative & significant way.

H^{1c}.Coercive bureaucracy has no significant effect on school climate & organizational commitment

H^2: Enabling bureaucracy has a significant effect on organizational commitment & school climate

H^{2a}: Enabling bureaucracy affects school climate in a positive & significant way.

H^{2b}: Enabling bureaucracy affects organizational commitment in a positive & significant way.

H^{2c}: Enabling bureaucracy has no significant effect on school climate & organizational commitment.

H^3: There is a significant difference between the opinions of teachers according to the teachers' demographic characteristics.

H^{3a}: There is no a significant difference between the opinions of teachers according to the teachers' demographic characteristics.

The Evolution of Bureaucracy

Bureaucracy continues to be an indispensable phenomenon in every aspect of our life including schools, hospitals, courts etc. Although, the origin of bureaucracy, which became a more popular phenomenon after Max Weber's theory of bureaucracy, goes back to ancient times. The phenomenon of bureaucracy began to take its place in history with the registration activity that gained momentum after the invention of writing. Sumerians had used it to administer records of agricultural activities. Later on the term "bureaucracy" was coined by the French word "bureau" – office – and the Greek word “kratos” – rule or political power. Therefore, since then the word has been used to operate officialdom properly by implementing certain procedures (Riggs, 1979).

This phenomenon has attracted the attention of theorists such as Karl Marx, John Stuart Mill and Max Weber who are among the most influential theorists in recent history. Even though Karl Marx did not use the term bureaucracy, his theory stated the roles and functions of bureaucracy. Marx was against the idea of bureaucracy, on the other hand, he supported the specialization brought by bureaucracy (Chattopadhyay, 1993). As a political theorist, John Stuart Mill advocated that bureaucracy is a common phenomenon used by successful administrations. According to Mill, a successful management involves dedication, skills and professionalism, which leads to the role of bureaucracy. (Warner, 2001).

Marx Weber has been certainly the first theorist that comes to mind when bureaucracy is mentioned (Drechsler, 2020). While the society's perception of bureaucracy has been characterized as paperload, approvals, signatures, waiting in line and pressure from civil servants and authorities, Weber theorized a bureaucratic model which is known as the "Weberian Bureaucracy Model" (Miewald, 1970; Sager & Rosser, 2021; Wong, 2013). The "Weberian Bureaucracy Model", on the other hand, has been considered different from the aforementioned concept of general bureaucracy. The tasks are arranged in a way to form a hierarchical system. Officialdom at every level of the hierarchy has been formally carried out in accordance with certain rules and standards (Langer, 2022; Meyer, 2013). Moreover, duties are divided into sections by experts. Transactions and correspondences are implemented in written form, and officialdom comply with the legal orders. Besides, Weber emphasized that the legal system of the modern state is based on laws. According to the Weberian Bureaucracy Model, it is essential to observe the coercive legitimate power of the administrative organization (Bozeman, 2000; Gualmini, 2008). A country's development is based on how the bureaucracy is implemented in that country. It is considered that the countries where bureaucracy is stronger have less development. (Cheng, Haggard & Kang, 2020; Lee, 2019; Monteiro & Adler, 2022; Obamuyi & Olayiwola, 2019; Suzuki & Hur, 2020). On the other hand, the Weberian Bureaucracy Model indicates the necessity of keeping a balance in the bureaucratic procedures implemented by the authorities (Cornell, Knutsen & Teorell, 2020; Hashmi & Shuja, 2020; Ferreira & Serpa, 2019; Saputra, Mahardika & Izharsyah, 2021; Serpa & Ferreira, 2019).

Educational Bureaucracy

Since bureaucracy facilitates order and functioning in institutions, it continues to be used in a dominant way in all institutions. Although the function of the educational system is to prepare young generations academically for the future, to achieve successful educational outcomes and to raise self-actualized individuals by implementing creative options and freedom of choice, bureaucratic functioning has been applied to maintain order and regulate social On the other hand, there are opinions that a balanced implementation of educational bureaucracy will prevent conflicts that may arise between teachers and administrators over the legitimization of authority. Some studies emphasized that educational bureaucracy plays an important role in pursuing multiple targets to maintain positive outcomes on school dropout rates, attendance and test performance. (Hanson, 1975; Smith & Larimer, 2004). Moreover, it is stated that educational bureaucracy functioning effectively can create an innovative and more productive environment through collaboration and interaction (Tjosvold & McNeely, 1988).

Enabling Bureaucracy

Enabling bureaucracy is an approach that aims to make the administrative processes of a country or organization more effective, efficient and user-friendly. This type of bureaucracy aims to make things easier for citizens, businesses and other stakeholders by speeding up processes and reducing unnecessary complexity. For example, moving transactions to online platforms and providing electronic services can speed up processes. Simplifying complex procedures and reducing unnecessary forms can help to speed up the processing of applications. Better communication and cooperation between relevant institutions and stakeholders can contribute to more efficient processes. Responding to requests and making decisions quickly can reduce processing times. Providing guidance and support to citizens and businesses to help them understand processes promotes facilitative bureaucracy. The aim of facilitative bureaucracy is to improve the quality of life in society by making public services more accessible and user-friendly mobility (Katz, 1971; Mehta, 2013).

Enabling bureaucracy in education may include regulations that aim to make educational institutions and systems work more effectively and efficiently. Such regulations are implemented to improve student achievement, support better teacher performance, and make educational processes more accessible (Oldac & Kondakci, 2020). Simplifying complex and overly detailed curricula can help students and teachers to better understand and apply them. Reducing the excessive number of examinations or excessive assessment practices can reduce student stress and teacher workload.

Arrangements can be made to reduce the complexity of school administration and speed up decision-making. (Hoy, 2003; Tsang, Wang, & Bai, 2022). Establish a more effective and fair evaluation system to support teachers' professional development. Arrangements can be made for better management of education budgets, better distribution of resources and faster access to schools. Facilitating the use of technology and making it easier for students to access digital resources and support services to help them overcome the challenges of learning. Streamlining bureaucracy aims to make education more efficient and student-centered. As a result, students learn better, teachers teach better, and the education system works better (Hoy & Sweetland, 2001; Kotnis, 2004; McGuigan, 2005; Schechter, Da'as & Qadach, 2022; Sinden Hoy & Sweetland, 2004).

Coercive Bureaucracy

Coercive bureaucracy denotes a bureaucratic system or process that impedes progress or complicates matters due to the complexity of multiple procedures, protocols, or regulations. Excessive regulations, lengthy application processes, inordinate demands for documentation or multiple approval requirements frequently add to the troubles of a burdensome bureaucracy. Such bureaucracy can adversely affect business, public services, or the everyday lives of citizens. The impact of such coercive bureaucracy may result in elevated business costs, reduced innovation, and inefficient resource allocation. Reforms aimed at reducing or simplifying such bureaucracy can boost economic growth and make doing business easier, especially for businesses. These reforms intend to expedite business processes, minimize unnecessary regulations and boost the business environment (Hoy & Sweetland, 2000; Kissell, 2023; Myksvoll, Tatham & Fimreite, 2022).

Coercive bureaucracy within the education sector may lead to numerous issues. Research indicates that the dominant bureaucratic structure applied in educational institutions alienates teachers, restricts their creativity and blunt teachers' commitment to the institution. An abundance of regulations and intricate procedures can impede the ability of educational institutions to create pioneering approaches and respond promptly. Ultimately, this can adversely impact the excellence of education. Coercive bureaucracy can also result in teachers and school administrators allocating their efforts towards administrative tasks, resulting in less focus on students. (Boz & Saylik, 2021; Churcher & Talbot, 2020; Kasikci, Kurtay, & Kondakci, 2023). Burdensome regulations can impede the ability of schools to respond flexibly to students' needs. This can lead to the standardization of the education system and limit its ability to provide individualized learning opportunities for students. Additionally, excessive bureaucracy can result in additional costs for educational institutions, leading to the inefficient allocation of resources and preventing resources from being spent directly on education activities. Lengthy application processes, convoluted admission procedures, and bureaucratic obstacles have the potential to generate discontent among students and parents. Stricter regulations and inspections may propel educators towards implementing an "exam-driven" pedagogical approach, which could potentially impede students' capacity to grasp reality and foster innovative thinking (Darling-Hammond, 1998; Frymier, 1987; Hedges, 2002).

Culture of Education

Culture has a complex terminology that is notorious to define. Although culture has many different definitions, the commonly accepted definition is that it is considered to be a phenomenon that includes the values, norms, beliefs, customs, habits, assumptions, knowledge, behaviors, language, arts and laws that are shared by the individuals in a particular setting (Eagleton, 2016; Hofstede, 2003; Johnson, 2013; Spencer & Franklin, Schein, 1991; 2012). Apart from being a phenomenon shared by individuals in society, culture continues to be a terminology that we encounter in other areas of life such as educational institutions, organizations, companies, etc. (Whiten & et al., 2011). The culture of education encompasses the attitudes, behaviors, and expectations of students, teachers, administrators, and other stakeholders involved in the education system to shape the way the education is approached and delivered. Furthermore, the culture of education can influence the curriculum, teaching methods, assessment practices, and overall goals of the education system (Entwistle, 2011; Lam, 2006; Miguel del Río, 2007; Tan, 2012).

In particular, many studies have focused on how school culture affects teachers-student’s relations, students' achievements, teachers’ efficacy and the relations between school stakeholders. Studies have shown that a constructive and collaborative school culture positively affects students' achievements, teachers' devotions, efficacy, productivity and relations between teachers, students and administrations (Bruner, 1996; Erickson, 1987; Goldring, 2002; Jerald, 2006; MacNeil, Prater, & Busch, 2009). Moreover, some school cultures place a greater emphasis on rote learning and memorization, while others prioritize critical thinking and problem-solving. Additionally, some school cultures have a more hierarchical approach to education, with a strong emphasis on teacher-led instruction, while others place a greater emphasis on student-centered learning, autonomous learning and collaboration (Masemann, 2003; McDermott,& Varenne, 2012; Peterson & Deal, 2009; Singh & Chaudhary, 2022).

School Climate

School climate is often referred to as a learning atmosphere in which students, teachers, parents, administrators and school staff share different experiences in numerous dimensions including feelings, attitudes and behaviors (Block, 2011; Loukas, 2007). It can also include the physical and emotional safety of the school, the level of engagement and sense of belonging among students, and the quality of relationships between students and staff. The school climate can have a significant impact on student learning and well-being, and is considered an important factor in the overall success of a school. School climate is directly related to education policies and practices. Studies examine the impact of these policies and practices on school climate. Research on teachers' behavior, attitudes, and teaching experiences in schools help us understand school climate. Furthermore, school climate is shaped by teachers' working conditions, teaching methods and collaboration (Bickel & Qualls, 1980; Zullig & Matthews, 2014).

School principals' leadership styles and management approaches can significantly affect the school climate as well. Studies have focused on understanding the relationship between leadership and school management and school climate. Moreover, diversity and equity issues in schools are important factors that affect school climate. Research in these areas can address inequalities and analyze the experiences of various student groups. Research examines the effects of family involvement in school climate on student achievement and school experiences. The physical environment and atmosphere of the school are part of the school climate. Studies on this subject are among the research topics of how the physical conditions of the school affect the student and staff experiences. School climate is shaped by the values, beliefs and norms in the school. Research can examine how these values are created and shared. These topics represent general areas of research on school climate, but research focuses can vary widely (Gilmore, 2022; Kutsyuruba, Klinger & Hussain, 2015).

Bureaucracy is one of the important phenomenon that plays a significant role in school climate. It encompasses procedures related to budgeting, personnel management, compliance with laws and regulations which can shape the way that schools operate the resources that are available to students and teachers. It impacts the level of trust and collaboration among staff members, and the level of engagement and motivation among students (Kean, Kannan & Piaw, 2018; McVey, 2009). On the other hand, if the bureaucracy is streamlined and efficient, it can boost a positive school climate by providing necessary resources and support, fostering collaboration and trust among staff, and promoting student engagement and achievements (Jacob, 2004; Teoh, 2017). Additionally, if the bureaucracy is too dominant, it prevents schools from responding to the needs of students and teachers quickly and effectively, which can also negatively affect the overall climate of a school (Chen, 2008; Cotton, 1996; Freiberg, 2005; Volk, 2014).

Organizational Commitment

Organizational commitment refers to the emotional attachment and loyalty of an employee or organizational member to his or her organization. This commitment reflects the employee's attitudes, values and commitment level towards the organization. Organizational commitment is an important concept in business life and is associated with a number of positive outcomes for both employees and organizations (Meyer & Allen, 2001; Pudjowati et al., 2021). There are some factors that are the basic components of organizational commitment. For example, Affective Commitment refers to an employee's feeling of emotional attachment and attachment to the organization. This commitment may lead the employee to view the workplace as a family or community and feel committed to the organization. Continuing commitment refers to an employee's desire to stay in the organization or continue to contribute to the organization. This means that the employee prefers to stay in the current organization rather than changing jobs. Normative commitment refers to the feeling that an employee has a responsibility to be committed to the organization for social or ethical reasons. This type of commitment may be based on personal values and norms. Organizational commitment is important to the success of an organization because committed employees are generally more motivated, more loyal and more productive. Additionally, the organization can retain loyal employees more easily and be more successful in attracting talented employees. Therefore, organizations often develop strategies to increase organizational commitment, as this is an important factor for long-term success (Al-Jabari & Ghazzawi, 2019; Mowday, 1998; Reichers, 1985; Ridwan, et al., 2020).

Research suggests that there are many different factors that increase organizational commitment. For example, an open communication helps employees understand what is going on in their organization. Transparent communication contributes to employees feeling more committed to the organization. It is stated that a good leadership increases the commitment of the employees to the organization. It is important for leaders to play a fair, supportive and guiding role. Opportunities for employees to develop their careers can increase commitment to the organization. Training, promotion opportunities and personal development programs can help. The participation of employees in organizational decisions and the evaluation of their views can increase the sense of commitment. It is important for employees to have a voice in the organization. Employees' satisfaction with their jobs can increase organizational commitment. Employees with high job satisfaction may be more loyal to the organization. Rewarding employees for their work and recognizing their achievements can increase engagement. Financial rewards, incentives and praise can be effective in this regard. Making employees feel valued and respected can increase organizational commitment (Purwanto, 2020; Redondo et al, 2021). Good human resources policies and a positive working environment are important in this regard. If employees are committed to the values and culture of the organization, their organizational commitment may increase. Therefore, it is important for organizations to clearly communicate their values and culture to their employees. Establishing good relationships with co-workers and team members can increase employee organizational commitment. Social support and solidarity can strengthen the sense of commitment. These factors form the basis of strategies to increase organizational commitment. Every organization is different, so engagement enhancement strategies must be customized. A successful commitment strategy can increase employee motivation, job satisfaction, and loyalty to their organization (Albalawi et al., 2019; Headley, Wright, & Meier, 2021; Luna-Arocas & Lara, 2020; Rahawarin, 2020).

There are a number of factors that reduce organizational commitment. These factors can weaken the emotional commitment of employees to the organization and negatively affect job satisfaction. There are some factors that can reduce organizational commitment. Lack of job satisfaction can reduce employees' organizational commitment. Dissatisfaction with their jobs negatively affects employees' commitment to their jobs and the organization. Unfair behavior can reduce employees' organizational commitment. If these injustices are felt, especially in matters such as wages, promotion opportunities and work distribution, commitment may weaken. Excessive workload and constant stress can reduce employees' job satisfaction and organizational commitment (Aranki et al., 2019; Hoff, 2021; Syakur et al., 2020). In this case, employees may not want to continue their work under more stress. Incomplete or ineffective communication can reduce employees' organizational commitment. Communication problems may prevent employees from understanding the organization's goals, values, or changes. Poor leadership or poor management can negatively impact employees' organizational commitment. Good leadership can encourage employees to trust and feel committed to the organization. Job insecurity can reduce employees' organizational commitment (Baugh & Roberts, 1994; Loan, 2020). Employees who are worried about losing their jobs may tend to lose their commitment to the organization. Conflicts, mobbing and bullying in the workplace can negatively affect employees' job satisfaction and organizational commitment. Intense working conditions and workload can cause employees to experience emotional exhaustion. Emotional exhaustion can weaken organizational commitment. Moreover, research emphasizes that overly rigid bureaucracy slows down the functioning of business and reduces employee motivation (Chegini et al, 2019; Marta et al., 2021; Sarhan et al., 2020; Suzuki & Hur, 2020). These are factors that can reduce employees' organizational commitment, but each organization and employee group is different.

Method

Research Design

In this study, a relational research design, which is one of the quantitative research methods, was used to determine to what extent teachers' perceptions of bureaucracy predict their school climate and school commitment levels. The relational research design is a method used to examine the relationships between variables during a research study. This design allows the researcher to analyze data to understand the relationships between independent and dependent variables. The relational research design uses statistical analysis to determine the relationship between two or more variables (Creswell & et al., 2007). This design is different from experimental or non-experimental research designs, which are usually used to determine causal relationships. Correlational research uses statistical techniques to measure, predict or explain relationships between variables. The correlational research design is also frequently used in survey studies and social sciences. Researchers collect data by asking respondents to complete questionnaires containing information about specific variables. This data is then analyzed statistically to determine the relationships between variables (Anastas, 2000; Galletta, 2013; Maxwell, 2012). The correlational research design is popular because it reduces complexity, can be applied to large sample groups and reflects real-world situations. The relational research design is basically considered within the scope of an analysis in which relational statistical analyses are performed. Correlational statistical analyses are statistical techniques used to identify and analyze the relationship between variables. It is used to determine the nature and strength of the relationship between two or more variables. The correlation coefficient indicates the direction (positive or negative) and strength of the relationship between the variables. It examines the effect of one or more independent variables on the dependent variable. This analysis involves the use of independent variables to predict or explain the value of a dependent variable. It is used to determine the differences of a dependent variable between groups or categories and to understand the relationships between a large numbers of variables in a data set and to reduce the variables into smaller groups or factors. These analysis techniques are common statistical tools used to evaluate data obtained in a correlational research design and to understand the relationship between variables. This design provides a framework for researchers to meaningfully interpret data and find answers to research questions (Edmonds & Kennedy, 2016; Leavy, 2022; Rovai & et al., 2013).

Study Group

The research was conducted with a group of 280 teachers and administrators working at primary and secondary state schools in Gebze, Kocaeli. The data were collected during the 2022-2023 academic year. The demographic characteristics of the participants in the study are given in Table 1.

Table 1.

Demographic Characteristics of the Teachers

Variables	Categories	f	%
Institution	Primary	90	32.14
	Secondary	190	67.85
Gender	Female	148	52.85
	Male	132	47.14
Age	24-29	25	8.92
	30-34	43	15.35
	35-39	68	24.28
	40-44	58	20.71
	45 & above	86	30.71
Seniority	1-5	23	8.21
	6-10	65	23.21
	11-15	49	17.49
	16 & above	143	51.07
Education	Bachelor's	223	79.64
	Master's	53	18.92
	Doctorates	4	1.42
Total		280	100

Design and Procedure

In this research quantitative data were obtained with the relational survey model since the research aimed to determine the effect of educational bureaucracy on school management, how this affects school teachers' commitment to school and their views on school climate. The survey method is generally used to study the characteristics of a group of people (Christensen, Johnson & Turner, 2014; Fraenkel & Wallen, 2006). The survey method is conducted using questionnaires or interview protocols to answer research questions or test hypotheses. It provides necessary conditions for the collection and analysis of data in accordance with the purpose of the research objectively. The relational survey method includes the processes such as interpretations, evaluations and generalizations to be applied to new situations as a result of the analysis and explanation of the data obtained (Fowler, 2013; Karasar, 2016; Rossi, Wright & Anderson, 2013; Seeram, 2019; Visser & et al. 2000). In addition, this method is used to determine whether there is a relationship between two or more variables related to various fields of interest (Karasar, 1995; Şen, 2005).

Data collection tools

Within the scope of the research, three different scales applied to the administrators and teachers working in official primary and secondary schools in Gebze, Kocaeli. To measure the effect of bureaucracy, the Enabling School Structure Scale consisting of 12 items, which was adapted into Turkish by Özer and Dönmez (2013), was used. The Organizational Commitment Scale for Teachers consisting of 17 items, which was developed by Üstüner (2009) as a result of data obtained from teachers working in primary and secondary schools, was used to measure teachers' commitment to school. The School Climate Scale consisting of 23 items developed by Canlı, Demirtaş and Özer (2018) was used to measure the effect of bureaucracy on school climate. The survey consists of two parts including scale items and demographic characteristics. The survey was prepared in google documents and sent to teachers and administrators online. The survey was prepared in the form of a five-point Likert scale including "strongly agree", "agree", "undecided", "disagree", "strongly disagree" and sent to teachers and administrators using the online platforms.

Table 2.

Cronbach Alpha Reliability Coefficient Statistics of the Scales

	Scales	**Cronbach's Alpha**	**N**
Cronbach's Alpha	The Enabling School Structure Scale The School Climate Scale Teachers’ Organizational Commitment Scale	0.72	3

As a result of the reliability analysis of the scales, Cronbach's Alpha reliability coefficients were examined to determine its internal consistency. When the values of the scales were analyzed, it was seen that the scales complied with the reliability criteria since they were above 0.70 (Daud et al., 2018; Hajjar, 2018).

Data Analysis

According to the answers given by the teachers participating in the research, which statistical analysis would be performed was determined. As a result of the analysis, normality test was performed. Moreover, ANOVA and t-tests were applied to the items to test the effect of dependent variables (Baştürk, 2010). In addition to these, Multiple Linear Analysis was performed to see whether there is correlation between the dependent variables. Considering the number of participants in the study, Kolmogorov-Smirnova test statistics were applied and as a result, it was seen that the answers given by the students showed homogeneous distribution. On the other hand, Skewness and Kurtosis values were taken into consideration since the data distribution of the Research-Inquiry was $p < 0.05$. Kolmogorov-Smirnov test results are shown in Table 3 ($p > 0.05$).

Table 3.

Normality Analysis Statistics of the items

Total Mean	**Kolmogorov-Smirnov**			**Shapiro-Wilk**		
	Statistic	**Df**	**P**	**Statistic**	**df**	**P**
School Climate Scale	.144	280	.000	.910	280	.000
Organizational Commitment Scale	.082	280	.000	.967	280	.000
Educational Bureaucracy Scale	.089	280	.000	.974	280	.000

Skewness and Kurtosis values were asymmetry and kurtosis values between -2 and +2 are considered acceptable to prove normal univariate distribution (George & Mallery, 2010). It has been argued that if the skewness is between -2 and +2 and kurtosis is between -7 and +7, the data will be considered normal (Bai & Ng, 2005; Bryne, 2010; Curran et al., 1996; Hair et al., 2010). Therefore, parametric tests were conducted in the research. Then, the data were turned into tables and whether there was a significant difference between the variables analyzed taking $\alpha = .05$ as a reference value. Skewness & Kurtosis results are shown in Table 4.

Table 4.

Normality Analysis Descriptions of Items

Variables	**Skewness**	**Kurtosis**	**Std. Error**
School Climate Scale	1.208	1.875	.146-.290
Organizational Commitment Scale	.633	.476	.146-.290
Educational Bureaucracy Scale	-.298	.602	.146-.290

Results

In this section, the answers given by the teachers about educational bureaucracy, school climate and organizational commitment are presented. In addition, the findings obtained as a result of parametric statistical analyzes and the interpretations of these findings are given.

Table 5.

t-Test Results of Students' Responses to the Scale Items According to Gender

Variables	**Gender**	**N**	**$\bar{X}$**	**SS**	**t**	**F**	**p**
School climate	Female	148	2.1	.65	-1.3		.18
	Male	132	2.2	.75			
Organizational commitment	Female	148	2.3	.51	-1.3		.18
	Male	132	2.4	.55			
						278	
Coercive bureaucracy	Female	148	3.4	.92	2.7		.00
	Male	132	3.1	1.0			
Enabling bureaucracy	Female	148	1.9	.67	-3.1		.00
	Male	132	2.2	.82			

When Table 5 is examined, according to gender, the mean arithmetic score of the teachers' views on School climate is $\bar{X}$=(2.10) for female teachers and $\bar{X}$=(2.21) for male teachers. Therefore, there is no significant difference between female and male ($p=0.18$, $p<0.05$). In addition, according to gender, the mean arithmetic score of teachers' views on Organizational commitment is $\bar{X}$=(2.63) for female teachers and X̄=(2.57) for male teachers. Therefore, there is no significant difference between female and male ($p=0.18$, $p>0.05$). On the other hand, the means of the answers given by female teachers to the Coercive bureaucracy items is X̄=(3.46) while the average of male teachers is X̄=(3.14). Therefore, there is a significant difference between the answers of female and male teachers ($p=0.006$, $p<0.05$). Moreover, the means of the answers given by female teachers to the Enabling bureaucracy items is X̄=(1.96) while the average of male teachers is X̄=(2.24). Therefore, there is a significant difference between the answers of female and male teachers ($p=0.006$, $p<0.05$).

Table 6.

t-Test Results of Teachers' Responses to the Scale Items According to Institution

Variables	Institution	N	X̄	SS	t	df	p
School climate	Primary	148	2.0	.67	-2.23	278	.02
	Secondary	132	2.2	.70			
Organisational commitment	Primary	148	2.4	.46	-.74		.45
	Secondary	132	2.3	.56			
Coercive bureaucracy	Primary	148	3.3	1.0	.67		.49
	Secondary	132	3.2	.94			
Enabling bureaucracy	Primary	148	2.0	.75	-.14		.88
	Secondary	132	2.1	.76			

When Table 6 is examined, according to institution, the mean arithmetic score of the teachers' views on School Climate is X̄=(2.00) for primary school teachers and X̄=(2.21) for secondary school teachers. Therefore, there is a significant difference between primary and secondary school teachers ($p=0.026$, $p<0.05$). In addition, according to institution, the mean arithmetic score of teachers' views on Organizational Commitment is X̄=(2.42) for primary school teachers and X̄=(2.37) for secondary school teachers. Therefore, there is no significant difference between primary and secondary school teachers ($p=0.45$, $p>0.05$). In addition, the means of the answers given by primary school teachers to the Coercive bureaucracy items is X̄=(3.37) while the average of secondary school teachers is X̄=(3.28). Therefore, there is no significant difference between the answers of primary and secondary school teachers ($p=0.49$, $p>0.05$). Moreover, the means of the answers given by primary school teachers to the Enabling bureaucracy items is $\bar{X}$=(2.08) while the average of secondary school teachers is $\bar{X}$=(2.10). Therefore, there is no significant difference between the answers of primary and secondary school teachers ($p=0.88$, $p>0.05$).

Table 7.

Descriptive Statistics of Teachers' Responses to Scale Items by Age

Variables	**Age**	**N**	**$\bar{X}$**	**SD**
School climate	24-29	25	2.1	.76
	30-34	43	2.3	.77
	35-39	68	2.1	.70
	40-44	58	2.1	.67
	45 & above	86	2.0	.64
	Total	280	2.1	.70
Organisational commitment	24-29	25	2.4	.50
	30-34	43	2.4	.50
	35-39	68	2.3	.49
	40-44	58	2.3	.61
	45 & above	86	2.4	.53
	Total	280	2.3	.53
Coercive bureaucracy	24-29	25	3.5	.93
	30-34	43	3.3	.96
	35-39	68	3.5	.83
	40-44	58	3.1	1.04
	45 & above	86	3.1	1.01
	Total	280	3.3	.97

	24-29	25	2.1	.80
	30-34	43	2.2	.77
	35-39	68	2.0	.65
Enabling bureaucracy	40-44	58	2.0	.79
	45 & above	86	2.0	.78
	Total	280	2.0	.75

Table 7 shows the means of the teachers' responses to the scale items according to age. ANOVA test was used to determine whether there was a significant difference between the averages of the teachers' responses to the scale items according to age. The results are given in Table 8.

Table 8.

ANOVA Results Regarding Teachers' Responses to "Educational Bureaucracy, School Climate and Organizational Commitment" in Terms of Age

Variables		**Sum of Squares**	**DF**	**$\bar{X}$**	**F**	**P**
School climate	Between Groups	2.1	4	.73	2.7	.35
	Within Groups	135.0	275	.26		
	Total	137.1	279			
Organizational commitment	Between Groups	1.0	4	.54	1.1	.46
	Within Groups	79.5	275	.49		
	Total	80.5	279			
Coercive bureaucracy	Between Groups	9.9	4	.25	.8	.03
	Within Groups	255.3	275	.28		
	Total	265.3	279			
	Between Groups	1.4	4	2.4	2.6	.63

Enabling bureaucracy	Within Groups	159.3	275	.92
	Total	160.8	279	

There is no significant difference (p=0.351, p>0.05) between the general arithmetic means of teachers' responses to "school climate" according to age when analyzing Table 8. Furthermore, there is no significant difference between the general arithmetic means of teachers' responses related to "Organizational Commitment" according to age (p=0.467, p>0.05). In addition, there is no significant difference between the general arithmetic means of teachers' responses related to "Enabling bureaucracy" according to age (p=0.634, p>0.05). However, there is a significant difference between the general arithmetic means of teachers' responses regarding "Coercive bureaucracy" by age (p=0.033, p<0.05). The Games-Howell post hoc test was used to analyze the difference between the ages, as the sample groups were different.

Table 9.

One-Way Post Hoc Results Regarding the Difference between Teachers' "Educational Bureaucracy" in Terms of Age

Age		$\bar{X}$	Std. Err	P
35-39	45 & above	.42*	.14	.039

When the Table 9 is examined, the arithmetic mean difference of the 35-39-year-old teachers and 45 & above -year-old teachers is $\bar{X}$=(.42*). Therefore, there is a significant difference between 35-39 year-old teachers' views on "Coercive Bureaucracy" of 45 & above year-old teachers. (p=0.039, p<0.05)

Table 10.

Descriptive Statistics of Teachers' Responses to Scale Items by Seniority

Variables	Seniority	N	$\bar{X}$	SD
School climate	1-5	23	2.3	.79
	6-10	65	2.2	.75
	11-15	49	2.1	.70
	16 & above	143	2.1	.66

	Total	280	2.1	.70
	1-5	23	2.3	.60
	6-10	65	2.4	.48
Organizational commitment	11-15	49	2.3	.56
	16 & above	143	2.3	.54
	Total	280	2.3	.53
	1-5	23	3.3	.93
	6-10	65	3.4	.95
Coercive bureaucracy	11-15	49	3.4	.87
	16 & above	143	3.1	1.01
	Total	280	3.3	.97
	1-5	23	2.1	.82
	6-10	65	2.1	.77
Enabling bureaucracy	11-15	49	1.9	.61
	16 & above	143	2.1	.79
	Total	280	2.0	.75

Table 10 shows the means of the teachers' responses to the scale items according to seniority. ANOVA test was used to determine whether there was a significant difference between the averages of the teachers' responses to the scale items according to seniority. The results are given in Table 11.

Table 11.

ANOVA Results Regarding Teachers' Responses to "Educational Bureaucracy, School Climate and Organizational Commitment" in Terms of Seniority

Variables		**Sum of Squares**	**DF**	**X̄**	**F**	**p**
School climate	Between Groups	1.1	3	.37	.76	.51
	Within Groups	136.0	276	.49		
	Total	137.1	279			
Organizational commitment	Between Groups	.3	3	.11	.39	.75
	Within Groups	80.2	276	.29		
	Total	80.5	279			
Coercive bureaucracy	Between Groups	5.7	3	1.9	2.0	.11
	Within Groups	259.5	276	.94		
	Total	265.3	279			
Enabling bureaucracy	Between Groups	1.0	3	.35	.61	.60
	Within Groups	159.7	276	.57		
	Total	160.8	279			

There is no significant difference ($p=0.515$, $p>0.05$) between the general arithmetic means of teachers' responses to "school climate" according to seniority when analyzing Table 11. Furthermore, there is no significant difference between the general arithmetic means of teachers' responses related to "Organizational Commitment" according to seniority ($p=0.755$, $p>0.05$). Moreover, there is no significant difference between the general arithmetic means of teachers' responses regarding "Coercive bureaucracy" by seniority ($p=0.110$, $p>0.05$). In addition, there is no significant difference between the general arithmetic means of teachers' responses related to "Enabling bureaucracy" according to seniority ($p=0.609$, $p>0.05$).

Table 12.

Descriptive Statistics of Teachers' Responses to Scale Items by Education

Variables	Education	N	X̄	SD
School climate	Bachelor's	223	2.1	.66
	Masters	53	2.0	.79
	Doctorates	4	2.4	1.1
	Total	280	2.1	.70
Organizational commitment	Bachelor's	223	2.4	.50
	Masters	53	2.2	.59
	Doctorates	4	2.6	1.1
	Total	280	2.3	.53
Coercive bureaucracy	Bachelor's	223	3.3	.91
	Masters	53	3.1	1.1
	Doctorates	4	3.0	1.4
	Total	280	3.3	.97
Enabling bureaucracy	Bachelor's	223	2.1	.73
	Masters	53	2.0	.82
	Doctorates	4	2.2	1.2
	Total	280	2.0	.75

Table 12 shows the means of the teachers' responses to the scale items according to education. ANOVA test was used to determine whether there was a significant difference between the averages of the teachers' responses to the scale items according to education. The results are given in Table 13.

Table 13.

ANOVA Results Regarding Teachers' Responses to "Educational Bureaucracy (Coercive & Enabling), School Climate and Organizational Commitment" in Terms of Education

Variables		**Sum of Squares**	**DF**	**X̄**	**F**	**p**
School climate	Between Groups	1.6	2	.84	1.73	.17
	Within Groups	135.4	277	.48		
	Total	137.1	279			
Organizational commitment	Between Groups	1.7	2	.86	3.03	.05
	Within Groups	78.8	277	.28		
	Total	80.5	279			
Coercive bureaucracy	Between Groups	1.8	2	.92	.97	.37
	Within Groups	263.4	277	.95		
	Total	265.3	279			
Enabling bureaucracy	Between Groups	.47	2	.23	.41	.66
	Within Groups	160.3	277	.57		
	Total	160.8	279			

There is no significant difference ($p=0.179$, $p>0.05$) between the general arithmetic means of teachers' responses to "school climate" according to education when analyzing Table 13. Furthermore, there is no significant difference between the general arithmetic means of teachers' responses related to "Organizational Commitment" according to education ($p=0.050$, $p>0.05$). Moreover, there is no significant difference between the general arithmetic means of teachers' responses regarding "Coercive bureaucracy" by education ($p=0.379$, $p>0.05$). In addition, there is no significant difference between the general arithmetic means of teachers' responses related to "Enabling bureaucracy" according to education ($p=0.664$, $p>0.05$).

Table 14.

Descriptive Statistics of Teachers' Responses to Scale Items by Field

Variables	Field	N	X̄	SD
School climate	Principal	20	1.6	.34
	Vice-Principal	27	1.9	.52
	Counsellor	8	2.1	.96
	Class Teacher	59	2.0	.72
	Subject Teacher	166	2.2	.69
	Total	280	2.1	.70
Organizational commitment	Principal	20	2.1	.38
	Vice-Principal	27	2.3	.38
	Counsellor	8	2.4	.53
	Class Teacher	59	2.4	.51
	Subject Teacher	166	2.3	.57
	Total	280	2.3	.53
Coercive bureaucracy	Principal	20	3.8	.99
	Vice-Principal	27	3.6	.94
	Counsellor	8	3.6	1.1
	Class Teacher	59	3.2	1.0
	Subject Teacher	166	3.2	.92
	Total	280	3.3	.97
Enabling bureaucracy	Principal	20	1.7	.72
	Vice-Principal	27	1.7	.53
	Counsellor	8	2.0	.83
	Class Teacher	59	2.1	.75
	Subject Teacher	166	2.1	.77
	Total	280	2.0	.75

Table 14 shows the means of the teachers' responses to the scale items according to field at school. ANOVA test was used to determine whether there was a significant difference between the averages of the teachers' responses to the scale items according to field. The results are given in Table 15.

Table 15.

ANOVA Results Regarding Teachers' Responses to "Educational Bureaucracy (Coercive & Enabling), School Climate and Organizational Commitment" in Terms of Field

Variables		**Sum of Squ**	**DF**	**X̄**	**F**	**P**
School climate	Between Groups	10.4	4	2.6	5.6	.00
	Within Groups	126.7	275	.4		
	Total	137.1	279			
Organizational commitment	Between Groups	1.6	4	.4	1.4	.22
	Within Groups	78.9	275	.2		
	Total	80.5	279			
Coercive bureaucracy	Between Groups	12.2	4	3.0	3.3	.01
	Within Groups	253.0	275	.9		
	Total	265.3	279			
Enabling bureaucracy	Between Groups	6.3	4	1.5	2.8	.02
	Within Groups	154.4	275	.5		
	Total	160.8	279			

There is a significant difference ($p=0.000$, $p>0.05$) between the general arithmetic means of teachers' responses to "school climate" according to field when analyzing Table 15. However, there is no significant difference between the general arithmetic means of teachers' responses related to "Organizational Commitment" according to field ($p=0.227$, $p>0.05$). On the other hand, there is a significant difference between the general arithmetic means of teachers' responses regarding

"Coercive bureaucracy" by field (p=0.011, p>0.05). In addition, there is a significant difference between the general arithmetic means of teachers' responses related to "Enabling bureaucracy" according to field (p=0.025, p>0.05). The Games-Howell post hoc test was used to analyze the difference between the answers, as the sample groups were different. The results are given in table 16.

Table 16.

One-Way Post Hoc Results Regarding the Difference between Teachers' Views on "School Climate & Educational Bureaucracy (Coercive & Enabling)" in Terms of Field

Variables	**Fields**		$\bar{X}$	**Std. Error**	**p**
School Climate	Principal	Class Teacher	-.45*	.12	,003
		Subject Teacher	-.66*	.09	,000
	Vice Principal	Subject Teacher	-.35*	.11	,027
Coercive Bureaucracy	Principal	Subject Teacher	.66*	.22	,012
Enabling Bureaucracy	Vice Principal	Subject Teacher	-.40*	.15	,046

As a result of the post-hoc Gabriel test after one-way analysis of variance (ANOVA) to determine which subgroups differed according to the field of field variable, a statistically significant difference at the level of (p<.05) in favour of the principal was found in between the principal and classroom teachers and subject teachers. In addition, it is seen that principals and vice principals have different perceptions than branch teachers as a result of the test of the coercive bureaucracy and enabling bureaucracy variables.

Table 17.

The Relation between School Climate, Organizational Commitment & Educational Bureaucracy (Coercive & Enabling)

Variables		**SC**	**OC**	**CB**	**EB**
School Climate (SC)	Pearson r	1	.574	-.273	.615
	P		.000	.000	.000
Organizational Commitment(OC)	Pearson r		1	-.040	.457
	P			.507	.000
Coercive Bureaucracy (CB)	Pearson r			1	-.305
	P				.000
Enabling Bureaucracy (EB)	Pearson r				1

Pearson Correlation Analysis was used to determine the relationship between educational bureaucracy (coercive & enabling), school climate and organizational commitment. The findings obtained are shown in Table 17. According to the table, there is a positive, moderate (r=0.574) and statistically significant (P<0.05) relationship between school climate and coercive bureaucracy. In addition, there is a negative, low level (r=-.273) and statistically significant P<0.05) relationship between school climate and coercive bureaucracy. On the other hand, there is a positive, moderate r=0.615) and statistically significant (P<0.05) relationship between school climate and enabling bureaucracy. Furthermore, there is a negative, low level (r=-.040) and significant (P<0.05) relationship between organizational commitment and coercive bureaucracy. In other words, as organizational commitment increases, coercive bureaucracy decreases. Moreover, there is a positive, moderate (r=.457) and statistically significant relationship between organizational commitment and enabling bureaucracy.

Discussion and Conclusion

Since the beginning of the formation of societies, school climate, organizational commitment and educational bureaucracy have become some of the main phenomena in educational research. States have developed different strategies to provide better educational opportunities and have tried to find answers to the problems that arise in schools. Today, educational research has continued to attract the interest of researchers (Dhillon & Meier, 2022; Maassen & Stensaker, 2019; Robinson, 2019). Therefore, in the study, teachers' and administrators' perceptions of school climate, organizational commitment and educational bureaucracy (coercive & enabling) were examined. In the research, first of all, scale reliability studies were conducted and the reliability coefficient of the scales was found as 0.72. (Daud et al., 2018; Hajjar, 2018). Kolmogorov-Smirnov test statistics were applied and as a result, it was seen that the answers given by the students showed homogeneous distribution. On the other hand, Skewness and Kurtosis values were taken into consideration since the data distribution of the Research-Inquiry was $p< 0.05$. In the study, it was seen that the answers given by the teachers to the items of school climate, organizational commitment and enabling bureaucracy did not differ in terms of gender variable, but showed a significant difference for the items of coercive bureaucracy ($p=0.006$, $p<0.05$). Statistically, the difference is significant and this difference is in favor of women. Studies conducted in the field have reached similar results (Rosenfeld 2017). Moreover, it was found that the teachers' views on School Climate differs significantly between primary and secondary school teachers and this difference is in favor of secondary school ($p=0.026$, $p<0.05$). This difference may be due to the fact that subject teachers spend more time in the teacher's room, enter different classes, and have less class competition. Research on school climate has reached similar results (Aldridge & Fraser, 2016; Pashiardis, 2000; Rafferty, 2003; Tajasom & Ahmad, 2011).

It was seen that there was a significant difference ($p>0.05$) between the views of subject teachers, principals and vice principals' responses to "school climate, coercive bureaucracy, enabling bureaucracy. When the school climate and enabling democracy variables are taken into consideration, it is seen that the averages of the answers of the subject teachers are higher than the other participants. Moreover, it is seen that the averages of the answers given by the principals are higher than the other participants on coercive democracy. On the other hand, no difference was found between teachers' views in terms of organizational culture. Research shows that there are differences between teachers' views on school climate, bureaucracy and organizational commitment (Gülşen & Gülenay, 2014; Lacks, 2016; Rudasill, 2018; Thapa, et al., 2013). Çeltek (2021) stated that preschool teachers perceive the bureaucratic culture in their schools more than subject teachers. Moreover, Karaoğlan (2019) indicated that classroom teachers perceived school structure to be higher than subject teachers.

Taking into account the variable of age, it was observed that there was a significant difference between the views of teachers aged 35-39 on "Coercive Bureaucracy" and the views of teachers aged

45 and above, and this difference was in favor of teachers aged 35-39 ($p=0.039$, $p<0.05$). The opinions of teachers aged 35-39 about coercive democracy were found to be at a higher level than those of teachers aged 40 and above. Similar results have been obtained in the relevant literature (Cox & Wood, 1980; Deniz & Erdener, 2020; Özgenel & Ankaralioglu, 2020; Theobald et al., 2009).

Within the study's scope, hypotheses were presented regarding the potential positive or negative effects of educational bureaucracy on both school climate and organizational commitment. Furthermore, it was hypothesized that teachers would have different perspectives on the research variables based on their demographic characteristics. To verify the validity of these hypotheses, relevant analyses were conducted. Therefore, regression analysis was used to find out whether there was any relationship between the research variables.

The first step was to examine the relationship between school climate and organizational commitment. The findings from the analysis indicate that there is a positive, moderate and statistically significant relationship between school climate and organizational commitment. Studies show that better school climate is associated with greater organizational commitment. Teachers' commitment to the school can be increased by a favorable school climate (Burak, 2022; Collie et al., 2011; John, 1999; Khan, 2019; Lai Eng Fei, & Han, 2020; Odoh, 2020; Yusof, 2012). The study also analyzed the relationship between school climate and enabling bureaucracy and concluded that there is a positive, moderate and significant relationship between the two variables. The findings suggest that the dominance of enabling bureaucracy in schools allows for a positive increase in school climate and the orderly progress of work (Avşar, 2019; Smith et al., 2020; Toprak et al., 2022; Yiğit & Ağalday, 2022). Furthermore, the study analyzed the level of relationship between school climate and coercive bureaucracy.

The findings indicate a negative, low-level and significant relationship between school climate and coercive bureaucracy. The coercive nature of bureaucracy is seen as one of the most important factors affecting the school climate. The school climate is negatively affected by coercive bureaucracy, which is an obstacle to the activities that teachers want to do. Research suggests that excessive bureaucracy has a negative impact on school climate, alienates teachers from the school administration, and causes teachers to be burdened with meaningless paperwork rather than focusing on students (Bellibaş et al., 2022; Besley et al., 2022; Bodur & Argon, 2019; Sarı, 2019; Waruwu et al., 2020). Additionally, the study examined the relationship between organizational commitment and enabling bureaucracy and coercive bureaucracy. The results of the study indicate that a positive, low level and significant relationship exists between organizational commitment and enabling bureaucracy, while a negative, low level and significant relationship exists between organizational commitment and coercive bureaucracy. As the level of enabling bureaucracy increases, so does the level of organizational commitment. Organizational commitment, like the school climate, is also adversely affected by excessive bureaucracy. An effective and efficient bureaucracy creates a positive environment by increasing the commitment of teachers to the school (Aranki, Suifan, & Sweis, 2019; Sarhan et al., 2020; Suzuki & Hur, 2020).

As a result, the data obtained from the study show that teachers have different opinions about how the educational bureaucracy works. Bureaucracy in the school environment has been shown to have a positive or negative impact on the school climate and teacher commitment.

Recommendations

To improve the functionality of the educational bureaucracy, it is imperative to review its operations and streamline procedures by eliminating unnecessary complexities, which will have a positive impact on the school climate and organizational commitment.

Utilizing technology effectively in educational institutions can lead to expeditious and efficient completion of tasks. Digital tools and automation systems can further facilitate the functioning of educational bureaucracy. Provision of regular training and development to enhance the capabilities and knowledge of educational issues. Keeping staff up to date can increase the functionality of the educational bureaucracy.

Consideration should be given to collaborating with other educational institutions to share resources and gain insight into best practice. By implementing these methodologies, one can enhance the functionality of the educational bureaucracy and ensure that educational institutions are more efficient, flexible and have a positive school climate and increased organizational commitment on the part of teachers.

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Conflict of Interest

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An Examination of The Relationship Between Social Studies Teachers' Environmental Knowledge and Sustainable Environmental Attitude

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Abstract. This study was conducted to examine the relationship between environmental knowledge and sustainable environmental attitude levels of social studies teachers. In the study, correlational model of quantitative research methods has been employed. The study group consisted of 136 social studies teachers. The data were gathered through "Sustainable Environmental Attitude Scale" developed by Yıldız (2011) and "Environmental Knowledge Test" developed by Karatekin (2011). Frequency, percentage, arithmetic mean, standard deviation, Mann Whitney-U test, Kruskall Wallis test, and Spearman Brown Row Differences Correlation Coefficient were used in the analysis of the data. The study results revealed that social studies teachers have a high level of environmental knowledge and positively sustainable environmental attitude. Moreover, it was found that environmental knowledge and sustainable environmental attitude of social studies teachers did not significantly differ by gender and professional. Finally, it was determined that there was no significant relation between environmental knowledge and sustainable environmental attitude of social studies teachers. It may be recommended to increase in-service training to increase teachers' environmental knowledge levels.

Keywords. Environmental problems, environment education, environmental knowledge, sustainable environmental attitude, social studies.

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The world has a wide range of environmental problems, such as ozone depletion, the greenhouse effect and climate change, fertile lands lost by erosion, forest fires, disappearing plant and animal species, and desertification (Yılmaz, 2006). These problems, which have been increasing especially after the Industrial Revolution, not only the past and present but have also affected future generations (Akçay, 2006; Tombul, 2006). Industrialization initially came to the forefront with the aspect of facilitating human life, but due to its significant impact, it has started to threaten the future and human life day by day. However, human beings, caught between economics and ecology, have tended to choose the side of economics (Karaismailoğlu, 2018). Humans are both the cause of environmental problems and the ones most affected by them (Bradley et al., 1999). Therefore, these problems are also a warning for humankind. (Knapp et al., 1995). Particularly towards the end of the 1960s, increasing pressure on environmental problems led to the agenda of international meetings. In these meetings (UNESCO, 1978; UNESCO-UNEP, 1988), it was agreed that the most permanent solution is the individual's active participation. Accordingly, there is a need for individuals who are conscious and sensitive about environmental problems, have positive attitudes and value judgements, and exhibit environmentally responsible behaviors in their daily lives (Özdemir Özden, 2020). As emphasised by many researchers (e.g., Erten, 2003; Knapp et al., 1995; Özdemir Özden, 2020; Roth, 1992; Stapp et al., 1969; Uzun & Sağlam, 2006), an effective environmental education that will raise these individuals can eliminate environmental concerns for the future.

The primary purpose of effective environmental education is to raise environmentally responsible citizens (Atasoy & Ertürk, 2008; Wilke, 1995). These individuals, who are also called environmentally literate, should have knowledge and attitudes towards the environment and environmental problems, an understanding that humans are part of nature, motivation, and skills to work towards solving and preventing environmental problems, and active participation in maintaining the balance between quality life and environmental protection (Roth, 1992). Schools are the most appropriate environments for raising individuals with these characteristics. Although environmental education is an interdisciplinary field, especially science and social studies courses (Disinger, 2001; Hungerford, 2001) come to the fore at the primary level in schools. In addition, environmental education is traditionally seen as the responsibility of science courses and science teachers. In some studies, conducted in Türkiye, it has been determined that the related subjects and outcomes are more in the science programme (Akınoğlu & Sarı, 2009; Karatekin, 2011). However, environmental problems are more socio-cultural than scientific-technological. Therefore, environmental problems and their solutions have a value-laden characteristic that is somewhat foreign to science fields, and, logically, social studies courses should play an essential role in environmental education (Hungerford, 2001). Thus, in Özdemir Özden's (2011) study, students also stated that they learned more about environmental education in the social studies course. Briefly, social studies course has an essential place in environmental education. In this sense, the social studies course curriculum (Ministry of National Education [MONE], 2018) concretely includes objectives, skills, and values for environmental education.

Moreover, as it is known, the mediation of teachers in a successful teaching process cannot be denied. The role of the teacher as a model is indisputable, especially in learning, such as environmental awareness and the development of responsible behaviours towards the environment. Therefore, it is essential to examine social studies teachers' knowledge, skills, attitudes and behaviours towards the environment and the relationships between them to determine their competencies towards environmental education as a model. In the literature, it is seen that most of the related studies were conducted with science teachers (e.g., Aksu, 2009; Erol, 2005; Sarışan Tungaç, 2015; Timur et al., 2012; Yıldız, 2011) and pre-service teachers (e.g., Akıllı &Yurtcan, 2009; Kahyaoğlu & Özgen, 2012; Kayalı, 2010; Öcal, 2013; Sadık, 2013; Şama, 2003; Timur &Yılmaz, 2011). There is no research that reveals the relationship between environmental knowledge and attitudes of social studies teachers. This study aims to determine whether there is a relationship between social studies teachers' environmental knowledge and sustainable environmental attitudes. Specifically, the study seeks to address the following sub questions.

1. What are social studies teachers' environmental knowledge and sustainable environment attitude levels?
2. Do social studies teachers' levels of environmental knowledge and sustainable environmental attitudes differ significantly according to gender and professional seniority?
3. Is there a relationship between social studies teachers' environmental knowledge and sustainable environmental attitude levels?

Method

Research Model

In this study, the correlational research model, which is one of the quantitative research methods, was employed. Correlational research is characterised by examining the relationships between two or more variables without any direct manipulation or intervention on these variables. Through this method, the intrinsic relationships between variables can be observed in their natural context. This method provides insights into the natural relationships between variables without changing or intervening in their states (Büyüköztürk et al., 2014).

Study Group

The study focused on social studies teachers working in public secondary schools affiliated with Kütahya Provincial Directorate of National Education. No special sampling was conducted since it was possible to reach the entire target group. An online data collection tool was presented to all teachers, and 136 teachers responded based on voluntary participation. Of these participants, 35.3 per cent identified themselves as female and 64.7 per cent as male. 28.7% of the teachers had 1-5 years of professional seniority, 27.2% had 6-10 years of professional seniority, 24.2% had 11-15 years of professional seniority, 14% had 16-20 years of professional seniority, and 5.9% had 21 years or more of professional seniority.

Data Collection Tools

The following data collection tools were used in the study:

Environmental knowledge test. The environmental knowledge test developed by Karatekin (2011) consists of 21 items and 3 sections (ecological knowledge, general environmental knowledge, and socio-political-economic knowledge). Question 21 was not used in the present study since it was appropriate for pre-service teachers and not for teachers. The KR20 reliability coefficient of the test was calculated as 0.71. In addition, it was determined that the average item difficulty index of the environmental knowledge test was 0.60, and the average item discrimination was 0.39.

Sustainable environment attitude scale. The scale developed by Yıldız (2011) was prepared in a 5-point Likert format and consists of twenty-seven items. KMO value was calculated as .882, and Barlett's test result was 7014.473 (p=.000). The scale consists of three factors. The factor loadings of the items ranged between .469 and .777. The lowest correlation value for the items was calculated as .287, and the highest value was calculated as .685. Cronbach's alpha reliability coefficient of the scale is .89. In the process of data collection, the initial step involved obtaining the necessary permissions from the Kütahya Provincial Directorate of National Education. Following this, school administrations were contacted via phone to communicate with social studies teachers, who were then provided with the link to the form. For schools near the researcher's residence, face-to-face meetings were arranged, during which the social studies teachers completed the online form. The entire online data collection phase spanned four months.

Data Analysis

As an initial step, reliability analyses were conducted specifically for the sample involved in this study. The reliability coefficient was calculated as .85 for the knowledge test and .83 for the attitude scale. A reliability coefficient of .70 and higher is considered sufficient for the reliability of test scores (Büyüköztürk, 2014). Then, to decide on the statistical analysis technique, the normal distribution feature of the attitude and knowledge scores of the teachers was examined. Skewness and kurtosis coefficients, histogram, Q-Q Plot graph, and box-line graph were analysed, and Kolmogorov-Simirnov values were calculated. This value was calculated as .032 for the knowledge test and .000 for the attitude scale. Since the calculated p-value was less than .05, it was found that the data did not show normal distribution characteristics, and non-parametric techniques could be used (Büyüköztürk, 2014). Accordingly, frequency, percentage, and arithmetic mean were used to analyse the research data. Mann Whitney U and Kruskall Wallis techniques were employed for comparisons between groups. In addition, the Spearman-Brown Rank Difference correlation coefficient was used to determine the relationship between environmental knowledge and sustainable environmental attitude. The significance level was accepted as .05 in analysing the data. In the interpretation of the data, 0-10 points between "low", 11-15 points between "medium", 16-20 points between "high" for Environmental Knowledge Test; 27-62 points between "low", 63-98 points between "medium", 99-135 points between "high" for Sustainable Environment Attitude Scale.

Results

Social Studies Teachers' Level of Environmental Knowledge

The general distribution of social studies teachers' scores from the environmental knowledge test is presented in Table 1.

Table 1.

General Distribution of Social Studies Teachers' Scores from the Environmental Knowledge Test

N	Minimum	Maximum	Arithmetic Mean	Standard Deviation
136	4	19	14.20	2.96

According to Table 1, the lowest score is 4, while the highest score is 19. The standard deviation of the participants' scores is 2.96, and the arithmetic mean is 14.20. Based on these findings, it can be said that social studies teachers have a moderate level of environmental knowledge.

Social Studies Teachers' Environmental Knowledge Regarding Variables

According to the sub-problems of the study, it was examined whether the environmental knowledge of social studies teachers differed significantly regarding gender and professional seniority variables. The results of the Mann-Whitney U-Test for environmental knowledge scores are presented in Table 2.

Table 2.

Mann Whitney U- Test Results of Social Studies Teachers' Environmental Knowledge Scores in Terms of Gender

Gender	n	Mean Rank	Rank Sum	U	p
Female	48	74.69	3585.00	1815.00	.172
Male	88	65.13	5731.00		

According to the rank means given in Table 2, the knowledge scores of female teachers are higher than those of male teachers. However, this difference between the scores is not statistically significant (U=1815.00, p>.05). In other words, it can be said that gender is not a variable affecting social studies teachers' environmental knowledge levels. The results of the Kruskal-Wallis Test for the professional seniority variable are presented in Table 3.

Table 3.

Kruskal Wallis Test Results of Social Studies Teachers' Environmental Knowledge Scores in Terms of Professional Seniority

Professional Seniority	n	Mean Rank	sd	χ^2	p
1-5 years	39	61.99	3	5.168	.160
6-10 years	37	72.35			
11-15 years	33	69.97			
16-20 years	19	78.89			
21 years and over	8	51.69			

According to the rank averages in Table 3, social studies teachers' environmental knowledge scores differ according to their professional seniority. While the highest mean score was obtained by teachers with 16-20 years of professional seniority, the lowest was obtained by teachers with 21 years of professional seniority and over. However, these differences between the groups were not statistically significant ($\chi2(3)=5.168$, p>.05). According to this finding, it can be said that professional seniority is not a variable affecting social studies teachers' environmental knowledge levels.

Social Studies Teachers' Attitude Levels Towards Sustainable Environment

The overall distribution of the scores that the social studies teachers received from the scale has been detailed and presented in Table 6 for further analysis and understanding.

Table 4.

General Distribution of Social Studies Teachers' Scores from the Sustainable Environment Attitude Scale

(N)	Minimum	Maximum	Mean	Standard Deviation
136	86	135	115.02	10.81

As seen in Table 4, the lowest score of the social studies teachers who participated in the study from the sustainable environment attitude scale was 86, while the highest score was 135. The standard deviation of the scores is 10.81. The arithmetic mean of the participants' scores was 115.02. Accordingly, it can be said that social studies teachers have strong and positive sustainable environmental attitudes. To analyse the opinions and attitudes of social studies teachers in more detail, their responses to each scale item are presented in Table 5.

Table 5.

Social Studies Teachers' Responses to the Sustainable Environment Attitude Scale Items

Items		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. The idea of inventing vehicles that pollute the air as little as possible excites me.	*f*	-	1	9	42	84
	%	-	0.7	6.6	30.9	61.8
2. The thought that harmful gases released into nature may exceed the carrying capacity of nature frightens me.	*f*	-	1	4	37	94
	%	-	0.7	2.9	27.2	69.1
3. It worries me to know that increasing pollution in the atmosphere is the cause of global climate change.	*f*	-	-	3	50	83
	%	-	-	2.2	36.8	61
4. It worries me that one of the reasons for the water shortage in the future is the increase in human population.	*f*	5	10	7	59	55
	%	3.7	7.4	5.1	43.4	40.4
5. To ensure the continuity of water for future generations, I prefer to use less pesticides, industrial products and household cleaners that cause pollution.	*f*	3	1	4	53	75
	%	2.2	0.7	2.9	39	55.1
6. The negative impact of chemicals accumulated in crops on other links in the food chain bothers me.	*f*	-	1	8	35.3	79
	%	-	0.7	5.9	35.3	58.1
7. I do not care about soil loss in other parts of the world.	*f*	66	50	10	6	4
	%	48.5	36.8	7.4	4.4	2.9
8. It is unnecessary to invest in renewable energy sources by thinking about the future.	*f*	77	43	8	3	5
	%	56.6	31.6	5.9	2.2	3.7
9. The idea of using these resources carefully to ensure the sustainability of energy resources is unnecessary.	*f*	82	37	6	8	3
	%	60.3	27.2	4.4	5.9	2.2

Table 5 (continued).

Social Studies Teachers' Responses to the Sustainable Environment Attitude Scale Items

10. Considering that fossil energy resources may one day be exhausted; it is unnecessary to use these resources carefully.	*f* %	80 58.8	39 28.7	7 5.1	4 2.9	6 4.4
11. The thought that nature cannot renew the resources we consume rapidly worries me.	*f* %	10 7.4	3 2.2	5 3.7	51 37.5	67 49.3
12. I am happy when I see recycling advertisements for a sustainable environment.	*f* %	2 1.5	1 0.7	10 7.4	52 38.2	71 52.2
13. I ignore the recycling emblem on the packaging of the products I buy.	*f* %	31 22.8	41 30.1	35 25.7	22 16.2	7 5.1
14. I find it necessary to give education about recycling in schools.	*f* %	2 1.5	6 4.4	4 2.9	32 23.5	92 67.6
15. I prefer to use products from bottles where the deposit process is applied.	*f* %	9 6.6	11 8.1	31 22.8	45 33.1	40 29.4
16. I do not prefer to use cloth bags, mesh bags, or paper bags instead of bags.	*f* %	30 22.1	42 30.9	35 25.7	22 16.2	7 5.1
17. I ignore the fact that the products I buy are multi-use rather than disposable.	*f* %	36 26.5	35 25.7	30 22.1	25 18.4	10 7.4
18. It is a distressing situation that we do not see enough recycling bins in the environment.	*f* %	1 0.7	2 1.5	4 2.9	47 34.6	82 60.3
19. It scares me that rapidly increasing consumption is an important obstacle to the sustainability of the environment.	*f* %	3 2.2	1 0.7	5 3.7	54 39.7	73 53.7
20. When we consume more than nature can give us, it is unnecessary to think that the future will be affected by this situation.	*f* %	72 52.9	38 27.9	8 5.9	7 5.1	11 8.1
21. I would be happy to attend seminars on consumption habits for sustainability.	*f* %	4 2.9	6 4.4	28 20.6	49 36	49 36
22. It is unnecessary to think that resources will run out when the human population increases.	*f* %	67 49.3	50 36.8	7 5.1	7 5.1	5 3.7
23. It does not concern me if the increase in human population prevents the sustainability of the natural balance.	*f* %	77 56.6	42 30.9	6 4.4	6 4.4	5 3.7
24. It is a waste of time to explain what I have learnt about sustainability to my family and close circle.	*f* %	73 53.7	46 33.8	9 6.6	3 2.2	5 3.7
25. I would like sustainability to be a philosophy of life in order to leave a good environment for our children.	*f* %	1 0.7	1 0.7	1 0.7	50 36.8	83 61
26. I am glad that people meet their raw material needs and reduce their pressure on nature through recycling practices.	*f* %	1 0.7	- -	- -	60 44.1	75 55.1
27. I find it important that people are told that natural resources are not infinite through recycling campaigns.	*f* %	1 0.7	- -	2 1.5	39 28.7	94 69.1

As Table 5 shows, it is evident that social studies teachers showed high agreement with the positive items on the scale. The highest rates of agreement belong to the items that *I am glad that people meet their raw material needs and reduce their pressure on nature through recycling practices (99.2%)*, and *it worries me to know that increasing pollution in the atmosphere is the cause of global* *climate change* (97.8%) and *I would like sustainability to be a philosophy of life in order to leave a good environment for our children* (97.8%). In other words, it can be said that almost all of the social studies teachers have positive attitudes towards recycling practices and are concerned about the fact that pollution in the atmosphere causes climate change and believe that sustainability should be a philosophy of life.

According to Table 5, one of the items that social studies teachers disagreed with the most was "*it is unnecessary to invest in renewable energy resources by thinking about the future*" (88.2%). When the above items are analysed, it is seen that the relevant attitude statements with low agreement are concluded with negative statements such as "it is unnecessary, it does not concern me, it is a waste of time". The fact that social studies teachers do not agree with these items can be accepted as an indicator of their positive attitudes towards the environment.

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In Table 5, it is seen that the rate of teachers' preference for the "neutral" option is low except for five remarkable items. It is seen that the items with high rates of neutral are *I ignore the recycling emblem on the packaging of the products I buy* (25.7%), and *I do not prefer to use cloth bags, mesh bags, or paper bags instead of bags* (25.7%). It is seen that the above items, which a significant number of social studies teachers have ticked "no idea", are mostly about recycling. On the other hand, it was stated that they would be happy to reduce the pressures on nature with recycling practices. It can be said that teachers think positively about recycling, but some teachers abstain from the statements about transforming into behaviour.

Sustainable Environmental Attitudes of Social Studies Teachers in Terms of Variables

Regarding the sub-problems of the study, it was analysed whether social studies teachers' scores on sustainable environmental attitudes differed significantly in terms of gender and professional seniority. The results of the Whitney U-Test related to gender are presented in Table 6.

Table 6.

Mann Whitney U- Test Results of Social Studies Teachers' Sustainable Environmental Attitude Scores Regarding Gender

Gender	n	Mean Rank	Rank Sum	U	p
Female	48	61.52	2953.00	1777.00	.127
Male	88	72.31	6363.00		

According to the mean ranks in Table 6, it is seen that the sustainable environmental attitude scores of male social studies teachers are higher than those of female social studies teachers. However, this difference is not statistically significant (U=1777.00, p>.05). In other words, it can be said that gender is not a variable affecting social studies teachers' sustainable environmental attitudes. The Kruskal Wallis Test results related to professional seniority are presented in Table 7.

Table 7.

Kruskal Wallis Test Results of Social Studies Teachers' Sustainable Environmental Attitude Scores in Terms of Professional Seniority

Professional Seniority	n	Mean Rank	sd	χ^2	p
1-5 years	39	72.51	4	1.631	.803
6-10 years	37	63.41			
11-15 years	33	67.36			
16-20 years	19	74.42			
21 years and over	8	63.13			

According to the mean ranks in Table 7, it is seen that social studies teachers' sustainable environmental attitude scores differ in terms of their professional seniority. Teachers with a professional seniority of 16-20 years had the highest mean score, while teachers with a professional seniority of 21 years and over had the lowest mean score. However, these differences between the groups were not statistically significant ($\chi2(4)=1.631$, p>.05). According to this finding, it can be said that professional seniority is not a variable affecting social studies teachers' sustainable environmental attitudes.

The Relationship Between Social Studies Teachers' Environmental Knowledge and Sustainable Environmental Attitude Levels

Spearman-Brown Rank Difference correlation coefficient was calculated to determine whether there is a significant relationship between social studies teachers' environmental knowledge and sustainable environmental attitudes. The results are presented in Table 8.

Table 8.

Spearman-Brown Rank Difference Correlation Coefficient between Social Studies Teachers' Environmental Knowledge and Sustainable Environmental Attitudes

		Sustainable Environmental Attitude
Environmental Knowledge	Pearson Correlation	.134
	Sig. (2-tailed)	.121
	N	136

The analysis results given in Table 8 show that there is no significant relationship between social studies teachers' environmental knowledge and sustainable environmental attitudes ($r=0.134$, $*p>.05$).

Discussion and Conclusion

In this study, it was observed that social studies teachers possess a moderate level of environmental knowledge. Upon reviewing the relevant literature, no studies specifically examined social studies teachers' environmental knowledge levels. However, there are some studies focused on science and technology course teachers. For instance, in a study conducted by Aydemir (2007), science and technology course teachers were found to have moderate environmental knowledge. Moreover, several studies in the literature focus on pre-service social studies teachers. These studies determined that pre-service teachers exhibited a moderate level (Karatekin, 2011; Sadık, 2013) and a low level (Alagöz, 2009) of environmental knowledge.

In the study, it was determined that social studies teachers showed high participation in the positive items of the sustainable environment attitude scale and did not participate in the negative items. However, a significant abstention was observed in the items aimed at transforming their thoughts into action. The reasons for this need to be investigated and discussed. It was found that social studies teachers generally have a high level of positive sustainable environmental attitudes. As for environmental knowledge, there is no research conducted with social studies teachers on environmental attitudes. However, there are many studies conducted with pre-service teachers in social studies and other fields that are in line with the results of this study (Ahi & Özsoy, 2015; Gül et al., 2018; Karatekin, 2011; Kayalı, 2010; Malkoç, 2011; Öcal, 2013; Sadık, 2013). In these studies, it was determined that teachers had a high level of positive environmental attitude. In some studies (Arık & Yılmaz, 2017; Eroğlu Doğan, 2013; Gürbüz & Çakmak, 2012; Kahyaoğlu & Özgen, 2012; Polat & Kırpık, 2013), it was found that pre-service teachers in different fields had moderate positive attitudes towards the environment. When analysing the results of the studies, it is seen that attitudes towards the environment are mostly high across all groups. However, the gradual increase in negative behaviours towards the environment in Türkiye constitutes a contradiction. It may be necessary to investigate the reasons for this situation.

In the study, it was determined that the environmental knowledge levels of social studies teachers did not change in terms of gender. Similarly, in some studies (Karatekin, 2011; McDaniel & Alley, 2005; Sarışan Tungaç, 2015; Timur & Yılmaz, 2011), it was determined that gender did not make a significant difference in the environmental knowledge scores of adults. In some studies, conducted for primary and high school students in the literature, it was determined that gender did not create a significant difference (e.g. Esen, 2011; İncekara & Tuna, 2010; Özdemir Özden, 2011; Sağır et al., 2008). However, there are studies that do not coincide with these results. According to a study conducted by Sadık and Çakan (2010) with biology students, it was found that males had higher levels of environmental knowledge. In Eroğlu Doğan's (2013) study conducted with prospective biology teachers, a significant difference was found in favour of females. In studies conducted with primary and high school students, it was concluded that female students had higher environmental knowledge levels (Atasoy & Ertürk, 2008; Çavuşoğlu et al., 2017; Gök & Afyon, 2015; Taycı, 2009; Uzun, 2007).

In the study, it was determined that social studies teachers' sustainable environmental attitudes did not change in terms of gender. Similar results were obtained in many studies with different samples (Aksu, 2009; Akbaş, 2007; Demirel et al., 2009; Esen, 2011; Gürbüz & Çakmak, 2012; Karadayı, 2005; Köse, 2010; Malkoç, 2011; Polat & Kırpık, 2013; Sağır et al., 2008; Uzun, 2007). However, there are many studies with different results. In the studies conducted with all primary school teachers (Ahi & Özsoy, 2015), classroom teachers (Gül et al., 2018) and pre-service social studies teachers (Karatekin, 2011; Öcal, 2013), a significant difference was found in favour of females. However, in many studies conducted with pre-service teachers in different branches (Akıllı & Yurtcan, 2009; Arık & Yılmaz, 2017; Eroğlu Doğan, 2013; Güşta Şahin & Doğu, 2018; Kahyaoğlu & Özgen, 2012; Kayalı, 2010; Sadık & Çakan, 2010; Şama, 2003; Timur et al., 2013), the significant difference was in favour of males. Moreover, it was determined that female students had more positive environmental attitudes in studies on early age groups (Atasoy & Ertürk, 2008; Gök & Afyon, 2015; Gökçe et al., 2007; Nalçacı & Beldağ, 2012; Özdemir Özden, 2011; Taycı, 2009).

In the study, it was found that both environmental knowledge levels and sustainable environmental attitudes of social studies teachers did not change in terms of their professional seniority. However, in Sarışan Tungaç's (2015) study, science teachers with less seniority years were found to have more environmental knowledge. Moreover, in some studies conducted with science and primary school teachers, similar results were obtained in terms of environmental attitudes (Aksu, 2009; Sarışan Tungaç, 2015). According to Ahi and Özsoy (2015), professional seniority was found to be a variable that made a significant difference.

The study's results indicated no significant relationship between teachers' environmental knowledge and sustainable environmental attitudes. Similarly, in Esen's (2011) study with gifted students at the primary school level, it was determined that there was no relationship between students' environmental knowledge and attitudes. However, many studies in the literature have revealed a significant relationship between environmental knowledge and attitude. According to Atasoy and Ertürk (2008), Sadık (2013), and Uzun (2007), there is a moderate positive and significant relationship between environmental attitudes and environmental knowledge. In the studies conducted with students, it was found that there was a positive relationship between environmental knowledge and environmental attitudes (Çavuşoğlu et al., 2017; Özdemir Özden, 2011; Taycı, 2009).

Recommendations

Recommendations for The Findings

The results of the study reveal that teachers do not have a high level of environmental knowledge. It is of great importance to increase teachers' environmental knowledge. Initiatives such as in-service seminars, online training sessions, conferences and panel discussions can be effective in this regard. Moreover, other research findings similarly point to moderate to low levels of environmental knowledge during pre-service education. To address this problem, teacher training programmes may need to be strengthened in terms of environmental education courses, or the quality of the education provided may need to be improved.

Recommendations for The Researchers

The results of the study reveal that teachers do not have a high level of environmental knowledge. It may be useful to conduct further studies to investigate the reasons behind this finding.

The study also reveals that social studies teachers have high levels of positive sustainable environmental attitudes. In other literature in the field, moderate to high levels of positive attitudes were also found. However, the increasing negative behaviours towards the environment in our country constitute an interesting contradiction. Studies can be conducted to investigate the reasons behind this contradiction. On the other hand, a similar study can be repeated with a larger sample or in different provinces to collect more data about social studies teachers' current knowledge and attitude levels. In this study, only professional seniority and gender variables were analysed. The effect of other variables can be investigated. Although there are many quantitative studies in the literature, as seen in this study, qualitative studies can be conducted to understand better the reasons affecting teachers' environmental knowledge and attitudes.

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Parents' Roles in Children's Games and Toys

***Emre Dağaşan**

Abstract. Games and toys are important elements that facilitate children's adaptation to the world. Games are an effective learning method that supports children's social, physical, and cognitive development. Children's games and the toys they use are greatly influenced by the people around them. Especially in the preschool period, parents' game the most crucial role for children. Children often explore their first games and toys with their parents, and these initial toys are usually provided by parents. The level of knowledge that parents have about games and toys determines the games children will Game and the toys they will use. The aim of this study is to identify the roles of parents in the game's children play and the toys they use. A qualitative approach was adopted using semi-structured interviews in the research. Twenty families with children participated in the study. The collected data were analysed using descriptive analysis. When the research results are examined, it is observed that parents pay attention to children's preferences, toy quality, and children's developmental level when choosing toys. It is believed that these toys contribute to children's cognitive, emotional, and physical development. In addition, computer games, ball games, chess, hide-and-seek, and other games are among the preferred games parents Game with their children. According to parents, these games not only increase children's happiness but also strengthen family bonds, boost self-confidence, and contribute to their socialization.

Keywords. Game, toy, parent roles, preschool education.

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The relationship between children and Game and toys is considered a fundamental element of every society and culture. Game and toys have a significant impact on children's education, development, and happiness. Children's interaction with toys and games an important role in how families and educators can shape children's lives. This is because Game and toys allow children to explore the world, develop social skills, enhance cognitive abilities, and build emotional intelligence. Additionally, it should not be forgotten that Game represents joy, freedom, and creativity for children (Doğanay, 1998).

Game, Toys and Emotional Development of Children

There are many different definitions of Game and Game activities that are considered as activities devoid of the difficulties of daily life and aimed solely at pleasure and relaxation, for children and partially for adults. Game is considered one of the fundamental needs of children and also carries distinct traces from our society's traditions and beliefs (Dağaşan, 2013, p. 56). Game is seen as a platform where children interact with the world, learn, and express themselves, and toys are important tools in this process. Game contributes to children's cognitive, emotional, social, and physical development, while toys provide materials that support this developmental process. Furthermore, Game and toys allow children to develop their freedom, creativity, problem-solving abilities, and social skills. Therefore, the relationship between children and Game and toys is a complex dynamic that helps both families and educators support the healthy development of children (Aral, 2000).

Piaget (2003) developed a theory that focuses on children's cognitive development with specific stages. According to this theory, children construct their understanding of the world through Game and toys. For example, constructivist games (such as puzzles) can help children improve their problem-solving and logical thinking skills. Vygotsky (1987) argues that social interactions Game a key role in children's learning. Game can help children develop their social skills and communication abilities. Especially, games gamed with adults or more experienced peers can enrich children's learning experiences. Erik Erikson suggests that personality development in different stages of life is marked by various challenges. Game and toys can help children explore their identities and develop positive self-concepts. In particular, activities like drama games can have an effective impact on children's identities and emotional well-being. Bronfenbrenner (1987) examines children's interactions with their environments at four different levels: microsystem, mesosystem, ecosystem, and macrosystem. Game and toys can influence children's development in each of these environments. For example, the experience of Gameing within the family (microsystem) can affect a child's emotional context (Ryan, 2001).

The impact of game and toys on child development is undeniable. Research has emphasized the importance of games for children's emotional intelligence development (Ahioğlu, 2008). Game can be beneficial in terms of recognizing emotional expressions, processing emotional experiences, and managing emotional states. Research has also indicated that children develop problem-solving skills through games (Özyürek, 2019). The literature also includes findings suggesting that games encourage children's abstract thinking abilities and contribute to cognitive development (Ahioğlu, 2008). According to Doğanay (1998), toys help children develop their social skills, particularly skills such as sharing, cooperation, and empathy, which are supported through toys (Ay, Acat, and Yüksel, 2016).

The Relationship between Game and Toys and Education

Game and toys play a significant role in children's education. Games and toys are powerful tools that educators can use to enrich learning experiences. For instance, building blocks or scientific experiment sets can encourage children to learn mathematics and science by providing concrete experiences. Games can help children develop important social skills such as collaboration, problem-solving, and empathy. These skills play a significant role in classroom interactions and friendships. Games can also support children's emotional intelligence development. Toys can teach children to recognize, manage, and be sensitive to the emotional needs of others. Additionally, game can encourage children's independent thinking and improve their creative problem-solving skills.

For children, game and toys represent more than just fun activities. These factors play a crucial role in children's healthy growth, development, and adaptation to the world. Therefore, research in this area is of great importance. Understanding how game and toys contribute to children's social, physical, and cognitive development holds fundamental significance in the field of education (Ay, Acat, and Yüksel, 2016). The skills children acquire during these early years can impact their future successes. Advances in science and technology today bring about a series of changes that deeply affect societal life and, consequently, the field of education. As a result, education programs are reviewed, evaluated, and, when necessary, reorganized to meet both societal and individual needs and the requirements of the subject matter (Atalay, Ay, and Gültekin, 2016).

Significance of the Study

Children are individuals who shape the future of societies. Toys and games influence children's worldviews, values, and skills. Families and educators strive to guide children through these critical stages, and the findings of this research can serve as a guide for them. Furthermore, for toy manufacturers, this can provide an important resource for better meeting the needs of children. Therefore, gaining more knowledge about the relationship between children and Game and toys can help both families and society support the healthy development of children (Ahioğlu, 2008).

A review of the relevant literature indicates that parents take into account children's ages, genders, and interests during the toy selection process (Özyürek, 2019). However, there is limited research focusing on how parents' toy choices can contribute to children's development. The relationship between Game, toys, child development, and education is complex and multidimensional. This research aims to provide in-depth knowledge about this relationship and how it can contribute to children's education and development.

Parents, who are the focus of this research, play a central role in children's relationship with game and toys. This study will help us better understand the roles and influences of parents in this process and provide an opportunity for parents to contribute more consciously to their children's development. The results of this research will offer valuable insights for educators and child development experts. They will provide guidance on how game and toys can be integrated into educational processes, enriching children's learning experiences, and how parents can be guided in this regard (Atalay, Ay, and Gültekin, 2016). Toy preferences also point to the societal and cultural context (Özyürek, 2019). This research is valuable for understanding how children's game habits and the role of parents in this context may vary in different societies and cultural groups.

This study aims to understand the roles of parents in the context of game and toys with their children and examine the impact of this interaction on children's development. The study addresses the factors that parents consider when selecting toys for their children and when playing with them, how these factors contribute to children's development, and which games and toys particularly have positive effects.

Research Objective

The aim of this study is to identify the roles of parents in relation to the games and toys children play with. To achieve this aim, the following research questions were addressed:

1. What are the factors influencing parents' toy preferences?
2. How do the toys preferred by parents contribute to children's development?
3. What games do parents play with their children?
4. What developmental areas do parents' play with their children contribute to?

Method

Research Model and Design

This research employed a qualitative research approach. Qualitative research is a research method widely used in the social sciences, education, psychology, and various other fields. It serves as a valuable research tool for understanding complex subjects such as human behaviours, experiences, and perceptions. Qualitative research involves the use of qualitative data collection methods to comprehensively examine an event or situation with a realistic and holistic perspective (Akman, 2014). As for the research design, a case study approach was utilized. Case studies involve the in-depth examination of a single event, community, program, group, or a limited phenomenon (Yin, 2003). In these studies, a holistic view of the situation is taken, and the case can be anything from a student, teacher, school, or a newly implemented program. Semi-structured interview forms, commonly employed in qualitative research, were used in the data collection process.

Study Group

The study group consisted of 23 parents, including 12 mothers and 11 fathers who have children. Individual characteristics of the parents in the study group are provided in Table 1.

Table 1.

Demographic Information of Participants

	Mother / Father	Number of Children	Education Level	Mother's/Father's Jobs
1	Father	3	Primary School	Officer
2	Father	3	Primary School	Not working
3	Mother	4	Middle School	Officer
4	Mother	2	Postgraduate	Officer
5	Father	1	High School	Small business
6	Mother	3	Bachelor's Degree	Officer
7	Father	3	High School	Employee
8	Mother	4	Primary School	Temporary Employee
9	Mother	2	Primary School	Not working

10	Father	3	High School	Self-employment
11	Father	2	Bachelor's Degree	Officer
12	Father	2	Middle School	Employee
13	Mother	2	Postgraduate	Officer
14	Mother	1	Bachelor's Degree	Officer
15	Father	4	Bachelor's Degree	Small business
16	Mother	2	High School	Employee
17	Mother	3	Primary School	Not working
18	Mother	2	Primary School	Temporary Employee
19	Mother	4	Primary School	Employee
20	Father	3	Middle School	Officer
21	Father	2	Postgraduate	Officer
22	Mother	2	Bachelor's Degree	Employee
23	Father	1	High School	Self-employment

Table 1 indicates that the average number of children per parent is close to three. The educational levels of families vary, with a high percentage of parents having completed primary school. Their occupations are diverse, with the majority working as Officer or Employee. Additionally, some parents are not employed.

Data Collection Tool and Analysis of Data

In data collection, a form consisting of four open-ended questions was used based on previous studies in the literature and expert opinions. These questions are as follows:

1. What factors do you consider when buying toys for your child/children?
2. What do you think is the impact of the toys you purchase on their development?
3. Which games do you most commonly play with them?
4. What kind of effects have these games had on their development?

In line with the questions directed at parents in the research, a coding key was created, and the data processed according to the coding key were descriptively analyzed in terms of frequencies, within the context of the research's aim and the questions in the written form. Findings were interpreted by directly supporting them with quotations. The frequency distributions of the responses provided by parents are presented in tabular form.

Reliability of the Research

The data obtained from interviews with parents were independently coded by two researchers working in the field of child development, and reliability studies were conducted by bringing the codings together. In calculating the reliability of the research, the reliability formula of Miles and Huberman (1994) was used.

Reliability = Agreement / (Agreement + Disagreement)

According to the reliability formula, the research has a reliability of 78%. Reliability calculations above 70% indicate that the research is reliable. Based on the obtained result, it can be said that the research is reliable.

Results

Findings Regarding Toy Selection

During the interviews with mothers and fathers, they were asked about the criteria they consider when buying toys for their children, and the responses were analyzed to determine the criteria they pay attention to, as shown in Figure 1.

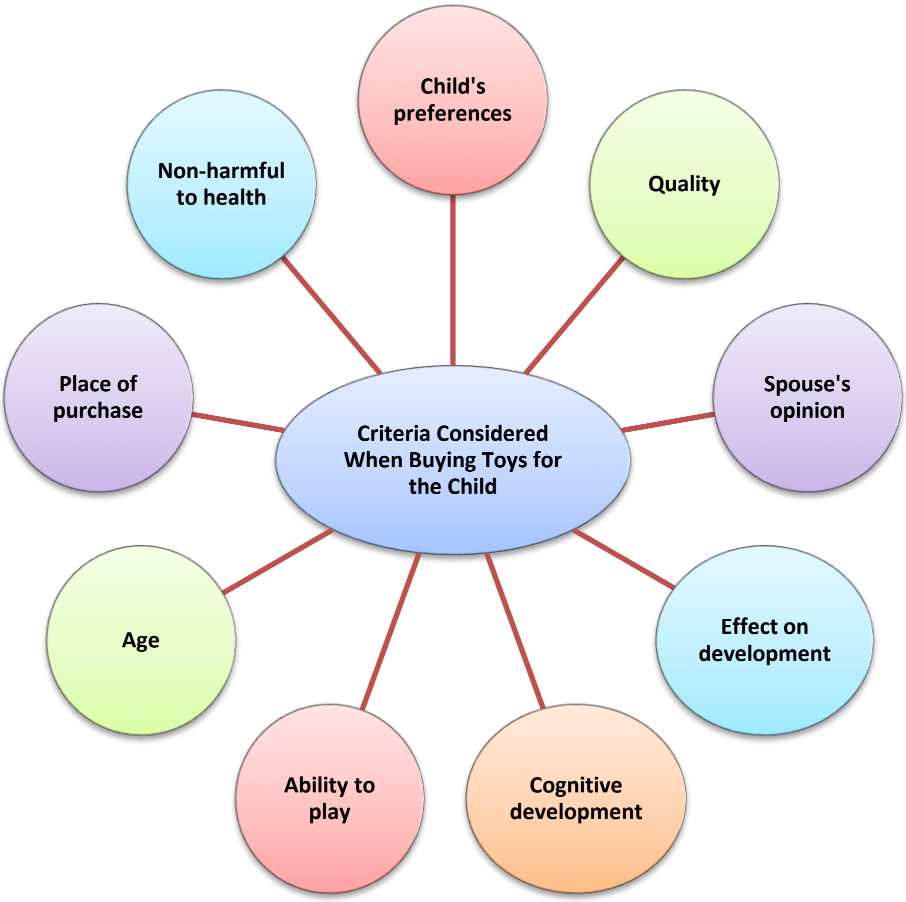

Figure 1. Factors Regarding Toy Selection.

It is observed that parents pay attention to the criteria of children's preferences, *toy quality, spouse's opinion, development level, cognitive development, skill level, age, place of purchase, and* *non-harmfulness to health* when buying toys for their children. In this context, it was determined that parents use the following expressions.

Table 2.

Factors Considered in Toy Selection

Factors Considered	***f***	**Opinions**
Children's preferences	14	*P2: "We act according to the children's desires. We buy whatever the children want. Our daughter wants dolls, and our son wants electric remote-controlled cars."* *P 1: "In reality, we buy whatever they want. They don't like what I buy anyway. Our son wants cars and marbles, and my daughters want dolls, toys like watches, and hairbrushes for their rooms."* *P 23: "We consider cognitive development, manual dexterity, overall development, age, and their own preferences."*
Quality	12	*P 18: "We buy what they want; they don't like it when we buy for them. We try to buy quality toys. Since we have a son, we get cars, balls, and bicycles."*
Spouse's opinion	9	*P 13: "My child actually wants a real cat or dog, but my spouse doesn't allow it."*
Impact on development	6	*P 12: "I generally prioritize their developmental levels."*
Cognitive development	4	*P 23: "We consider cognitive development, manual dexterity, overall development, age, and their own preferences."*
Ability to play	2	*P 15: "We used to buy cars, Legos, and puzzles."*
Age	2	*P 19: "Age is an important factor for me."*
Place of purchase	2	*P 5: "We used to buy them from the local market. They are still around; my siblings have them now."*
Non-harmfulness to health	1	*P6: "We evaluate if it's healthy and its materials from a health perspective. We consider their preferences. When I say I'm going to buy something, we don't buy things that are harmful, violent, or divisive."*

Findings on the Contribution of Toys to Child Development

Parents were asked about the contributions of the toys they purchased for their children to their children's development, and the responses are provided in Figure 2.

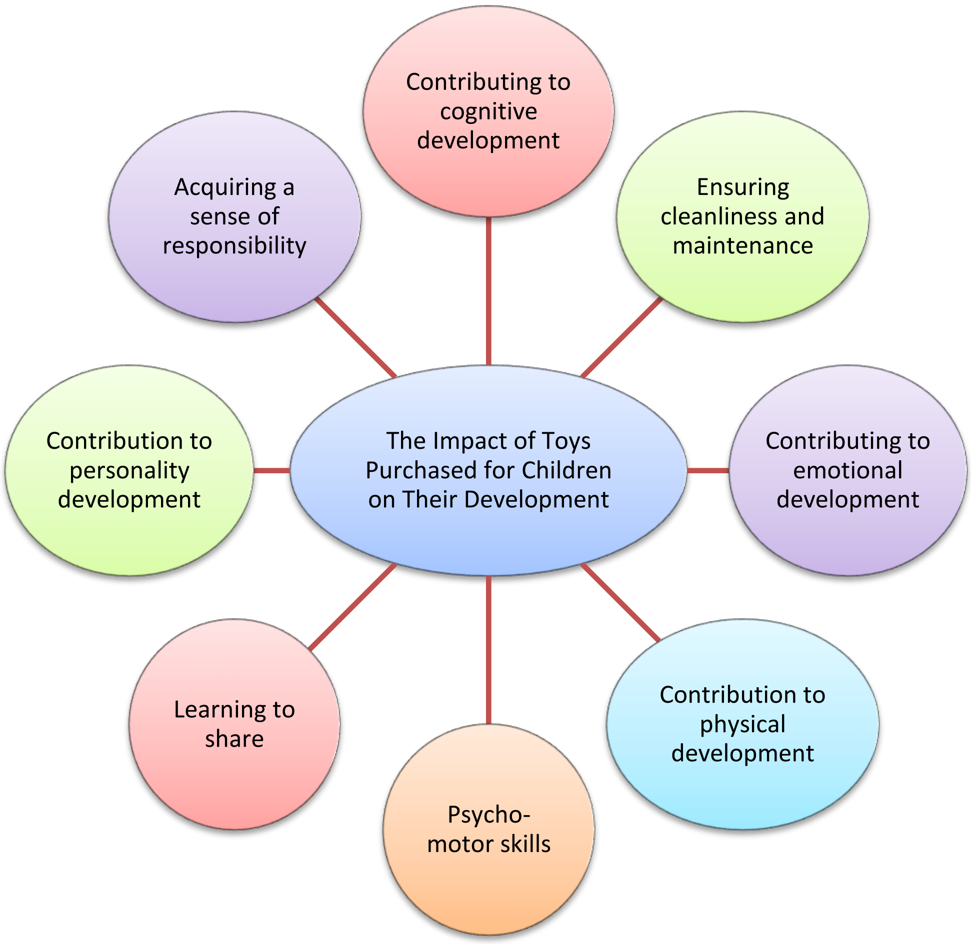

Figure 2. Contributions of Toys Purchased by Parents to Child Development.

According to Figure 2, parents believe that the toys they have purchased contribute to their children in terms of cognitive development, cleanliness and maintenance, emotional development, physical development, psycho-motor skills, learning to share, personality development, acquiring a sense of responsibility, and cognitive development.

In this context, the statements made by parents are as follows:

Table 3.
Findings Regarding the Contributions of Toys to Child Development

Contributions	***f***	**Opinions**
Cognitive development	14	*P9: Brain games are beneficial for cognitive development, they enhance problem-solving skills and increase intelligence.*
Cleanliness and maintenance	8	*P5: Dressing up her dolls and doing their hair has been beneficial for her personal grooming and hair care skills.*
Emotional development	6	*P13: Choosing animal toys may have contributed to developing a love for animals.*

		P15: Electronic toys have been effective in encouraging my eldest to explore the electronics field, as he tries to disassemble and create things.
Physical development	6	*P7: Riding a bicycle contributes to physical development and muscle growth. He used to play with toy tractors and engage in farming activities, which also increased his knowledge.*
Responsibility	5	*P19: Playing games related to earning money might encourage them to take on the role of a household provider in the future.*
Skill acquisition	3	*P22: Playing with toy cars might have contributed to his interest in driving.*
Personality development	2	*P10: Personality development may have been influenced by toys. They are currently very sharing, good-natured, and gentle. Toys might have played a role.*
Sharing	1	*P16: Since my daughter is the only child, she learns to share and sees her dolls as siblings.*

Findings Regarding Games Played with Children

Parents were asked about the criteria they consider when playing games with their children, and the responses are provided in Figure 3.

Figure 3. Games Played by Parents with Their Children.

In Figure 3, it can be observed that parents prefer to play the following games with their children: Chess, Pretend play, Hide and seek, playing ball, Name-city, Computer games, Imitation games, Word generation, Jump rope Rock-paper-scissors, Playing in the playground, Dodgeball and Tag. In this context, parents have expressed the following statements.

Table 4.
Games Played by Parents with Their Children

The Games	**f**	**Opinions**
Chess	10	*P3: He enjoys playing chess a lot.*
Hide and seek	8	*P6: His greatest joy is playing hide and seek with me.*
Playing with a ball	8	*P8: We play outside, jump rope. We sit outside, and I wait while we play dodgeball. Nowadays, kids play computer games.*
Name-city	6	*P17: ... We used to play name-city-animal a lot with my daughter.*
Not playing games	5	*P21: We can't play much. We mostly focus on lessons, and I can only spend very little time when we have it. Computer games are in now. He plays computer games.*
Animal mimicry games	5	*P1: Usually, we all sit down, each person mimics an animal, and we know that. We play name-city. Word generation: creating a new word that starts with the last two letters.*
Word generation	4	*P22: Word generation: creating a new word that starts with the last two letters.*
Sibling rivalry game	3	*P23: We play sibling rivalry together.*
Rock-paper-scissors	2	*P8: My daughter likes to play rock-paper-scissors.*
Playground games	2	*P3: We used to play together at the playground. She would slide down, and she would say, 'Hold me,' and I would hold her.*
Playing house	1	*P4: From hide and seek to playing house, we made coffee and tea with toy sets, had meals, and played with her toys. We played with a ball.*
Jump rope	1	*P18: We play outside, jump rope. We sit outside, and I wait while we play dodgeball. Nowadays, kids play computer games.*
Dodgeball.	1	*P8: We play dodgeball*

Findings on the Contributions of Games

Parents were asked about the contributions of the games they played with their children and the answers are presented in Figure 4.

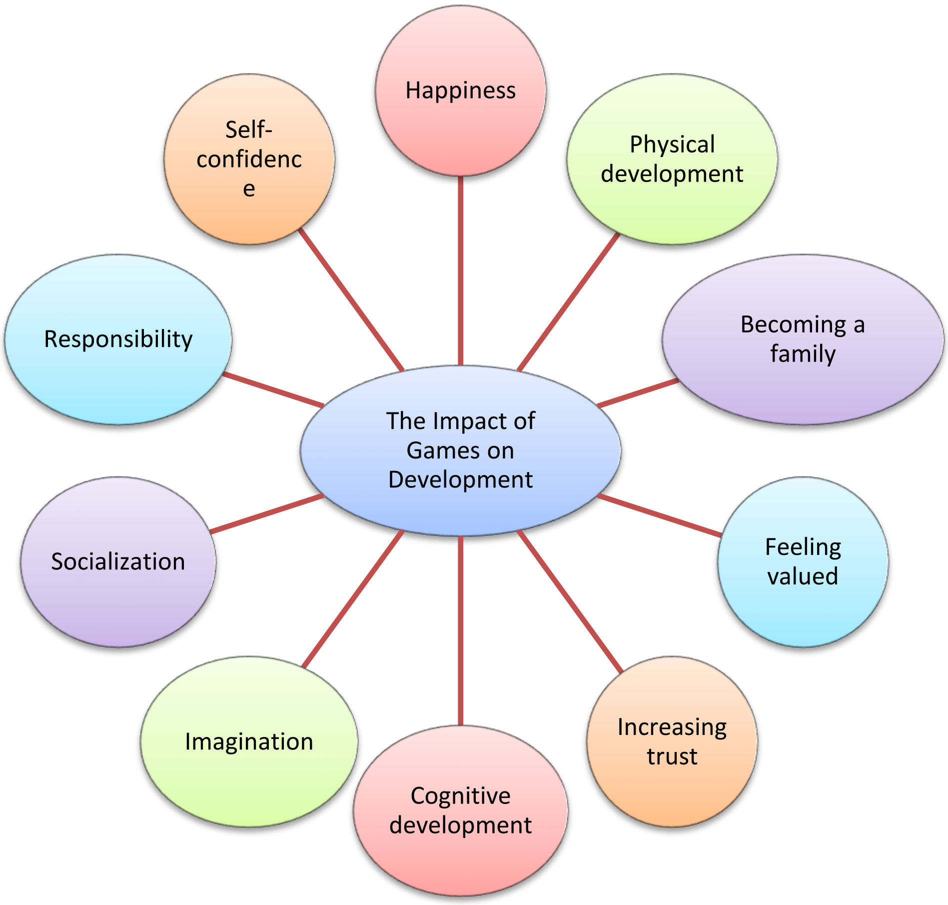

Figure 4. Contributions of Games to Child Development According to Parents.

According to Figure 4, parents have expressed that the games they play have contributions to various aspects of their children's development, including happiness, physical development, family bonding, feeling valued, increased trust, cognitive development, imagination, socialization, responsibility, and self-confidence. The following statements were made by parents in this context.

Table 5.

Contributions of Games to Child Development According to Parents

Contributions to development	**f**	**Opinions**
Happiness	14	*K3: Knowing that we are together as a family makes them happy. Allocating time for them makes them feel valuable. It strengthens the bond between us.* *K4: There is unity, the child feels safe, happy, and we spend quality time together. Love gets stronger, of course, they love more.*
Physical development	12	*K18: When we play together, they get happy, they feel better. There is physical development when jumping rope, playing with a*

		ball. I want to set boundaries for computer games. But since I'm here, they play until I come, it can be 3-4 hours, of course.
Becoming a family	8	*K4: There is unity, the child feels safe, happy, and we spend quality time together. Love gets stronger, of course, they love more. K3: Knowing that we are together as a family makes them happy. Allocating time for them makes them feel valuable. It strengthens the bond between us.*
Feeling valued	8	*K3: Knowing that we are together as a family makes them happy. Allocating time for them makes them feel valuable. It strengthens the bond between us.* *K16: She loves playing together, she gets upset if we don't. Since she's an only child, she loves being cared for. She gets happy psychologically when she receives attention. Rope and ball games improve hand-eye coordination.*
Trust	5	*K3: For example, my eldest daughter went to college, she still calls me and says, 'I'm going to the café with my friends,' she tells me everything. I know every detail; she doesn't hide anything. I think spending time with her was beneficial. It builds trust.*
Cognitive development	4	*K23: ... I think this game contributes to her math skills.*
Imagination	4	*K11: It develops her imagination. We describe animals in such a way that she tries to guess them. I think it increases their vocabulary. It contributes to her mathematical intelligence. For example, she thinks about 45-degree angles. If she doesn't know, she looks in her notebook or book. She goes outside to the park with her friends, plays ball, and helps her complete her physical or social development with her friends.*
Socialization	3	*K11: It develops her imagination. We describe animals in such a way that she tries to guess them. I think it increases their vocabulary. It contributes to her mathematical intelligence. For example, she thinks about 45-degree angles. If she doesn't know, she looks in her notebook or book. She goes outside to the park with her friends, plays ball, and helps her complete her physical or social development with her friends.*
Responsibility	3	*K5: My older child was very rule-oriented. He reads well now in the military academy. When I was young, I used to tell them, 'You'll come home at this hour in the evening.' It works with the older one, but it didn't have much effect on the younger one.*
Self-confidence	2	*K10: ..., they gained self-confidence. ..., they did things on their own, evaluated themselves, and increased their self-confidence.*

Discussion

According to the results, the children's preferences play a fundamental role in this process, and parents take care to cater to their children's interests. However, it can be said that this is not the sole variable. The quality of the toys, their suitability for the child's age and developmental level, the educational value of the game, and whether it is safe for health are also important factors. These results highlight that families actively play a critical role in supporting their children's development and that toy selection is a crucial factor in this process (Aksoy and Baran, 2017).

According to the findings obtained in the research, parents believe that toys contribute to their children's cognitive, emotional, and physical development. This reflects that parents do not see toys only as a means of entertainment but also evaluate them as tools that help their children develop skills and abilities (Özdil, 2008). Especially in early childhood, supporting learning processes through toys can help children acquire fundamental skills (Atalay, Ay, and Gültekin, 2016).

The research results emphasize the diversity of games parents play with their children. This indicates that parents respect their children's individual interests and needs and contribute to their versatile development through games (Uğur, 2018). Parents support their children's mental, physical, and emotional skills by interacting with them through different games. The positive effects of the game's parents play with their children are of great importance in terms of child development and education. Games can increase children's happiness, contribute to their physical and mental development, strengthen family bonds, and help them develop social skills (Demiriz and Ulutaş, 2016). These findings highlight the importance of emphasizing games in education and child development programs.

The findings indicate that parents establish an important bond when playing games with their children, and this interaction strengthens family bonds. These interactions can contribute to children feeling valuable and building trust (Orhan, 2019). The quality time parents spend with their children can help them develop emotional security and self-esteem.

Conclusion and Recommendations

This study aimed to determine the roles of parents regarding the games and toys that children play with. The following conclusions have been drawn from this study:

1. When parents buy toys for their children, they pay attention to their children's preferences, the quality of the toy, their partner's opinions, their children's developmental levels, whether it contributes to development, their fine motor skills, age, the toy store, and whether it is harmful to health.

2. Parents believe that the toys they have purchased contribute to their children's intellectual development, being clean and well-maintained, emotional development, physical development, developing a sense of justice, developing psychomotor skills,

learning to share, personality development, gaining a sense of responsibility, and cognitive development.

3. When looking at the games, parents prefer to play with their children, it is concluded that they play chess, hide and seek, ball games, name-city, computer games, imitation games, word generation, number guessing, okey, sibling rivalry, rock-paper-scissors, object storytelling, playing in the playground, playing house, jumping rope, dodgeball, three-in-a-row, riding a bicycle, and playing hairdresser games.

4. It has been concluded that the games parents play with their children have positive contributions such as making children happy, contributing to physical development, forming a sense of family, making them feel valuable, increasing trust in the family, cognitive development, improving imagination, boosting self-confidence, fostering a sense of responsibility, and promoting socialization.

These findings can offer some important recommendations to parents, educators, toy manufacturers, and researchers:

Recommendations for Parents

- *Pay attention to children's preferences:* Understanding children's toy preferences and respecting their desires supports their personal development.

- *Emphasize toy quality:* The quality, durability, and safety of toys are important. High-quality toys can be used for a longer time and can contribute more to a child's development.

- *Consider the child's developmental level:* Each child is different. Choosing age-appropriate toys for your child is important to meet their needs.

- *Evaluate the educational value of toys:* Consider how toys and games meet the educational needs of children. Educational toys and games can contribute to a child's learning process.

- *Interact with children:* Playing with children is not only about having fun but also about strengthening bonds. Playing with children can help them feel valuable.

Recommendations for Educators

- *Include games and toys in educational programs*: Educational programs in schools or preschools can include toys and games to support children's cognitive, emotional, and social development. This can provide students with active learning experiences.

- *Use games for educational purposes*: Teachers can use games not only as a means of entertainment but also as tools that help students develop specific skills. Games can be educational tools, especially in areas such as mathematics, language development, and problem-solving skills.

Recommendations for Toy Manufacturers

- *Develop educational toys:* Educational toys can enrich children's learning experiences. Designing such toys can provide products that contribute to child development.

- *Produce safe and durable toys:* The safety and durability of toys are important for both parents and children. Developing products that comply with quality standards is essential for long-term use.

Recommendations for Researchers

- *Conduct more research on child development and games:* More studies can be conducted on toy preferences and game interactions of parents and children in different age groups and cultures.

- *Design studies based on feedback from parents and children*: Parents and children should be encouraged to share their opinions about toy preferences and game interactions. This feedback can be valuable for developing better products and services.

About Author

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What Geographical Skills do the International Geography Olympiad Aim to Measure? A Content Analysis of iGeo Questions

***Eyüp Artvinli, **Leyla Dönmez**

Abstract. The aim of this research is to analyse the geography Olympiad questions organized between 1996-2022 according to main topics and geographical skills. The general qualitative research approach was used in the data collection phase of the research. The geography Olympiad questions organized between the years 1996-2022, which constitute the data sources, were decoded with descriptive analysis technique. In this research, the questions belonging to the 18 years that constitute the data sources were examined and analysed. While analysing the data sources of the research, attention has been paid to main topics and geographical skills are the determining element. It is found that iGeo questions aim to develop Spatial Analysis and Interpretation, Map Skills, Geographic Information Systems (GIS), Data Interpretation and Analysis, Fieldwork and Observation, Critical Thinking and Problem-Solving, Cultural and Human Geography Skills, Environmental Analysis and Sustainability. It can be suggested that content of geography curriculums and courses are designed to aim these geographical skills to educate students for their future jobs.

Keywords. Geographical Skills, iGeo Questions, Geography Olympiad, Main Topics in Geography.

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One of the most important phases of learning geography for a teacher is to find out if the students learn or how much did they learn. We have a constant need to measure, analyse, and make decisions, yet we need to ask if we are assessing or evaluating. Both assessment and evaluation are important aspects of education—they are central to learning and teaching (Kidman Chang, 2022). To find the answer we need to ask right questions for students. This phase of teaching geography can be seen the latest stage of learning process. Finding out if someone has learnt what you intend for them to learn remains a key issue in geography education (Chang, Seow, 2018). Thus, geographical educators should ask "How do we know that the learners have learnt? What is the evidence of learning/assessment?" (Chang, Wu, Seow, Irvine, & 2018).

> An international assessment of students' use of geographic information, facts, concepts, processes, and models is necessary to reveal how geography is understood and practised by students within diverse global contexts. This is important because no single country can resolve issues, such as global climate change, facing the world's people, places, and environments (Solem, Stoltman, Lane, Bourke, Chang, & Viehrig, 2018).

In this context, the International Geography Olympiad (iGeo) is considered in most of international geography community in the world one of the most important activities to measure and assess the students' learning geography in international dimension. iGeo is a prestigious competition that brings together young geographers from around the world to test their knowledge, skills, and passion for geography. This annual event challenges participants with a diverse range of questions that require a deep understanding of geographical concepts and the application of various geographical skills. In this article, we will conduct an analysis of iGeo questions, categorizing them according to the main topics and geographical skills they assess and highlighting the importance of these skills in fostering geographic literacy. Geography educators from different countries report that the content of the tests of the Olympiad contribute positively to the debate about the importance of geography as a secondary school subject (Van der Schee, 2012).

For geography teachers and geographers in education, the International Geography Olympiad can be an important platform for an international discussion about the quality of geographical education worldwide (Van der Schee, 2007). The International Geography Olympiad (iGeo) is an annual competition for the best 16- to 19-year-old geography students from all over the world. Students chosen to represent their countries are the very best, chosen from thousands of students who participate enthusiastically in their own National Geography Olympiads. The iGeo consists of three parts: a written test, a multimedia test and substantial fieldwork requiring observation, leading to cartographic representation and geographical analysis. The programme also includes poster presentations by teams, cultural exchanges, and time for students to get to know their fellow students and explore the host city (The International Geography Olympiad (iGeo), 2022). This prestigious event challenges students with a wide range of questions that delve into the intricacies of our planet and its diverse landscapes. Participation in the international geographical Olympics is for high school students an opportunity to test both their skills and knowledge against their peers from around the world, as well as a great opportunity to get to know the exotic corners of the planet and to confront their theoretical knowledge of the geographical reality (Osuch, Kurek, 2014). The Olympiad exercises typically entail fieldwork, mapwork, data collection, analysis, and interpretation and, although not necessarily covered explicitly, issues of global environmental change, human-environment interactions, and sustainability are frequently included (Meadows, 2020). On the other hand, Edelson et al. (2013) argue that the primary purpose of educational assessment should be for making informed decisions. Because they typically regard assessment as a separate activity from instruction, educators, students, parents, and policy makers often overlook invaluable ways assessments can support and improve teaching and learning (Edelson et al., 2013).

iGeo competition comprises a series of written tests, fieldwork exercises, and multimedia tasks designed to assess students' geographical knowledge, analytical abilities, and problem-solving skills. These assessments are not just about determining winners; they serve as a testament to the intellectual curiosity and dedication of the participants. iGeo also serve to development of own geography national Olympiads of countries and their geographic literacy (Wei, Yang, & Wang, 2014; Chang, Huang, & Tsaur, 2019; Songnui, 2020; Pospisil, 2020). Lane and Bourke (2017) also concluded that the International Geography Olympiad is a valid and reliable assessment that could be used to establish an international benchmark of geographical literacy. Many tasks from the Olympiad are used in classroom work to diversify the teaching-learning process. Therefore, the Geography Olympiad is a development engine not only for students but also for school geography in general (Liiber & Roosaare, 2007; Min & Dongying, 2007). Promotion of the Geography Olympiad is one way to revitalize geography education in Japan and is an opportunity for the exam takers to significantly upgrade their geography skills (Izumi, Iwamoto, 2017). In addition, Dóra, Gábor, and András (2018) from Hungary.

> "We examine these factors through the lens of a special group, namely students who have grown up in the Hungarian education system but have participated also in domestic and international iGeo (International Geography Olympiad) competitions. Broad experiences from students and their

preparation team can enable us to identify the most important differences between international and Hungarian systems and highlight the direction which Hungarian geography should go, from a traditional, fact-based lexical subject to a problem-based and skill-oriented subject. This new type of geography can improve the critical thinking of students and their ability to synthesize information instead of learning facts which they can easily access on the internet. This is an important step to reevaluate geography's role and provide concrete steps for the adaptation process (Dóra, Gábor, and András, 2018)."

The Relevance of Geographical Skills Beyond iGeo Questions

Geography is a multidisciplinary field that encompasses a wide range of skills essential for understanding the Earth's physical and human systems. Geography's assessment for learning should have its benchmark in international tests that combine the knowledge and skills that are related to the contemporary issues on planet Earth of today and tomorrow (Van der Schee, Nott́eband, Zwartjes, 2010). These skills form the foundation of geographic literacy and are crucial for addressing global challenges, making informed decisions, and appreciating the complexity of the world around us (Artvinli, 2010, 2012, 2020; Seiichi, 2017). While the International Geography Olympiad serves as a platform to showcase the talents of young geographers, the skills honed through the competition extend far beyond its boundaries. For example, more than 100 of the winners of All-Russian Geography Olympiad have graduated from universities with the 'red' Diploma (with honors). More than a dozen of them have already become PhDs in Geography (Naumov, 2007).

International Geographical Union (IGU) as a responsible body, with an interest in young geographers and a commitment to the international Olympiad as a bridging device for those interested in using Geography in their careers (Chalmers, Berg, 2014). Geographical skills are applicable in a wide range of academic and professional pursuits:

Higher education. Many iGeo participants go on to pursue degrees in geography, environmental science, urban planning, and related fields. The skills they acquire in the competition provide a strong foundation for their academic journeys.

Research and innovation. Geographical skills are essential for conducting research in areas such as climate science, urban studies, and natural resource management. They enable researchers to analyse data, create models, and propose solutions to complex problems.

Environmental advocacy. Geographers with strong environmental analysis and sustainability skills are well-equipped to advocate for conservation and responsible resource management. They play a vital role in protecting ecosystems and raising awareness about environmental issues.

Urban planning and development. The ability to interpret urban landscapes and propose sustainable urban development strategies is crucial in the field of urban planning. Geographical skills help planners make informed decisions about infrastructure, transportation, and land use.

Public policy and governance. Geographers contribute to public policy by providing data-driven insights and recommendations. Their skills in data analysis, critical thinking, and problem-solving are highly valued in government agencies and international organizations.

Global citizenship. Geography equips individuals with a global perspective and an understanding of the interconnectedness of our world. Geographical skills foster global citizenship, encouraging individuals to engage with global issues and advocate for positive change.

The Diversity of iGeo Questions

One of the most striking aspects of the iGeo questions is their diversity. Geography, as a multidisciplinary field, encompasses a wide range of topics, and the questions in the competition reflect this breadth. The International Geography Olympiad is not just a competition; it is a celebration of geography. The questions presented at iGeo serve as a testament to the depth and diversity of the field. They inspire young geographers to explore the world with curiosity, analyse its complexities with precision, and envision a future where geographic knowledge contributes to a sustainable and harmonious global society.

As we analyse the questions of the International Geography Olympiad, we recognize the profound impact this competition has on nurturing the next generation of geographers. It encourages them to see the world through a geographical lens, equipping them with the skills and perspectives needed to address the pressing challenges of our time. The iGeo questions challenge participants to think critically, analyse data, and propose solutions to real-world problems, mirroring the work of professional geographers.

Moreover, the International Geography Olympiad fosters global connections among young geographers. Participants come from diverse cultural backgrounds, representing a tapestry of perspectives. This international exchange of ideas not only enriches their understanding of geography but also promotes cross-cultural understanding and collaboration—a valuable skill in our interconnected world.

For educators and geography enthusiasts, the iGeo questions offer a treasure trove of thought-provoking scenarios and topics. They serve as an excellent resource for sparking discussions, conducting classroom activities, and deepening one's own geographic knowledge.

The questions of the International Geography Olympiad represent a testament to the vibrancy and relevance of geography as a discipline. They challenge young minds to explore the world's complexities, promote critical thinking, and inspire a commitment to global sustainability. As participants embark on their journeys through these questions, they emerge not only as skilled geographers but also as responsible global citizens who appreciate the beauty and significance of our planet. The iGeo questions, in essence, pave the way for a brighter and more geographically aware future, one where our understanding of the world is continually enriched through exploration, analysis, and appreciation of its diverse landscapes and cultures.

The International Geography Olympiad, which occupies an important place among the studies of the IGU-International Geographical Union, is held in the form of a competition of teams of 4 students selected because of the national competitions of the participating countries. Each participating country is represented by 4 students and 2 team leaders. Students compete individually in the Olympiads, which are open to students studying at the high school level. The country ranking is determined by the sum of the individual achievement scores of the students. The competition takes place in three stages. Up until 2012, the Olympiads were held every two years and after that it was decided to organise every year by IGU.

The aims of the Olympiad are to:

- Stimulate active interest in geographical and environmental studies among young people.
- Contribute positively to debate about the importance of geography as a senior secondary school subject by drawing attention to the quality of geographical knowledge, skills, and interests among young people.
- Facilitate social contacts between young people from different countries and in doing so, contribute to the understanding between nations.

There are three sub-dimensions of this research. The first of these is the written test part of the competition, which consists of open-ended questions. The second part of the division consists of multimedia questions. The last part of the study consists of field study questions. The questions of the competition, which are examined in three sub-dimensions according to the years, have been analysed according to sub questions below:

1. Which geographical topics are included the mostly in iGeo questions?
2. Which geographical/other skills are aimed to measure in iGeo questions?

Method

Research Model

This research occurs in a qualitative pattern. Qualitative research can be defined as research in which qualitative data collection methods are used, such as observation, interview, and document analysis; and a process is followed for the realistic and holistic presentation of perceptions and events in a natural environment (Yıldırım and Şimşek, 2016, p. 45). Research data was obtained through document analysis, which is a qualitative research method covering the analysis of written materials containing information about facts and events (Wachter, 2010).

In this study, research data was collected by document analysis technique and the data was analyzed by content analysis. Content analysis is defined as "the systematic reading of a body of texts, images, and symbolic matter, not necessarily from an author's or user's perspective" (Wachter, 2010).

Data Analysis. The process of data analysis is the process of exporting the meaning of data. Document analysis is a systematic procedure for reviewing or evaluating documents both printed and electronic (computer-based and internet-transmitted) material. Like other analytical methods in qualitative research, document analysis requires that data be examined and interpreted to elicit meaning, attainment understanding, and develop empirical knowledge (Yıldırım and Şimşek, 2016).

Before coding was performed in the study, studies were conducted on the validity and reliability of the study. The content validity of the data collection tool has been redeveloped in accordance with the review of a training program expert specializing in field education, and it has been decided that it is suitable for the purpose of the study.

Document analysis is a qualitative research method used to analyse the content of written documents rigorously and systematically (Wach, 2013). It is a systematic method used to examine and evaluate all documents, including printed and electronic materials. Like other analytical methods in qualitative research, document analysis requires that data be examined and interpreted to elicit meaning, gain understanding, and develop empirical knowledge (Corbin and Strauss, 2008).

The decoders were examined separately by a field Specialist Researcher and expert for reliability. The formula developed by Miles and Huberman (1994) for the reliability calculation of the work was conditioned to work. Reliability=Consensus / (Consensus + disagreement) according to the calculation, the reliability of the research was found to be 94%. The fact that this ratio is more than 70% indicates that the study is reliable (Miles and Huberman, 1994).

Selecting a sample from data. A criteria sampling method was preferred to objective sampling methods when determining a research sample.

Category development. At this stage, it was looked for geographical skills included in the literature review were analysed through iGeo questions.

Defining an analysis unit. Depending on the purpose of this study, main geographical skills in the literature were associated with the achievements and geographical skills were categorized in the iGeo Olympiad questions.

Digitization. The data collected in accordance with the categories, units and attainments of analysis determined in the study were considered separately in each size and in accordance with the geographical skills.

Findings

In this phase, after content analysis of 18 years iGeo questions, it is found that they focused on these skills: Spatial Analysis and Interpretation, Map Skills, Geographic Information Systems (GIS), Data Interpretation and Analysis, Fieldwork and Observation, Critical Thinking and Problem-Solving, Cultural and Human Geography Skills, Environmental Analysis and Sustainability.

Geographical Topics Included the Mostly in iGeo Questions

The International Geography Olympiad (iGeo) is a prestigious competition that tests the knowledge, skills, and passion of young geographers from around the world. As participants dive into the challenging questions of iGeo, they encounter a diverse array of topics that encompass the rich tapestry of our planet's geography. In this sub-problem, it is embarked to explore the main topics of iGeo questions, offering insights into the multifaceted world of global geography. After the document analysis it is found that participants are challenged to explore:

Physical geography. Questions related to the Earth's physical features, including landforms, climate patterns, geological processes, and ecosystems. These questions test students' understanding of the natural world and their ability to analyse environmental phenomena. Physical geography forms the bedrock of iGeo questions, as it delves into the Earth's natural features and processes. Participants are often presented with questions related to:

Landforms: Questions may explore the origins and characteristics of landforms such as mountains, plateaus, and valleys. Participants must analyse the forces that shape the Earth's surface.

Climatology: Climate-related questions investigate weather patterns, climate zones, and the factors influencing climate change. Understanding climatology is crucial for comprehending global weather phenomena.

Biogeography: Biogeographical questions examine the distribution of plant and animal species across the planet. Participants analyse ecosystems, biodiversity, and the impact of human activities on the natural world.

Geological Phenomena: Geology-related questions may cover topics such as earthquakes, volcanoes, and tsunamis. Participants must grasp the geological processes that lead to these events.

Human geography. Inquiries into the human dimensions of geography, such as population dynamics, urbanization, cultural diversity, and geopolitical issues. These questions assess students' knowledge of human societies and their impact on the environment. Human geography questions invite participants to navigate the complex world of human societies, cultures, and interactions. Key topics include:

Population Geography: Questions may focus on population distribution, growth, migration patterns, and demographic trends. Participants analyse the factors that influence human population dynamics.

Urbanization: Urban geography questions explore the growth of cities, urban planning, and the challenges of urbanization. Participants delve into the complexities of urban life and development.

Cultural Geography: Cultural questions delve into the diversity of cultures, languages, religions, and traditions around the world. Participants gain insights into the cultural tapestry of humanity.

Economic Geography: Economic questions investigate global trade, resource distribution, economic systems, and development disparities. Participants analyse the economic forces shaping our interconnected world.

Geopolitics. Geopolitical questions immerse participants in the realm of international relations and global affairs. Topics include:

Political Geography: Political questions examine the borders, territories, and geopolitical conflicts between nations. Participants gain insights into the ever-changing political landscape.

Geopolitical Conflicts: Participants may be tasked with analysing specific geopolitical conflicts, their historical contexts, and their implications on regional and global stability.

International Organizations: Questions related to international organizations explore the roles and functions of entities like the United Nations, NATO, and the European Union in shaping global geopolitics.

Geopolitical questions challenge participants to unravel the complexities of international relations, fostering a deeper understanding of the forces that shape the world.

Environmental Issues. Environmental questions in iGeo focus on the critical challenges facing our planet. Topics include:

Climate Change: Participants analyse the causes, impacts, and potential solutions to climate change, including its effects on ecosystems and human societies.

Conservation and Sustainability: Questions may explore conservation efforts, sustainable resource management, and strategies for preserving biodiversity.

Environmental Hazards: Participants are tasked with evaluating environmental hazards such as pollution, deforestation, and natural disasters, and proposing mitigation measures.

Ecosystems and Biomes: Questions delve into the characteristics and importance of Earth's diverse ecosystems and biomes.

Environmental questions prompt participants to engage with pressing global issues, encouraging them to consider their role as stewards of the planet.

Cultural Landscapes. Cultural landscapes represent the fusion of human culture and the natural environment. Topics include:

Historical Landscapes: Participants may examine historically significant landscapes, including archaeological sites, ancient cities, and cultural heritage sites.

Sacred Places: Cultural geography questions may explore sacred or religious sites, their significance, and their cultural impact.

Cultural Land Use: Questions often investigate how human cultures have shaped the landscape through agriculture, architecture, and urban planning.

Cultural landscape questions take participants on a journey through time and space, revealing the profound ways in which human societies have left their mark on the Earth.

Geographical techniques. Assessments that gauge students' proficiency in using geographical tools and techniques. This includes map interpretation, spatial analysis, and the use of geographic information systems (GIS). Maps and Cartography: Participants are challenged to interpret and create maps, understand map projections, and use cartographic techniques effectively.

Geographic Information Systems (GIS): GIS-related questions may involve data analysis, spatial modelling, and the application of GIS technology to solve real-world problems.

Data Interpretation: Questions often require participants to interpret data, graphs, and charts related to geographic phenomena.

Regional studies. Questions that delve into specific regions or countries, requiring students to apply their geographical knowledge to analyse regional challenges, opportunities, and dynamics.

Sustainability and global challenges. Inquiries related to pressing global issues, including climate change, resource management, and sustainable development. These questions challenge students to think critically about the future of our planet.

Geographical Skills Aimed in IGeo Questions

The International Geography Olympiad (iGeo) assesses a wide range of geographical skills through its questions. These skills are fundamental to understanding and analysing geographic phenomena. Here are the findings of document analysis by the researchers for the key geographical/other skills aimed in iGeo questions according to analysed previous questions:

Spatial analysis and interpretation. Spatial analysis is the ability to examine and interpret spatial data, such as maps, satellite images, and geographic coordinates. Questions in this category often require participants to:

- Analyse maps to identify geographic features, patterns, and trends.
- Interpret satellite imagery to understand land use, environmental changes, or urban development.
- Calculate distances, areas, or densities using geographical coordinates.

- Participants are required to analyse maps, satellite imagery, and other spatial data to identify patterns, trends, and relationships.
- They must demonstrate an understanding of spatial concepts such as scale, distance, direction, and location.
- This skill enables participants to make sense of spatial information, identify geographic features, and draw conclusions from maps and imagery.

To further illustrate the connection between this skill and iGeo questions, let's explore a few examples from previous competitions. These questions highlight how specific skills are tested and their real-world relevance:

- Question: Participants are presented with a map showing vegetation distribution in a region. They are asked to analyse the map and explain the factors contributing to the observed patterns.
- Skill Emphasized: Spatial analysis and interpretation.
- Real-World Relevance: This skill is vital for understanding environmental patterns and helping make decisions related to land use, agriculture, and conservation.

Map skills. Map skills involve the creation and interpretation of maps. It is found that iGeo questions in this category challenge participants to:

- Design thematic maps that represent geographic data effectively.
- Interpret map legends, scales, and symbols to extract information.
- Identify distortions in different map projections and their implications.

Map skills are fundamental for geographers, as maps are powerful tools for communication, navigation, and conveying complex spatial information. To further illustrate the connection between this skill and iGeo questions, let's explore a few examples from previous competitions. These questions highlight how specific skills are tested and their real-world relevance:

- Question: Participants are given a map with multiple layers of information, including topography, land use, and transportation networks. They are asked to design a new map that highlights specific aspects while maintaining clarity.
- Skill Emphasized: Map skills.
- Real-World Relevance: The ability to create effective maps is crucial in fields such as urban planning, disaster management, and transportation logistics.

Geographic information systems (GIS). GIS skills involve the use of Geographic Information Systems, which are computer-based tools for analysing, managing, and visualizing geographic data. iGeo questions related to GIS ask participants to:

- Perform spatial analyses using GIS software.
- Create thematic maps with GIS applications.
- Questions often involve the use of GIS software or concepts to analyse geographic data.
- Participants may be asked to perform spatial analyses, create thematic maps, or solve real-world problems such as urban planning or environmental assessment using GIS.
- Proficiency in GIS is increasingly important for geographers and professionals in various fields.

Proficiency in GIS is increasingly important in modern geography, as it enables geographers to explore complex spatial relationships and make data-driven decisions. To further illustrate the connection between this skill and iGeo questions, let's explore a few examples from previous competitions. These questions highlight how specific skills are tested and their real-world relevance:

- Question: Participants receive a dataset containing population density, land cover, and climate information for a region. They are tasked with using GIS software to analyse the data and propose strategies for sustainable development.
- Skill Emphasized: GIS skills.
- Real-World Relevance: GIS proficiency is essential for addressing complex spatial problems, including urban growth, environmental conservation, and disaster response.

Data interpretation and analysis. Geographical data interpretation and analysis skills require participants to make sense of numerical and statistical information related to geography. iGeo questions in this category involve:

- Analysing population data to identify demographic trends.
- Interpreting climate data to understand weather patterns and climate change.
- Evaluating statistical information to draw conclusions about environmental phenomena.

- They must analyse and interpret data to draw conclusions and make inferences.
- Data interpretation and analysis skills are crucial for understanding geographic patterns and trends.

These skills are vital for geographers, as data analysis plays a crucial role in understanding geographic patterns and making informed decisions. To further illustrate the connection between this skill and iGeo questions, let's explore a few examples from previous competitions. These questions highlight how specific skills are tested and their real-world relevance:

- Question: Participants are provided with demographic data for a city over several decades. They must analyse the data to identify trends in population growth, migration patterns, and age distribution.
- Skill Emphasized: Data interpretation and analysis.
- Real-World Relevance: These skills are valuable for understanding demographic shifts, informing public policy, and addressing social and economic challenges.

Fieldwork and observation skills. Fieldwork and observation skills involve conducting on-site investigations and collecting primary data in the field. Questions in this category require participants to:

- Questions may require participants to describe and analyse geographic features or phenomena observed during fieldwork or in photographs.
- Propose hypotheses and conduct experiments or surveys to gather data.
- Evaluate the accuracy and reliability of field-collected data.
- They must use fieldwork experience to provide detailed and accurate descriptions.
- Fieldwork and observation skills are vital for conducting on-site investigations and collecting primary data.

Fieldwork and observation skills are essential for geographers to gain firsthand experience and gather valuable data for research and analysis. To further illustrate the connection between this skill and iGeo questions, let's explore a few examples from previous competitions. These questions highlight how specific skills are tested and their real-world relevance:

- Question: Participants are given a set of photographs taken during a field expedition to a coastal area. They must describe the geographic features observed, including landforms, vegetation, and human impact.
- Skill Emphasized: Fieldwork and observation.
- Real-World Relevance: Fieldwork skills are essential for conducting environmental assessments, ecological studies, and land-use planning.

Critical thinking and problem solving. A fundamental aspect of the iGeo questions is their emphasis on analytical and critical thinking. Participants are not merely expected to regurgitate facts; they are encouraged to analyse data, synthesize information, and draw informed conclusions. The questions often present complex scenarios and require students to apply their geographical knowledge to propose solutions or interpretations. For example, participants might be presented with a map showing temperature anomalies and asked to explain the potential implications of these anomalies on local ecosystems. Or they may need to analyse demographic data to identify trends and challenges in a specific region. iGeo questions focus on these skills ask to participants:

- Evaluate the potential impacts of human activities on the environment.
- Assess the ethical and social implications of geographic issues.
- Participants are challenged to think critically about complex geographic issues.
- They must analyse scenarios, propose solutions, and evaluate potential outcomes.
- Critical thinking and problem-solving skills are essential for addressing real-world challenges.

These skills enable geographers to address pressing global challenges, such as climate change, resource management, and social justice. To further illustrate the connection between this skill and iGeo questions, let's explore a few examples from previous competitions. These questions highlight how specific skills are tested and their real-world relevance:

- Question: Participants are presented with a case study of a city facing water scarcity due to climate change. They are asked to assess the challenges, propose solutions, and consider the social and environmental implications.
- Skill Emphasized: Critical thinking and problem-solving.

- Real-World Relevance: These skills are crucial for addressing complex global issues, such as climate change adaptation and resource management.

Cultural and human geography skills. Cultural and human geography skills focus on understanding human societies, cultures, and their interactions with the environment. Questions in this category involve in iGeo:

- Analysing cultural landscapes and their evolution.
- Exploring the distribution and characteristics of human populations.
- Evaluating the social and economic factors influencing urbanization and migration patterns.
- Questions may focus on human geography topics, including population distribution, migration, urbanization, and cultural landscapes.
- Participants must analyse social, economic, and cultural factors that influence human activities and patterns.
- Cultural and human geography skills provide insights into human-environment interactions.

These skills provide insights into the complexities of human-environment interactions, helping geographers understand and address issues related to globalization, cultural diversity, and social change. To further illustrate the connection between this skill and iGeo questions, let's explore a few examples from previous competitions. These questions highlight how specific skills are tested and their real-world relevance:

- Question: Participants are given a scenario involving cultural diversity and urbanization in a specific region. They must analyse the factors influencing cultural change and urban development.
- Skill Emphasized: Cultural and human geography skills.
- Real-World Relevance: Understanding cultural dynamics and their impact on urbanization is essential for promoting social cohesion and sustainable urban development.

Environmental analysis and sustainability. Environmental analysis and sustainability skills encompass the assessment of environmental issues and the development of sustainable solutions. iGeo questions related to these skills require participants to:

- Evaluate the impact of human activities on ecosystems and natural resources.

- Propose strategies for environmental conservation and sustainable development.
- analyse case studies of environmental challenges and their solutions.
- Participants may be asked to evaluate environmental issues, assess the impacts of human activities on ecosystems, and propose sustainable solutions.
- They must consider the long-term well-being of the environment and its resources.
- Environmental analysis and sustainability skills are vital for addressing environmental challenges.

These skills are crucial for geographers to contribute to the protection of the environment and the promotion of sustainable practices. To further illustrate the connection between this skill and iGeo questions, let's explore a few examples from previous competitions. These questions highlight how specific skills are tested and their real-world relevance:

- Question: Participants are provided with data on air quality, water pollution, and land degradation in an industrial area. They are tasked with evaluating the environmental risks and proposing strategies for sustainable industrial practices.
- Skill Emphasized: Environmental analysis and sustainability.
- Real-World Relevance: These skills are critical for addressing environmental challenges, ensuring sustainable resource use, and minimizing ecological impacts.

Conclusion and Discussion

According to Eraslan (2009), there are four main factors that affect student success in such international competitions. These are (1) teacher training program, (2) traditional school life, (3) cultural perspective on the teaching profession and (4) in-service teacher training. First, it is important to compare these main problematic points to find the differences of such competitions results between countries. Those four phases should be supported in a country to develop the quantity of education's results. If one of them or most of them are weak in a country, it can be hard to develop the content of the education in that country. One of the main problematic points is the teacher training program for measure to student success in some countries (Pınar, 2011).

In this research, it is found that iGeo questions were produced during the last 18 years focus on these skills:

1. Spatial Analysis and Interpretation,
2. Map Skills,
3. Geographic Information Systems (GIS),
4. Data Interpretation and Analysis,
5. Fieldwork and Observation,
6. Critical Thinking and Problem-Solving,
7. Cultural and Human Geography Skills,
8. Environmental Analysis and Sustainability.

These skills can be found in a similar content in the literature. The International Geography Olympiad serves as a testament to the importance of geographical skills in fostering geographic literacy and understanding our world. Geography curriculums around the world also aim to develop geography skills of students (Ministry of National Education (MoNE), 2018). Through a diverse array of questions, the competition challenges participants to apply spatial analysis, cartographic, GIS, data interpretation, fieldwork, critical thinking, cultural and human geography, and environmental analysis skills. According to Winter, Berg (2007) it does appear that the fieldwork experiences of the Olympiads are meeting the needs of the participants and they want more of it.

On the other hand, many countries use the result of iGeo to evaluate end develop their own teaching of geography in their countries (Izumi, 2015). For example, according to Barwiński, Sawicki, Uroda (2014) and Podgórski, Charzyński, Zaparucha (2016) the International Geography Olympiad is also a way of comparing the results of teaching geography in the Polish educational system with that of other countries. Given the results achieved by Polish students, this comparison is very positive and gives cause for optimism. Polish youth and the teaching of geography in Polish schools may be viewed more positively and optimistically because of the national and international Geography Olympiads. iGeo also helped the development of students' high-level thinking skills were observed by researchers from the results of tests on geography by the syllabus of the national science Olympics in geography (Wijayanto, Susetyo, Nofrion, 2020) as most of the iGeo questions focus on the higher order thinking skills (Artvinli, Dönmez, 2022).

As educators and learners, we should recognize the value of these skills and continue to emphasize their development in geography education. By nurturing the next generation of geographers with strong geographical skills, we empower them to address the complex challenges of our rapidly changing world and contribute to a more informed, sustainable, and interconnected global society. To develop these geographical skills in students, the same skills need to be developed in teacher candidates. For example, in the book exam for those who want to become teachers in Finland, students' skills in researching information, thinking critically, distinguishing between relevant and irrelevant information, forming their own opinions, defending, and synthesizing are measured (Eraslan, 2009). In this context, the teaching styles of geography teachers are also of particular importance (Artvinli, 2010). Moreover, these skills of students are transferable and applicable in various academic and professional fields. Students who develop strong geographical skills can excel in careers related to urban planning, environmental management, international relations, data analysis, and more.

The analysis of iGeo questions according to geographical skills underscores the significance of incorporating these skills into geography education. Geographic literacy goes beyond memorizing facts and figures; it equips students with the ability to analyse complex spatial information, make informed decisions, and engage in critical thinking about global issues. A well-developed international test may help to draw more attention to the importance of geography and good geography teaching, especially if it is combined with research not only in the field of assessment of learning but also in the field of assessment for learning (Van der Schee, Kolkman, 2010).

The analysis of iGeo questions according to geographical skills reinforces the idea that these skills are the backbone of geographic literacy and problem-solving in our ever-changing world. Geography educators and enthusiasts should recognize the intrinsic value of these skills and continue to integrate them into the curriculum.

In doing so, we not only prepare the next generation of geographers but also equip them with the tools to understand, analyse, and address the pressing challenges facing our planet—from climate change and urbanization to cultural diversity and environmental sustainability. Geographical skills, as demonstrated through iGeo questions, are not just academic exercises; they are a pathway to informed citizenship and a more geographically literate, interconnected global society.

Recommendations

For students, the iGeo questions exemplify the vast potential of geography as a field of study and a career choice. They reveal the excitement of exploring diverse landscapes, cultures, and environmental phenomena. Beyond the competition, geography education nurtures critical thinking, spatial reasoning, and an appreciation for the planet's intricacies. It equips young minds to contribute meaningfully to society, whether as environmental advocates, urban planners, or global policymakers.

Educators can draw inspiration from the iGeo questions to design engaging lessons that cultivate geographic literacy and stimulate curiosity. These questions provide a blueprint for fostering a sense of wonder about the world and encouraging students to become active participants in its exploration. To do this, educator should focused on these main skills of iGeo in the past.

For lifelong learners, the questions of the International Geography Olympiad offer a wealth of opportunities to delve into the complexities of our planet. They provide a window into the evolving field of geography, where digital tools, ethical considerations, and global challenges shape the way we understand and interact with the world.

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Examining YouTube Videos with Counting and Numbers Content for Preschool Children

***Şeyma Şengil Akar**

Abstract. Children, who are introduced to technology as soon as they are born, have access to internet-based videos as young as one year old. These colourful, animated cartoon/animation content supported by songs have turned into informal learning tools for children. Some of these videos, which families do not hesitate to present as educational content, are math videos. These videos reach millions of views. These videos with mathematical content prepared for children, mostly shared with the label of children's songs, are the subject of this study. In this study, we focused on Turkish number and counting videos from the open access YouTube content provider. Document analysis method was used in this study. As a result of the analysis, it was observed that only a few videos were adequate in terms of mathematical language, content and number teaching, and almost all of the other videos included incorrect or inaccurate mathematical representations. While counting, it was observed that number symbols were used as "ordinal numbers". In addition, it was observed that there were scenes where the amount counted and the number did not match. It was thought that these situations could lead to false learning. Based on all these findings, it can be concluded that the mathematical language used in YouTube video content is weak.

Keywords. Numbers, counting, early childhood, YouTube, video content.

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As a result of the widespread use of the Internet and the ease of access to digital technologies, it is known that the age of access to video content platforms such as has decreased until early childhood (Nansen et al., 2016) in last decade. In early childhood, it has been observed that children use technologies such as tablets and cell phones from twelve months of age and can access content (Hourcade et al., 2015). Many children are offered digital content, especially cartoon/animation videos, by their parents or caregivers (Neumann & Herodotou, 2020). In the preschool period, especially the content in the videos classified as educational content is presented to children with a positive perspective by parents, caregivers and teachers (Gözen et al., 2021; Puspita et al., 2022), and according to research, 80% of 0-7-year-old children watch songs/cartoons/animations in these digital content before going to school (Neumann & Herodotou, 2020). From this point of view, it can be said that digital content environments such as YouTube exist as a non-formal learning tool in children's lives. In addition, preschool and classroom teachers use media technologies, especially cartoons, videos, and animations in different lessons in their classes (Veziroğlu-Çelik et al., 2018). When the content of YouTube Turkish children's channels is searched with the keywords "numbers, counting", it can be seen that among the video materials that children encounter through songs, cartoons and animations, there are also mathematical contents for counting or recognizing numbers. These contents may be the first contents about numbers that children encounter for number teaching.

Numbers is a learning domain that forms the basis of mathematics and all content is constructed in relation to the learning domain of numbers (Van de Walle et al., 2014). Children start learning mathematics with counting skills and this skill is realized in early childhood (Akkaya, 2019; Akman, 2002; Baroody et al., 2009; Kilpatrick et al., 2001; Taşkın, 2019; Van de Walle et al., 2014). Number is an abstract concept, but if the learning of numbers in the preschool period progresses with the right support, the concept of number and number sense develops in children (Baroody et al., 2009; Olkun & Toluk-Uçar, 2007). Number sense, in its simplest definition, includes skills such as understanding numbers conceptually, establishing numerical relationships between numbers, recognizing the magnitudes of numbers and comparing numbers, developing reference points for comparisons, and understanding numerical operations using the relationships of numbers (Berch, 2005; Baroody et al., 2009; NCTM, 1998; Reys et al., 1999). In these definitions, the first emphasis is on understanding numbers conceptually and comparing numbers. Making sense of numbers also begins in early childhood (Sarnecka & Carey, 2008; Olkun & Toluk-Uçar, 2005) and numerical relationships and skills developed in early childhood form the basis of all arithmetic skills of children (Frye et al., 2013; Geary, 2015). For example, the number 17 is less than 18 but greater than 16, and this number is closer to 20. It can also be represented as 15+2 or 20-3. Many of these numerical relationships are similar for 578 and 2319, and these simple numerical associations generalize to larger numbers as children grow older. Learning constructed through mislearning in the early period and skills that are not developed (conceptual understanding of numbers, comparing, referencing, etc.) constitute the root of the difficulties that may be encountered in the future (Reid, 2016). In addition, it has been observed that children who lack mathematical skills in early childhood lag behind children who are better in mathematics in later years (Aubrey et al., 2006; Clements & Sarama, 2007).

Studies have shown that learning numbers is inseparable from number sense skills (Kayhan-Altay, 2010; Sarnecka & Carey, 2008,). While perceiving multiplicities begins in infancy, counting begins to develop from the age of two and by the age of six, a child can count almost like an adult (Sezer, 2008). In order to acquire counting skills, principles such as the cardinal number principle (the last number represents quantity), the one-to-one matching principle, the principle of abstraction, the principle of conservation and the principle of ordinal independence need to be established in children (Alptekin, 2015, Frye, 2013). Therefore, the processes related to counting skills in early childhood are meaningful. Counting skill develops in six stages: "understanding quantity, rote counting, asynchronous counting, simultaneous counting, concurrent counting, consequential counting, and abbreviated counting" (Akkaya, 2019). The first stage is the stage of visual understanding of quantity and amount. In the first stage of this development, children begin to be able to compare quantities that are more or less, while in the last stage, they can comprehend, group and subitize the number of multiplicities in their minds without the need to count. (Frye et al., 2013; Sarnecka & Carey, 2008; Sarnecka & Lee, 2009). Children construct the concept of number abstractly in their minds by seeing quantities of different numbers (between 1-10) together and visualizing them in their minds (Sarnecka & Carey, 2008). The skill that is confused with the counting skill and subitizing given above is the ability to recognize and write numbers (Van De Walle et al., 2014). The fact that children recognize and read/write certain numbers in early childhood leads early childhood teachers and parents to think that children understand the concept of number. However, before children learn to write "table" in the first grade, they encounter table objects in many different ways and form an image of this concept in their minds before writing "table". The fact that preschool children can read the number “seven” does not mean that they can visualize the magnitude of the number “seven” in their minds or that they can relate this number to other numbers. This is because this skill is a skill like literacy and is different from other skills related to counting (Van De Walle et al., 2014). In addition, studies have not found a direct relationship between quantity perception and writing symbols of numbers (Hannula et al., 2007). In order for counting to continue in a sequential manner, the numbers in the first ten must first be established quantitatively, conceptually and in number order (Frye et al., 2013; Sarnecka & Lee, 2009; Van de Walle et al., 2014,). Realizing the meaning between the number two and the number three in counting occurs when the child conceptually realizes the difference in quantity (Olkun & Toluk-Uçar, 2007).

With children's access to technology, it is seen that children learn different information directly from these technologies in an informative way (Veziroğlu-Çelik et al., 2018). When video content is prepared according to children's ages, cognitive development levels and appropriate skills with audio and visual supports, children can learn various information that is readily available from digital content, media and screens (Heintz & Wartella, 2012). Informal knowledge is defined as the knowledge that children learn in daily life through real-life experiences without a specific program purpose outside of school (Saraç, 2017). Considering the number of views on YouTube, which is the most important digital content provider in Turkiye, it can be thought that this content is an important resource for children to learn numbers, considering that a video with number content used in this study has reached "one hundred and seventy-five million" views. However, does this resource present mathematical content accurately? We only see the objects in the videos for a few seconds in front of a limited screen. For example, counting a group of objects passing through the screen one by one can be a difficult visualization for a child to understand, since he/she does not know where the object comes from and where it goes, since not all of the quantity is visible, since it is not clear from the visual whether the object is the same or different. In this context, it can be expected that these animated animations/cartoons supported by various sounds and visuals should be well-constructed, composed of interconnected images, emphasizing the continuity of the object, well-grounded and have accurate mathematical content.

There are some studies examining children's learning processes with YouTube content (Gülmez, 2019; Mulyana et al., 2022). In a study on reading numbers in early childhood with YouTube content, it was observed that preschool children's level of reading numbers increased with YouTube video content (Mulyana et al., 2022). In his study, Gülmez (2019) presented video content specially prepared by subject to students via YouTube and investigated whether there was a significant difference in children's concept learning. As a result of this study, there was a significant difference in favor of the experimental group in learning some concepts (Gülmez, 2019). From this point of view, it is thought that the content presented contributes to children's learning and creates an informal learning environment. The subject of this study is whether the mathematical language and representations of these colourful, attractive, child-oriented contents, which are watched by millions of viewers and mostly shared with the label of children's songs, are appropriate.

In this context, the aims of this study is to examine the general structure, mathematical language and content of numbers/counting videos on YouTube in terms of supporting counting skills and number sense. In this context, this study will examine the most watched Turkish short videos (songs, cartoons) on YouTube and discuss the contribution of these contents to the correct construction and development of number concept in children. The following are the research questions of this study.

1. What are the general purposes (e.g., instructional goals) of the content of the most watched numbers/counting videos?

2. How are mathematical language and representations used in numbers/counting videos that are expected to support counting ability and number sense?

Method

In this study, document analysis, one of the qualitative research methods, was used. Although document analysis is sometimes considered as a complementary data collection method, it is also seen as a part of methodology in qualitative research (Bowen, 2009; Wach & Ward, 2013, Merriam, 2009). Documents are resources that are readily available in written, audio-recorded, video or visual form. Documents are an important element used in qualitative research for many years (Merriam, 2009). Types of documents include books, letters, journals, diaries, maps, charts, statistics, constitutions and regulations, legal texts, newspapers, photographs, memoirs, interviews, school records, health and public records, pictures, videos, messages, and so on. In this research, YouTube data is considered as a document since it is a direct open access resource that can be accessed by everyone, especially children. The following section details the sampling, data collection and data analysis stages.

Research Documents and Data Collection

The data of the study are videos on YouTube content Turkish provider that contain number teaching for children. This research is limited to Turkish-language video content originating from Turkiye. These videos constitute the data set of the study. Criterion sampling was used to select these videos. These criteria are; "videos that correspond to the search for some keywords, have a single video content, are aimed at early childhood, are produced by children's video content channels, are shorter than five minutes, and are widely watched". When the Turkish keywords "numbers, counting, I am learning to count, I am counting, I am learning numbers, I am counting, I am learning numbers, digits" were searched through the YouTube content provider, the videos were sorted from the most watched to the least watched, and the main data source of this study was created. First, the above keywords were entered into the YouTube search engine. Then, videos for children in terms of content were listed by selecting those related to these keywords. Since some videos were shared by more than one channel, the most watched of these videos were selected as the source. In the lists in this context, those with the same video content and video content created by collage with more than one video were eliminated and the videos were sorted from the most watched to the least watched. On this basis, selection was made based on the total number of views. The selected videos were those with only one video content. As of the date the researcher downloaded these videos for video analysis (Feb 2023), the most viewed videos were "one hundred and seventy-five million" and the least watched videos were approximately "three million". However, it can be assumed that these videos may have been watched more, as there are different video copies of these videos and some of the views may be due to multiple people sharing a single screen. The list below lists the name of the relevant videos, the link to the videos for easy access by readers, the video channels that provided the videos, the date the videos were uploaded and the number of views.

Table 1.

Information about videos

No:	Name of Video (Tr and Eng) Link	Channel	Upload.Date	Nr of View
1.	Sayılar- Sevimli Dostlar çizgi film çocuk şarkıları 2017 (Numbers- Cute Friends cartoon kids songs 2017) https://youtu.be/nxsleDObpYo	Sevimli Dostlar (Cute Friends)	10.06.17	175.802.824
2.	5 Küçük Ördek (5 Little Duck) https://youtu.be/LVeQBh5qu08	Mini Anima	12.02.17	87.366.600
3.	1 den 10 ‘a kadar sayıları öğreniyoruz (Learning numbers from 1 to 10) https://youtu.be/iSFG5FGEV0Q	Tino Oyuncalar &Çocuklar	09.20.19	25.033.677
4.	10 küçük araba-Sayı saymayı öğreniyoruz (10 small cars-Learning to count) https://youtu.be/8h9UJqSYuyI	Afacan Tv	04.12.17	19.536.291
5.	Haydi Saysana Let's Count https://youtu.be/NF0pYmopVbY	Edis & Feris	09.05. 14	19.312.143
6.	10 küçük aslancık / Saymayı öğreniyoruz (10 little lions / Learning to count) https://youtu.be/XSCkVl2mOP0	Afacan Tv	03.07.14	8.203.250

7.	Sayım Şarkısı/ Charlise & the Numbers ile 1den 10a kadar sayılarla tanışın (Meet numbers from 1 to 10 with the Counting Song / Charlise & the Numbers) https://youtu.be/mIJePQ2shPc	Baby Tv	07.17.14	7.870.740
8.	Doru Atı Eğitici Çizgi Film, Sayılar ve Renkler (Doru Horse Educational Cartoon, Numbers and Colors) https://youtu.be/jz2BFpkOrqE	Agubebe tv	07.01.17	6.736.869
9.	Hodo ile Sayıları Öğreniyoruz (Learning Numbers with Hodo) https://youtu.be/rhgHZzitf9Q	Çocuk Diyarı	05.23.18	5.607.604
10.	1,2,3,4,5 ile birlikte saymaya ne dersiniz? /Sevimli Dostlar Bebek Şarkıları (How about counting with 1,2,3,4,5? /Cute Friends Baby Songs) https://youtu.be/UClsM1esRu8	Sevimli Dostlar	01.25.20	5.598.860
11.	Sayılar /1den 20 e kadar Türkçe Sayılar (Numbers / Turkish Numbers from 1 to 20) https://youtu.be/FLrpcOgTvwc	Mini Baykuş	05.21.16	4.635.076
12.	Sağ Elimde Beş Parmak (Say Bak) Şarkısı ve Sözleri (Five Fingers on My Right Hand (Count) Song and Lyrics https://youtu.be/uf_EN3axLmw	Alpi ve Arkadaşları	12.09.15	4.444.555
13.	Pepee- Sayılar Şarkısı(pepee- Numbe song) https://youtu.be/VEnFp58n5fE	Düşyeri	01.07.15	3.610.316
14.	Sevimli Dostlar ile sayıları öğreniyorum (Learning numbers with Cute Friends) https://youtu.be/xlwUZW8sjFs	Sevimli Dostlar	11.07.20	3.604. 268
15.	Sevimli Tren Hodo ile Sayıları Öğreniyoruz (Learning Numbers with Hodo the Cute Train) https://youtu.be/0Jda7sUDBgQ	Çocuk Diyarı	04.23.15	2.951.232

Data Analysis

In this study, the documents were analysed by descriptive analysis method (Merriam, 2009). Data analysis took place in three stages. First of all, about fifty videos were analysed on the basis of the research, and criteria were determined by deciding according to which criteria content analysis would be made from these videos. These criteria were the most watched videos with "single video" content for children that met the keywords "numbers, counting, learning to count, counting, learning numbers, numbers". These videos selected in this study constitute the data set of the research. All videos were analysed and transcripts of the visuals of the study were obtained. The selected videos were watched one by one many times and a preliminary analysis was made, and themes and codes were created from these preliminary analyses to analyse the data set of the research. The primary purpose here is to make a holistic analysis of the videos in general. In the preliminary analysis, it was seen that the content of each video had an instructional goal. When analysed on the basis of these goals, the first theme is "instructional purpose". Then, each scene in the video content was analysed one by one, and the mathematical representations of visual and auditory elements were examined. While analysing these videos, relevant codes (showing numbers as multi-digit numbers, the set of counted objects and the counting number not being consistent... etc.) were obtained. Since this list of themes and codes will be presented and discussed in the findings section, no further details are given here to avoid repetition. Within the framework of these themes and codes, detailed examinations were made and the research findings were described.

Reliability, Validity and Ethics

In qualitative research, there is no validity and reliability like quantitative research, but there are some strategies (Merriam, 2009). In this study, direct quotation method was used to increase credibility, and the data obtained by analysing the content of the videos were presented by direct quotation method. In addition, the relevant parts of the videos were screenshotted and given as evidence in the relevant sections. In order to increase the transferability of the research, purposive sampling was used and the inclusion and exclusion criteria were clearly written and detailed.

In order to increase the reliability of the research, after the relevant codes were created, the expert opinion of an academic working in the field of mathematics education was consulted twice. There are two main reasons for seeking expert opinion. The first reason was to confirm the appropriateness of the code list. According to the expert opinion taken in accordance with the purpose in the first stage, the researcher and the expert reached a consensus on the relevant code list. The second purpose was to calculate the inter-rater reliability coefficient. In the second stage of the study, after all videos were analysed, expert opinion was taken to calculate inter-rater reliability. Three videos corresponding to 20% of all videos were analysed by the expert within the framework of the relevant codes, and 92 % consistency was found between the rates. According to Krippendorff (1995), this level of consistency is high (as cited in Bilgen & Doğan, 2017). Since the research was conducted with the document analysis method, open access sources were used, thus avoiding many problems that may be ethical problems, such as publication copyright, conflicts related to the content.

Results

When the videos were analysed, it was deemed appropriate to discuss them under two themes. Under the first theme, the findings regarding the general structure of the video contents will be presented under the theme of "instructional purposes of the videos". Under the second theme, the mathematical representations in the content of the videos will be presented under the theme. All codes and themes are given in a table below.

Table 2.
Themas and Codes

Thema	Code	Video
Purpose of Videos	Videos Focus on Symbol Teaching	5,9,11,15
	Videos Focus on Sequential Counting	4,6,7,13
	Videos focus on Counting Quantities	1,2,3,7,10,12, 14
Mathematical Representations	Using Symbols (Numbers) Only	5,7,9,11,13,15
	Representing Numbers as Multi-Digit Numbers	1,5,7,8,9,10,13,14,15
	Representing Cardinal Numbers as Ordinal Numbers	1, 5, 10,14
	Mismatch Between the Number of Objects Displayed and The Cardinal Numbers	4,6,12
	Failure to Count the of Quantity	1

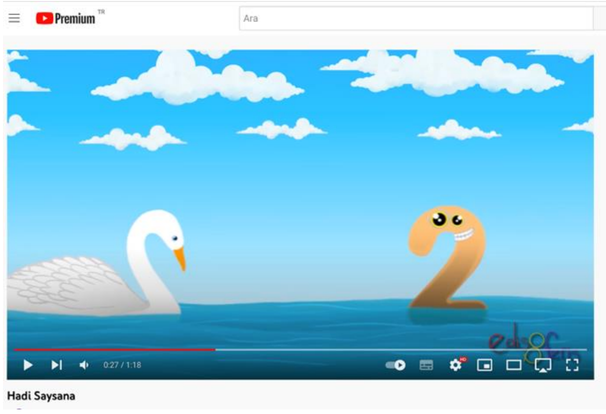
When all videos are analyzed, only two of the fifteen videos present mathematical content accurately. When the content of the other videos is analyzed, it is seen that there are some problematic sections in terms of presenting mathematical content with correct representations. These sections were analyzed with five codes under the theme of mathematical representations as the table seen above.

General Content of the Videos

When the general content of the videos was analyzed holistically, the theme of "instructional purpose of the videos" was formed. The sub-codes of this theme are as follows: "counting quantities, teaching consecutive numbers videos, teaching symbols of numbers". Detailed analysis of these videos will be presented under the following headings.

Videos focus on symbol teaching. When the contents of the videos were analyzed, the first code under the instructional purpose of the videos was "focused on symbol teaching". All videos in the study (including the 15th video) included symbol representation of numbers. However, the contents of the videos under this theme (videos 5, 9, 11, 15) only address videos that focus on reading the symbols of numbers. In these contents, it is understood that the reading of symbols is tried to be taught by reading or showing each symbol. Four of the fifteen videos were categorized under this theme. These videos are; Lets Count (5th Video), *We Learn Numbers with Hodo* (9th Video), Numbers-1 to 20 (11th Video) and Numbers with Hodo the Cute Train (15th Video). When we watch these videos, it is seen that the video contents are generally prepared for the reading of numbers. For example, the lyrics in English translation and video image of 5th video (Lets Count) are in below.

Video Image



Lyrics

1,2,3,4,5,6,7,8,9,10
1,2,3,4,5,6,7,8,9,10
La la la la la la la,
Let's count
Numbers start with one,
La la la la la la la,
Come on, count it,
Then comes two,
Like a swan,
Three is like a bird,
Four, like sails

Figure1. 5th Video Image and Lyrics.

In the song of the video, the general focus is on the reading of all symbols. In the content of the video with lyrics, each number is likened to a figure as seen in the picture. Two is likened to a swan, three is flown like a bird, four is likened to a sail, and the round part of six is depicted as a belly. In the two most watched videos (9th & 15th videos 9) of the same video content producer, the train cars are loaded with number symbols and read in sequence. In another video content (11th video), the numbers between 1-20 are given as symbols and verbally in order. Although this video content was presented in a plain form and was not supported by a song or a rhythm, it was still viewed millions of times.

Videos focus on sequential counting. In the videos collected under this theme (4th, 6th, 7th, 13th), it was observed that sequential counting was more dominant. In these videos, numbers were emphasized by using song-themed content such as 10 little cars (4th video), 10 little lions (6th video), Counting song (7th video), Pepee Numbers Song (13th video), and rhyming one after another. For example, the lyrics and sample video image of the song in the 6th video (10 little Lion) are as follows.

Video Image

Lyrics

1 little, 2 little ,3 little lion,
4 little, 5 little, 6 little lion,
7 little, 8 little, 9 little lion
10 little lion …

Figure 2. 6th Video Image and Lyrics.

As given in the relevant image and description, a lion is presented on stage in this video content. Lions are seen in the visual from different directions in sequence. In the video where only one lion is seen in each scene, the rhythm and song are quite melodic. It is seen that the main purpose of this video content is to "teach the order of consecutive numbers" accompanied by music and rhythm.

The video content of 6th video (ten little cars) is the lyrics of the same song sung using vehicles. In the video content, a single vehicle appears in each scene and consecutive counting is performed when this single vehicle appears.

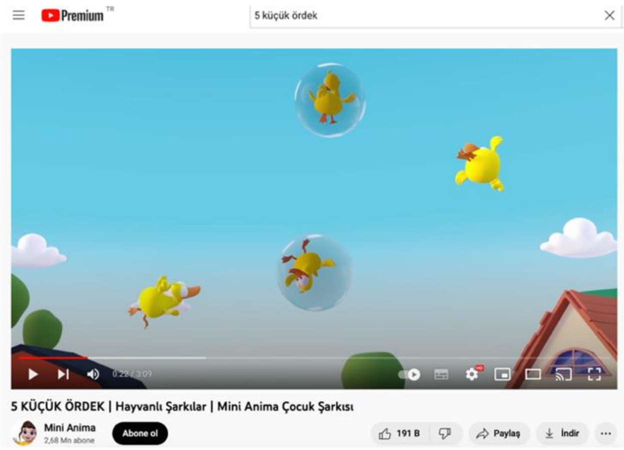
In the "counting" song, the rhythmic counting of numbers such as "1,2,3,4,5, 6,7,8,8,9,10" is repeated many times in a row. After this repetition, a rhyming word is sung for each number. Some of the lyrics' translation are quoted directly below:

"My name is a handyman,
My name is two, what's yours?
That's me three, that's hard to do,
Come on, let's dance, one, two, three,
...."
(Baby tv, Turkish Counting Song)

As can be seen in this example, in the content of this video, there are no visuals or lyrics that show the quantitative meaning of number or the relationship between number and multiplicities. To give another similar example, in the 13th video (Pepee numbers), fewer symbols were used and "no" objects were used compared to the other videos; rather, the numbers were counted one after another rhythmically with rhythm and rhymes. It is seen that the "Pepee" video is completely oriented towards teaching counting numbers.

Videos focus on counting quantities. When the video contents are analysed holistically, it can be said that under the third theme, there are videos (1st , 2nd , 3rd , 7th , 10th , 12th and 14th videos) that have content for counting objects. In these videos, it is possible to characterize these videos as object counting videos since they aim to match the numbers with objects as well as showing the numbers with symbols. These video contents aim to develop skills such as counting objects and comparing objects. Under this heading, there are videos that present mathematically correct content (2nd,3rd,4th videos) as well as videos that present conceptually incorrect or incomplete content (e.g., 7th video). Among these videos, the "five little ducks" video (2nd video) and the "How about counting 1,2,3,4,5 together?" video (10th video) are examples of videos with correct mathematical content. In this section, more examples with correct representations will be discussed. Below are the lyrics with translation from Turkish and the screenshot of the video with the correct mathematical representations (2nd video).

Video Image



Lyrics

One day five little ducks hid in secret,
The mother duck quacked,
The four ducks are back,
One day four little ducks,
They hid in secret,
The mother duck quacked,
The three ducks came back...
…….

Figure 3. 2nd Video Image and Lyrics (When it is sang "The four ducks are back".).

The 2nd video titled "Five little ducks" was coded as "videos on counting quantities". This video contains an act of counting backwards from five, as described above through direct quotation. In each scene within the video, the entities to be counted and the way the counting numbers are spoken are consistent. For example, while the song says "four ducks are back", only four ducks are shown on the screen. Although this video does not include the representation of the number with a symbol, since it clearly shows how many quantities the number represents, it can be considered that this video supports number sense and can be a correct tool to be used in teaching the concept of number.

When analyzed in terms of presenting mathematical content, another good example is 3rd video titled "We are learning numbers from 1 to 10". This video is not a video with song content like the other videos. The video depicts an image with a voiceover. For example, the balls are counted one by one as they bounce and get on the wagon. "two, one two, well done green balls", etc. The relevant video content and visuals are presented below.

Video Image

Video Content

In the video, there are numbered wagons and in front of these wagons there are as many balls as the corresponding number. An audio instruction is given. This instruction is: "two: one, two, well done green balls, you are in your wagon". Thus, the colored balls counted on the stage get into the numbered wagons. For example, two balls get into the two wagon.

Figure 4. 3rd Video Image and Video Content.

Another video presented with accurate mathematical content is "How about counting with 1, 2, 3, 4, 5?" (10th video). The flow of the video is similar to 10th video (the five little ducks) in terms of the harmony of the visuals and the lyrics of the song.

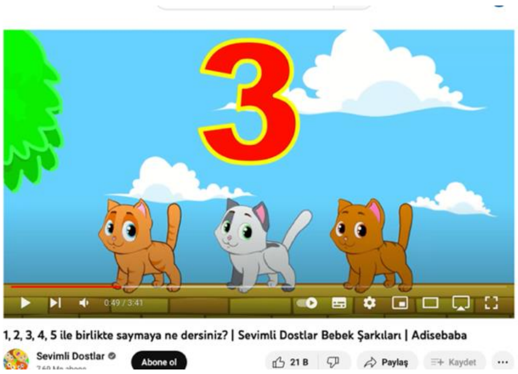
Video Image	**Video Image and Lyrics**
	In the video, the cats are on the wall and the cats on the wall are counted backwards according to the number sung in the song. The lyrics of the song are as follows: Five cats on the wall, five cats on the wall One came down from the wall, left four cats Five cats on the wall, five cats on the wall, Two of them came down from the wall, left three cats…

Figure 5. 10th Video Image and Video Content.

In the video above (10th video) cats are on a wall. In this video content, first a song was prepared for the cats to come down from the wall in order, and when each cat came down from the wall, the remaining amount was counted backwards and given in an accurate representation. At the beginning of the song, five cats appear on the wall. At each scene transition, a cat descends from the wall and the number of cats left is verbalized and emphasized in writing. As can be seen from the related visual, the number of cats in the visual is consistent with the number sung. In the continuation of the video, the same content is presented over the sparrow. However, there are some display errors in this video. These errors are mentioned in the headings below.

When all videos are watched, these three videos (2nd, 3rd, 10th) are the most mathematically correct videos. All visuals and voice-overs are consistent throughout the entire video and numbers are correctly represented as symbols. However, the other videos in this category (1st, 7th, 12th and 14th) have incorrect representations in different situations. In this respect, in order to avoid repetition, these videos are not included here because they are presented under the themes and codes below.

Mathematical representations. In the second part of the presentation of the findings of the study, the contents of the videos were analyzed in terms of the representations used in the presentation of mathematical content. Misrepresentations were observed while presenting the content of these videos. These elements were categorized under the following codes. These codes are: "*Using Symbols Only (1)*", *"Representing Nominals as Multi-Digit Numbers"(2), "cardinal numbers are* *shown as ordinal numbers"(3), "mismatch between the number of objects displayed and the cardinal numbers"(4), "failure to count the of quantity"(5).*

Using symbols (nominals) only. In six videos (5^{th} , 7^{th} , 9^{th} , 11^{th} , 13^{th} , 15^{th}), object quantities that can be associated with numbers were not included, but numbers were visualized as symbols and used in this way. The general purpose of these videos may be to teach the consecutive repetition of numbers or the reading of number symbols. Examples of these videos are given below.

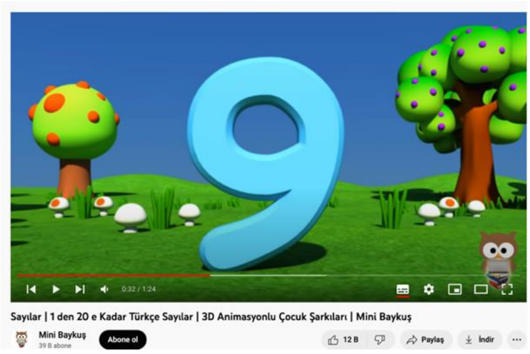
Video Images	**Explanation about Images**
	*9th video: Learning numbers with Hodo.* In this video, the train arrives at the stops in order The numbers are loaded into the wagon one by one. In this video, the train introduces the number by saying "look guys, this is the second of the two numbers we are looking for".
	*11th video: Turkish Numbers from 1 to 20* In this video, only the numbers are displayed in order. The incoming number is read.
	*13th Video: Pepee Number Song* In this video Pepee and Shila sing a rhyming song together. "1, 2, 3, 4, 5, Choose a wife for yourself. 6, 7, 8, 9, 10, jump jump jump jump jump..."

Figure 6. Related Video Images and Contents.

As can be seen in the examples in the videos above, the video content is geared towards the skill of reading numbers. In this demonstration, only reading is done in the video, similar to letter teaching. In all of the videos under this code, only symbols were included. In these videos, no demonstration was made to determine the amount of multiplicity, which is the main purpose of counting.

Representing nominals as multi-digit numbers. When the video content is watched, a frequently used way of representation in the videos
(1st, 5th, 7th, 8th, 9th, 10th, 13th, 14th, 15th) is to write all the digits and/or numbers side by side as if showing a multi-digit number. The images below are taken from the relevant videos.

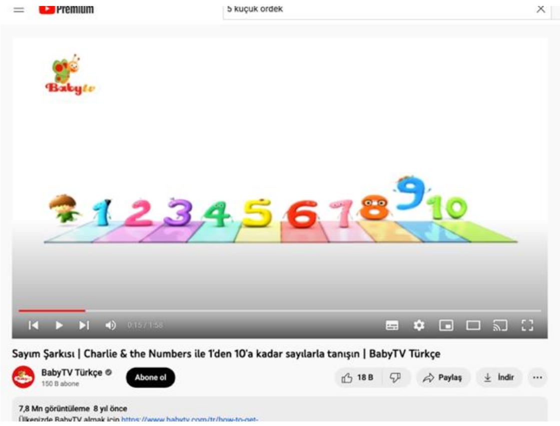
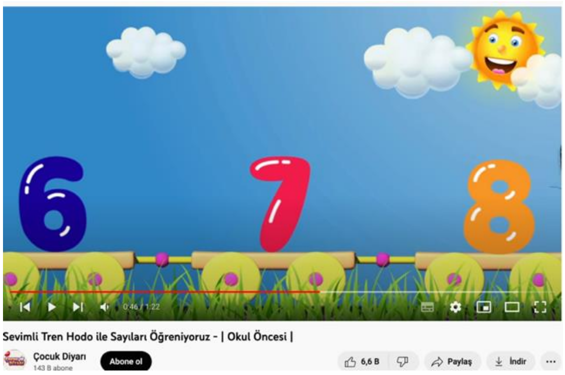
Video Images	**Explanation about Images**
	7th Video: Counting Song (0: 15) In the video, all numbers are presented together as a whole, as an eleven-digit number.
	14th Video: Learning Numbers With Cute Friends (0:38 sn) In this representation, the numbers 1,2,3,4 are given such as the number one thousand two hundred and thirty four (1234)
	*15th Video: Learning Numbers with cute train Hodo. (0:46)* *In this video, he counts the numbers one by one. However, for example, as seen in the image, while the number seven is shown, other numbers continue to appear on the screen.*

Figure 7. Related Video Images and Contents.

The notation given in these examples is seen in many videos. Mathematically, the main reason for writing the digits side by side is that the digits represent different magnitudes in different digits and together represent a magnitude as a whole. In these representation examples (in nine videos), it was observed that the nominal numbers were shown as representations of large-digit numbers and all numbers were written side by side. In these visuals, all numbers are shown as if they were a single multi-digit number.

Representing cardinal numbers as ordinal numbers. Another noteworthy misrepresentation in the video content is the representation of cardinal numbers as ordinal numbers. This representation is present in all videos (1st, 4th, 6th, 8th, 10th, 11th, 14th) that count by showing the whole objects with consecutive numbers. Some examples are given below.

Video Images	**Explanation about Images**
	14th Video: *Learning Numbers with Cute Friends.* In this video, numbers appears on each car. The numbers are used like the ordinal numbers. They do not represent the quantity of objects.
	10th Video: *How about counting with 1,2,3,4,5?* In this video, the symbols of the numbers appear one by one on each object in a similar representation like as ordinal numbers.

Figure 8. Related Video Images and Explanations.

In the videos, a single object is always pointed at and a number appears on it, even though a dot is not placed next to it to indicate "pearl". From this point of view, one number appears on the screen for each object. The most obvious error in this representation is the use of counting numbers as ordinal numbers. In this representation, each object of the counted set is paired with a number.

Mismatch Between the Number of Objects Displayed and The Cardinal Numbers. In the analysed videos, it can be considered as one of the noteworthy demonstrations. It is a notation used in consecutive counting videos. The notation used in two different ways is collected under this code. In the first case, as the objects in the videos flow through the screen one by one, different numbers appear on the screen simultaneously. Examples of videos using this representation are given below.

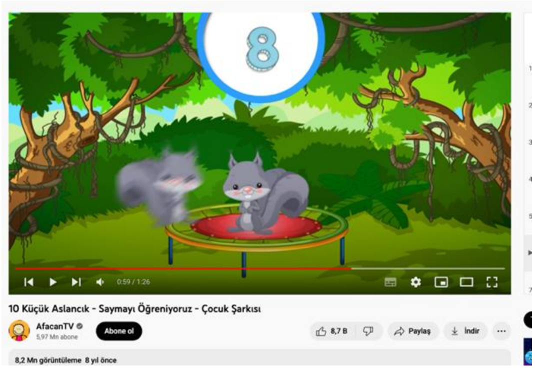
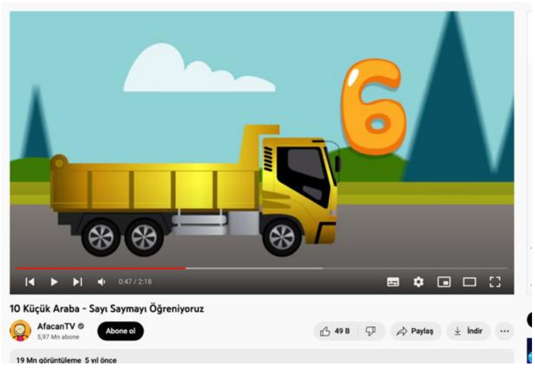
Video Images	**Explanation about Images**
	6th Video : 10 Little Lion In the lion video, the number eight is written while two animals appear on the screen. Throughout the video, an animal comes and goes from different places on the screen. When these animals appear, the counter on the screen runs.
	4th Video: 10 little car. A similar video by the same creator is about vehicles. These vehicles are shown moving quickly from right to left as if they were moving on a road. In the car video, as in the lioness video, a single object appears on the screen, while the number changes.

Figure 9. Related Video Images and Explanations.

In these videos, each time an object is seen, a counting number is given. In this representation, while the objects on the screen are constantly changing, the numbers also change like a counter display. However, it is not possible to match the number with the multiplicity or size of the object in this visual. For example, in the "lioness" video, while there is only one lion on the screen, the number eight is seen. In the second image, in the "10 small cars" video, the number six is given even though there is only one truck on the screen. In such a representation, there is an inconsistency between the number and the object seen. In such a representation, since there is no visualization of the number of objects in the set, the meaning of the magnitude of the numbers disappears. Below is the content related to the "five finger video" (video 12), which is coded under this code but as a different example.

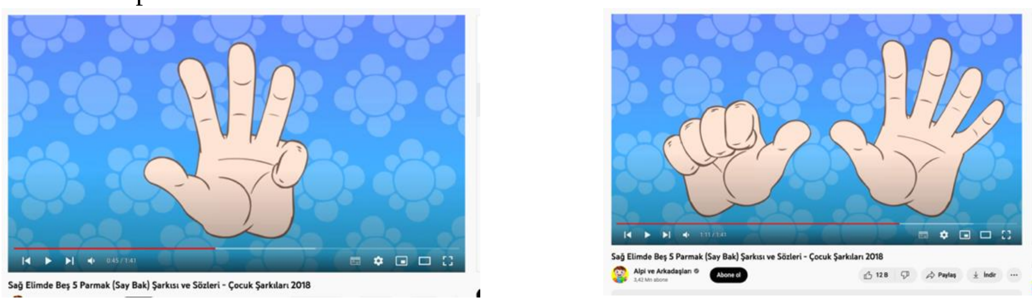


Figure 10. Video Image from 12th Video(Five fingers on my right hand).

The song in this video is an old preschool song. In this song, the creator shows the counting fingers in order with a simple visual. No symbols of numbers are used, but verbal counting is done with each finger. In one part of the song, the sixth finger is counted again like the first finger. While six fingers are visible in the visual (visual 2), the lyrics of the song start the counting from the beginning by counting "one, two, three..." again. While there are six fingers in the visual, the verbal expression "one" is presented. Therefore, there is an inconsistency between the number of counting and the number of objects.

Failure to count the of quantity. Below this code is a single video (1st). In different scenes of the video, different numbers of objects are given, but only up to ten are counted in the whole video content. In this case, the multiplicity that appears in the first scene does not match the shape and/or number of objects counted.

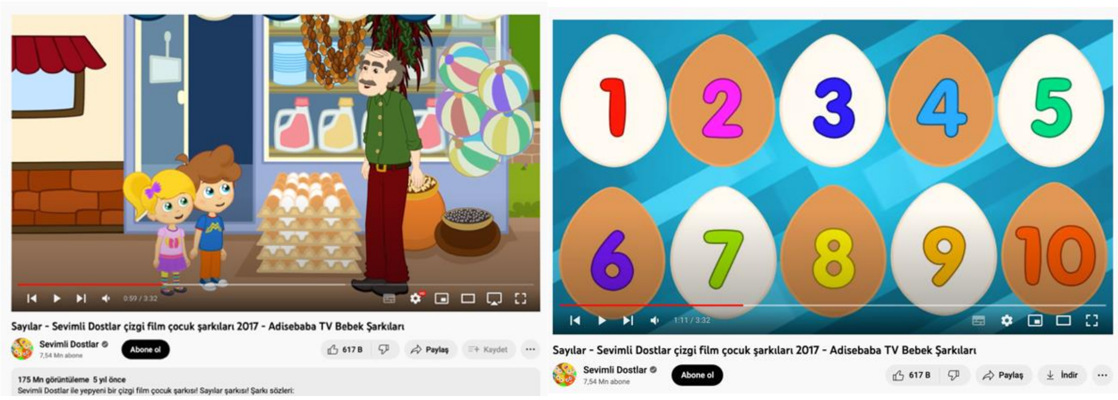


Figure 11. Video Image from 1st Video (Numbers, cute friends).

For example, in the video screenshot (Figure 11), children ask the grocer “how many eggs he has”. The grocer responds by saying "let's count them together". On the screen in the video image, five boxes of eggs are drawn very realistically. In the image, thirty eggs are shown in each egg carton, and since there are five cartons of eggs, it can be calculated that there are one hundred and fifty (150) eggs in the image. However, only up to ten of them are counted in the video. Throughout the video, objects such as balloons, flowers, watermelons, fish are shown in different quantities. However, the number of objects shown in the first scene is inconsistent with the number of objects counted. Below is another example from the same video.

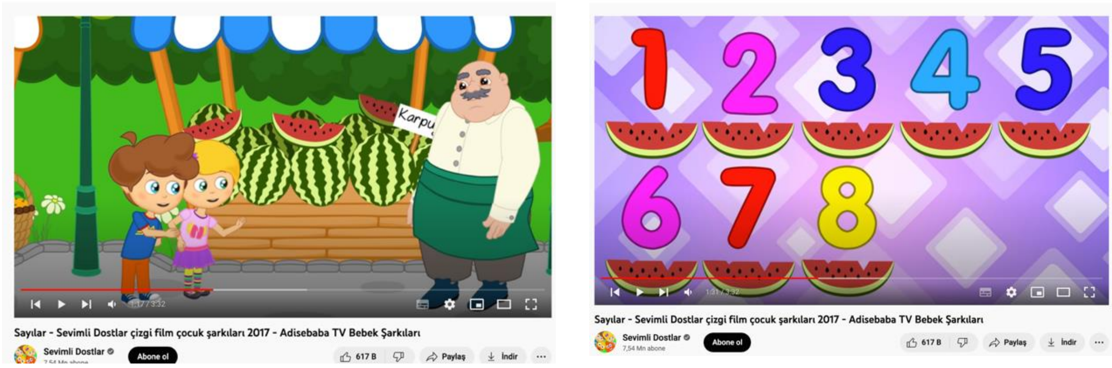


Figure 12. Video Image from 1st Video (Numbers, Cute Friends).

In the same video content, in the "watermelon" counting section, for example (Figure 12) as given above, a watermelon slice is counted after all watermelons are shown. It is seen that the counted objects are not consistent even in terms of shape. Similar negative example demonstrations are found throughout the video.

Figure 13.Video Image from 1st Video (Numbers, Cute Friends).

In this scene (figure 13), the fisherman is seen to have fish of different sizes and colours. Although there are thirty-one fish in the first scene, only ten of the small grey fish are counted. In this video, this is coded as "not counting the multiplicity shown".

Discussion, Conclusion and Recommendations

When the videos were analysed holistically, the content of the videos was categorized under three basic codes. The codes of the videos are "counting quantities, teaching consecutive counting numbers, teaching the reading of symbols of numbers". When these videos are examined, it is seen that the videos whose main purpose is "teaching consecutive counting numbers" repeat the numbers consecutively, and that the videos are created to memorize the counting order without attributing any meaning to counting. Although consecutive numbers were given verbally in these videos, no association with objects or multiplicities was used. In these videos, it does not seem possible for children to attribute the correct meaning to counting or to grasp the meaning of numbers as magnitude. This is because children begin to learn the concept of counting by comparing multiplicities (Sezer, 2008). Children construct the concept of number abstractly in their minds by seeing quantities of different numbers (between 1-10) together and visualizing them in their minds (Sarnecka & Carey, 2008).

According to the instructional purpose, 40% of the videos analysed were categorized under the code "teaching the reading of number symbols". It is seen that only symbols are used in these videos. Counting numbers is a different skill than memorizing a song or reading a letter (Olkun et al., 2013, Van de Walle et al., 2014). Trying to teach symbols under the name of number teaching and producing scenes using meaningless words instead of multiples may hinder children's number learning. The fact that preschool children can read the number seven does not mean that they can visualize the magnitude of the number seven in their minds or that they can establish the relationship between this number and other numbers. This is because this skill is a skill like literacy and is different from other skills related to counting (Van De Walle et al., 2014). From this point of view, the importance of concrete learning environments or concrete materials to support children's learning becomes more apparent, especially instead of presenting only symbol teaching videos to children.

When the videos are analysed in terms of instructional purpose, it can be said that the "counting quantities" videos are more understandable because the symbols and content are more consistent. However, the comprehensibility of the videos does not mean that their content is completely appropriate for mathematical representations. It can be said that only three videos out of the fifteen videos analysed were compatible in terms of both visual, mathematical and verbal content. In all the other videos (80%), there are inconsistencies between the representations and verbal expressions. However, what children see and what they hear should be exactly the same (Frye et al., 2013).

When the contents of the videos were analysed under the theme of "mathematical representations". In this theme there are five codes such as "using only symbols, showing numbers as a multi-digit number, using counting numbers as ordinal numbers, not matching the number of objects and counting numbers, not counting the multiplicity shown" were formed. The first code, "using only symbols", was used in six of the analysed videos (40%). This is a result of not associating the teaching of numbers with objects, that is, with "determining the amount of multiplicities", which is the main purpose of counting. However, the first stage of counting skill is the comparison of multiplicities (Reid, 2016). These video contents present counting verbally, regardless of multiplicities or quantities, only for literacy skills. In order for children to associate counting and numbers, they need to be presented with a concrete multiplicity (Van de Walle et al., 2014).

Another code under the theme of mathematical representations in the analysed videos is "using counting numbers as ordinal numbers". In the visuals in the videos, representations such as "ordinal numbers" were used on the counting objects. In the videos where each object is matched with a number, "the object matching the number 1 is no different from the object matching the number 7" in terms of representation. Children may have problems with this type of representations that they do not know the exact meaning (Frye, 2013). Children construct the concept of number abstractly in their minds by seeing and visualizing quantities of different numbers (between 1-10) together (Sarnecka & Carey, 2008). In addition, even before the introduction of technology into our lives (Treacy & Willis, 2003), studies have shown that five-year-old children have difficulty understanding that the last number spoken is the actual value of the number when counting a group of objects. When everything was more tangible, children had difficulties in understanding numbers and cardinality (Treacy & Willis,2003). In addition, research on linear representation of numbers shows that even if all children can count to ten, they cannot fully understand the quantity of the number (Reid, Baroody, Purpapa, 2015). In these videos, presenting a number with each object as an ordinal number may also make it difficult to understand the cardinal number and the quantity of multiplicity. Children who watch this video and do not know how to count may not be able to understand the quantity of multiplicity and the cardinal number principle. However, learning cardinal number principle is necessary for learning how to count (Sarnecka & Carey, 2008; Treacy & Willis, 2003).

In the videos analysed in this study, another code was "representing numbers as large-digit numbers". In the videos, it is seen that the numbers are written as a multi-digit number without leaving a space next to each other. These multi-digit numbers, which we see holistically, may prevent the individual reading and realization of numbers (digits) in number teaching. The use of this representation in many videos is striking. Nine out of fifteen videos (60%) used this representation. However, in preschool education, especially each number is introduced to children one by one (Van de Walle et al., 2014). The main reason for this is that these symbols are very complex for children who do not know numbers at all (Reid, Baroody, Purpapa, 2015). Writing these numbers together can be as complicated as writing a long sentence for an illiterate child.

Another code analysed in the demonstrations used in the videos is "the number of objects and the number of counting do not match". For children to perceive numbers correctly, they need to see these multiplicities holistically and hear the correct number (Reid, Baroody, Purpapa, 2015). In the videos coded under this code, the number of objects on the screen and the number of counting do not coincide. For example, in the "count look" video, six fingers are shown on the screen, while the counting number is one. However, even when watching a movie, if the audio and visuals are not synchronized in the video scene, we pause the video and make sure that what we see and what we hear are synchronized. Because the opposite is confusing. The mismatch between the number of objects seen and the number counted also contradicts the principles of counting, one-to-one correspondence, conservation, and cardinality. Children can count accurately when they understand the one-to-one mapping of each number to an object (Sarnecka & Carey, 2008; Treacy & Willis, 2003). The inconsistency between the number of objects and the number of counting objects in the videos may be an obstacle for children to learn counting correctly or may cause confusion in children.

Appropriate content needs to be presented appropriately for children to learn numbers because children's number sense in early childhood is a predictor of later mathematics achievement (Aubrey et al., 2006; Clements & Sarama, 2007). In first video; objects shown and objects counted are not consistent. Although this was observed in a single video, this code is considered to be important because it was the most watched video. This situation was coded as "not counting the multiplicity shown". For example, the quantity of watermelons at the watermelon stand was asked, but the watermelon slices were counted. In the content of this video, there are inconsistent situations like this (fish, eggs, cotton candy, balloons) in all scenes. These misrepresentations are not in accordance with the basic principles of counting (counting each object as a whole, "without dividing or fragmenting", one-to-one matching) (Frye et al., 2013).

The videos analysed in the research analyses are called educational videos. Parents are highly motivated to let their children watch these videos (Gözen et al., 2021). However, the presentation language of mathematics in these videos, which reach millions of views, is open to discussion. Even in content that can be considered innocent, there are errors, mistakes and content that can lead to difficulties in understanding mathematics. This content, which appears to be relatively less harmful than other videos as YouTube content, may be one of the obstacles in front of children's construction of conceptual knowledge rather than helping children learn. When it is seen that the videos are watched millions of times, it is understood how high the effect size of video content is. In this context, it can be suggested that families and teachers who use videos as preschool education content should be more careful and should not trust educational videos in YouTube content that contain many errors that are not noticed at first glance.

Although the video content generally has mathematically incorrect content, it would be more appropriate for parents and teachers to be selective because there are some videos with correct representations. This is because videos are good learning tools when they are well prepared, attract children's attention, teach while entertaining, and appeal to many senses (Neumann & Herodotou, 2020). Although most of the songs in the video content are beautiful, it may be difficult for children to understand when they are presented with poorly prepared and inaccurate visuals. In such cases, if these contents are to be used as a material, they can be presented to children only as songs, independent of visuals. In future studies, research can be conducted on how are children mental images who encounter a lot of video content.

About Author

First Author: Şeyma Şengil Akar is an. assistant professor at Kastamonu University, Faculty of Education, and Department of Elementary Education. Her doctoral desertion emphasis on Mathematics Education. Her academic interests are mathematics education, gifted education, mathematical modeling (MEA), mathematical creativity. She has articles, book chapters and presentations on these topics.

Conflict of Interest

As the author of the research, I declare that I do not have any interests or conflicts. The YouTube video content provider that I used during the research was chosen only because it is the most accessed or most used data provider. I, as the author, have no vested interest, institutional relationship or contact with YouTube. In addition, during the course of the research, in accordance with the purpose of the study, some video content from some children's education channels on YouTube was analyzed in detail. Most of these video contents were analyzed in terms of mathematical content and some of the videos were found to be adequate, some were found to be inadequate and poor. In this analysis and reporting process, completely scientific processes have been carried out and I, as the author, have no interest/conflict between me and these content providers.

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Ethical Standards

Since the method of this research is document analysis from open access sources, ethics committee permission was not obtained as there was no need for an ethics committee permission for the research. In the whole process from the planning of this research to its implementation, from data collection to data analysis, all the rules specified to be followed within the scope of the "Higher Education Institutions Scientific Research and Publication Ethics Directive" were followed. None of the actions specified under the second section of the Directive, "Actions Contrary to Scientific Research and Publication Ethics", have been carried out. In the writing process of this research, scientific, ethical and citation rules were followed; no falsification was made on the collected data. This study has not been sent to any other academic publication environment for evaluation.

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Examining the Studies on the Advantages of Rural Areas in Mathematics Education

***Ayşe Nur Günay, **Kürşat Yenilmez**

Abstract. Problems related to education are mostly addressed in rural areas. In the literature, it is stated that qualified (mathematics) education(in) can also be provided in rural areas. The ability to provide qualified education in the countryside depends on being aware of the advantages provided by the countryside in education and taking advantage of these advantages, as well as identifying and solving problems. In our study, the advantages of rural education expressed in national and international literature were compiled using the document review model of qualitative research. As a result of the inductive content analysis, six themes expressing the educational advantages provided by the countryside were created as healthy environment and nutrition opportunities, local community values, the social function of the school is strong, teachers are effective in the local role, the number of students per teacher is low and a rich concrete living experience. The proposals expressed in the literature that will increase the use of the advantages provided by education in rural areas have been presented by comparing them with village institutes.

Keywords. Advantages of education in rural areas, mathematics education, village institutes, document review, content analysis.

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TDK (2023) defines rural areas as places where production based on natural resources is more common economically, where the average income level is generally lower than in cities, where there is a unique cultural structure and where social life is determined within the framework of traditions. The concept of rural can be defined in different ways based on administrative status, population and economic activities (Yoloğlu & Zorlu, 2020). Due to these differences in definitions, the scope of the concept of rural varies in countries around the world and each country develops unique education policies for rural education (Sevinç, Kantar Davran & Sevinç, 2016). Considering both the cultural dynamics of education and the characteristics of rural education, a national education policy is vital to ensure equal and quality education in rural areas. According to the 1739 numbered Turkish National Education Basic Law, equality of opportunity in education should be provided for every citizen of our country. It is the responsibility of the state to ensure that children living in rural areas also benefit from equal and qualified education (Yağan Güder, 2019).

From the foundation of the Republic until the multi-party period of 1950's, considering that nearly 75% of the population lived in rural areas, special education policies such as village institutes, village teacher schools, education courses and community centres were put into practice for the rural population. After this period, there were no special education policies for the rural population in Turkey; the educational problems of the rural population were tried to be solved through centralised village schools and regional primary boarding schools (YİBO) (Sevinç, Kantar Davran & Sevinç, 2016, p. 260). In Table 1 below, the number of students in disadvantaged student groups compiled from the 2021-2022 National Education Statistics data published by the Ministry of National Education is presented for the secondary school level. According to the data in Table 1, it is seen that the number of students in disadvantaged groups among all secondary school students is expressed in thousands.

Table 1.

Number of secondary school students in disadvantaged student groups (MEB, 2022).

Disadvantaged group	Total number of students	Number of male students	Number of female students
In rural secondary schools	239 222	121 868	117 354
Regional boarding secondary schools	51 152	26 228	24 524
Secondary schools with transported education	416 577	211 349	205 228
In secondary schools across Turkey	**5 293 067**	**2 697 181**	**2 595 886**

The problems experienced by disadvantaged student groups are expressed in the literature: Although transport education provides equal opportunity, it is stated by the students that it creates road fatigue, reduces the free time left for the student, and causes communication problems among peers (Şimşek & Büyükkıdık, 2017). In village schools, there are problems such as economic difficulties, material deficiencies, problems in school-parent communication and inadequacy of teachers' readiness for village conditions, and this situation can negatively affect the learning process (Sidat & Bayar, 2018, p. 247).

As of the 19th century, development studies have started to be carried out in rural areas (Howley, 1997). Rural areas have some unique characteristics. While supporting rural life, planning should be made in accordance with these characteristics (Ece, 2012). Garan (2005) states that rural-specific arrangements were not made in the curriculum renewal studies in our country and that rural education problems could not be overcome for this reason. It is observed that studies on rural education, especially mathematics education, are few in both national and international literature. It is stated that there is a need for studies comparing rural and urban education opportunities and characteristics. Education in urban and rural areas is unequal due to differences in social life (Garan, 2005). Urban population increases with industrialisation and social development. With urbanisation, economic, social, political and cultural changes are experienced and rural areas remain in the background. Curricula that are not specific to rural areas negatively affect the city, which has started to become rural with intensive migration (Akbayır & Ece, 2016).

Arnold, Newman, Gaddy, and Deen (2005) analysed rural education research conducted in the USA between 1991 and 2003. They found that there was a lack of quality research conducted in rural areas. According to their findings, the relationship and values between school and community are different in rural areas, and there are different variables such as creating learning opportunities, the relationship between school size and student achievement, the relationship between school and district capacity, and the expectations of the community and parents from schools that need to be examined separately in rural areas. In their analysis of the literature on rural education, Howley, Howley, and Huber (2005) report that there are very few empirical and applied studies examining mathematics education in rural schools and communities.

It is known that educational dynamics are different in rural and urban areas. However, according to Howley (2003), there are also differences in the educational achievement of rural areas. Regional classifications, regional population, distribution of local and community resources, regional community values, school climate, and focus on goals are the sources of educational differences between rural areas. Many reasons such as parents' educational characteristics (Çapuk & Ünsal, 2017; Yağan Güder, 2019), parenting interventions (Palavan & Göçer, 2017), limited access to resources (Atmaca, 2004; Vernon-Feagans, Kainz, Amendum, Gingsberg, Wood, & Bock 2012; Yağan Güder, 2019) are against rural educational environments. In rural areas, children work with their families and participate in home life. Since family education is inadequate, they cannot get help with their homework, and parents in rural areas raise children with stricter and harsh methods (Garan 2005). According to Faragher, Hill, and Clarke (2016), schools in rural areas are small and employ few education specialists. This situation may cause new teachers not to benefit sufficiently from their experienced colleagues. Teachers may have to teach outside their field, there are few opportunities for professional development, and the declining rural population affects policy development. Tachie and Chrishe (2013) listed the reasons for low mathematics achievement in rural schools as lack of materials, negative teacher behaviour, apathy, and absenteeism. Anderson (2005) states that students studying in rural high schools do not find advanced mathematics useful because they do not use it in their daily lives. Anderson and Chang (2011) found that rural high school students graduated with fewer mathematics credits and their mathematics level remained at a low level. Williams (2005), based on PISA 2000 results, examined the distribution of rural mathematics achievement by country. In 14 out of 24 countries, rural scores were lower than urban scores. Williams associates this situation with low socioeconomic level and states that it is directly proportional to community size.

It is also stated in the literature that rural education has important advantages. Kearney (1994), in his study titled "The Advantages of Rural Schools", mentioned many advantages that are also mentioned in other studies. For example, Boylan, Sinclair, Simith and Squires (1993) analysed teachers' survey results and reported that rural schools offer a healthier, quieter, safer life, lower crime rates and more clean, open spaces. A study analysing the educational advantages of rural areas was conducted by Alspaugh (1992). The difference between the scores of rural and urban areas in reading achievement in aptitude tests was very small. In addition, it was determined that socioeconomic-based discrimination in urban areas decreased the academic achievement of low socioeconomic students living in urban areas. In rural areas, it was stated that there was no socioeconomic-based discrimination. The low divorce rate in rural areas was evaluated as a situation in favour of students (Kaplan, 2010). Rural students have more regular breakfast and healthier eating habits than urban students. This situation has positive effects on course success (Onyechi & Ugwunnadi, 2009). The social structure in rural areas has a closer communication and children develop their expression skills in this environment. Rural society is in solidarity. Teachers work more devotedly due to their strong ties with the community (Anderson, 2005; DeYoung & Kannapel, 1999; Yurttaş, Yavuz, & Atasan, 2007). In rural education institutions, issues such as direct communication, creativity, less antisocial student behaviours, less demanding excursion activities, high level of teacher prestige and less bureaucracy are advantages (Batey & Hart-Landsberg, 1993; Özpınar & Sarpkaya, 2010). Rural small schools have advantages in terms of individual attention, co-operative learning, low levels of discipline problems, close co-operation between school and community, high teacher motivation resulting from less bureaucratic and more flexible administrative structure, more time and space for extra-curricular activities (Kearney, 1994). Combined classes, which are common in rural areas, offer flexible working groups due to age differences. An environment conducive to peer education is created (Feu Gelis, 2003, as cited in Morales-Romo, 2017). Anderson (2005) states that dropout rates are lower in rural schools. Preston (2006) analysed the experiences of rural teachers and reported that teaching activities and classroom management are easier in rural areas and high participation in extracurricular activities is observed. Students living in rural areas have a higher sense of responsibility and life experiences. In rural areas, children's participation in family life enables them to be hardworking, honest, co-operative and interested in life, and improves their self-confidence (Salamon, 1995; as cited in Taş, 2010). The environmental perceptions of high school students living in rural areas are higher than their peers living in urban areas (Terlemez, 2018). A similar result was found for secondary school students in Bölükbaşı's (2020) study; the visual perception scores of children living in the village were higher. In addition, children living in rural areas start preschool education naturally and have more opportunities to make observations in their lives. Thus, they have the opportunity to experience more concrete experiences in gaining autonomy than their urban peers. They have the opportunity to learn by doing and experiencing because they live in touch with nature (Şeker, 2015; Yurttaş, Yavuz, & Atasan, 2007). Outdoor teaching activities support the development of motor skills, which can positively affect the development of cognitive and social skills (Peltonen, 2002, as cited in Kilpimaa, Määttä, & Uusiautti, 2012). Students in rural areas find mathematics valuable and see it as an important tool to increase their welfare (Lucas & Fugitt, 2007; Toker, 2015). Students in rural areas do not have a problem such as technology addiction, while this is a common problem in urban areas (Gökçek & Toker, 2015).

Howley, Howley and Huber (2005) state that in rural schools, local people believe that schools are strong. They reported that students have strong communication skills and that there are many community members and students willing to learn despite the lack of economic and technological opportunities. They state that long-term professional development, community involvement and technological supports that will increase the capacity of teachers and administrators will positively affect rural areas.

According to Çiftçi (2010), mathematics achievement is low in rural areas, but positive perceptions of mathematics are high. In the 2003 PISA, Turkish students living in the Eastern and Southeastern Anatolia Regions, which have rural characteristics, had higher positive attitudes despite low achievement. Similarly, in TIMSS 2007 results, although mathematics achievement was below the average in rural countries such as Algeria, Egypt, Oman and Morocco, attitudes were found to be positive (Çiftçi, 2010). Karadeniz and Karadağ (2014), in their study examining mathematics anxiety and attitudes in rural areas, state that rural students need more support in terms of self-confidence in mathematics.

In addition to the advantages of rural areas, suggestions to increase the utilisation of these advantages have been another research question in the literature. It can be said that the studies providing suggestions are mostly seen in recent years. Pegg and Pannizon (2011) state that rural areas are behind in PISA results for Australia and that increasing the cooperation between rural secondary mathematics teachers and students and creating learning networks can increase mathematics achievement. Murphy (2019) examined an Australian rural school with high mathematics achievement. He reported that valuing mathematics, building teacher capacity, career education, vocational education and training, creating community connections, and individualised instruction increased mathematics achievement. Smith (2002) states that locally based education can be a solution for different rural areas with its flexible structure and there are five perspectives for this. These perspectives are listed as cultural research (ethnomathematics research), nature research, solving real world problems, entrepreneurship opportunities, and introduction to community life (as cited in Showalter, 2013).

Showalter (2013) states that the alignment of culture, terrain and content through locally based mathematics education, in other words, education by region, increases the success of rural mathematics education. This result is explained by the fact that locally based mathematics education eliminates the disconnect between classroom mathematics and life mathematics. Palinussa, Molle, and Gasperz, in their studies conducted in 2017 and 2021, state that realistic mathematics education in Indonesia is a teaching method designed specifically for the rural context. According to the research, using the existing daily context increases the ability to understand the maths problem in the brain, students do not have difficulty in communicating. Close mathematical examples facilitate the child's participation in reasoning processes.

Although in the international literature, suggestions to increase the utilisation of the educational advantages of rural areas have been clustered in recent years, in the history of Turkish education, these suggestions go back much further. As a result of the urgent need for national development and the existing socio-economic situation, the village institutes, which were a unique educational initiative, are a very successful example of rural education. The necessity for rural education to have national qualities has led our educators to examine the village institutes in order to find solutions to the problem of rural education in our country.

Village institutes were established with the aim of learning by doing, learning by living, full learning, raising individuals and educators who can solve problems. Since these goals could only be achieved through practical education, village institutes were concentrated in rural areas (Tural, 2016). The same educational goals are also valid in today's understanding of education.

The physical facilities of schools in urban centres are insufficient in the face of population density. It is important for our national welfare to be able to see the opportunities offered by rural education and to ensure that every student benefits from these opportunities at the highest level.

In village institutes, cultural courses were common, while agricultural and technical courses were modified according to the climate and needs of the region where the institute was located (Metin Göksu, 2020). Today, it can be predicted that differences appropriate to the region will increase success, provided that the basic cultural framework for rural areas remains the same. In addition, village institutes also provided important opportunities for learning environments outside the classroom. Thus, it is seen that rural areas create learning opportunities with work-oriented activities intertwined with nature (Tural, 2016).

Işıldak and Saylar (2022) examined the teaching in village institutes in terms of its suitability for STEM activities. As a result, they reported that the village institutes carried out a teaching that was suitable for 21st century skills, supported the theory of multiple intelligences, and supported by the technology of the period. In the research, it is stated that the tasks such as animal and plant care given to the students develop the awareness of responsibility, contribute to the power of observation, and today, village schools with transport have the potential to establish their own observatories with advantages such as altitude and air cleanliness.

When the national and international literature is analysed, the number of studies expressing the problems related to rural education and especially mathematics education is quite high. On the other hand, there are also studies finding that the region of study does not affect teachers' teaching practices. For example, Mohan, Swabey, and Kertesz (2019) studied 197 teachers in remote, rural, and urban schools in Fiji and reported that there was no difference in teaching activities (as cited in Palas, 2022). However, it is accepted among mathematics educators that learning mathematics can also take place qualitatively in rural areas due to the fact that mathematics learning depends on the individual effort of the student and its content is the same content based on logical inference (Arons, 1997; DeYoung, 1995, as cited in Howley, 2005). Benjamin (2006) compared the mathematics achievement of 5th grade students in rural America, China and Taiwan. He reported that students in rural China and Taiwan were more successful than students in rural America and that this difference could not be explained only by cultural factors. The quality of mathematics education in rural education depends on the effective use of opportunities in rural areas. For this reason, in this study, the advantages of rural education and mathematics education in national and international literature will be compiled and a comparison will be made of the situations that are seen as advantages nationally and internationally. As a result of our study, suggestions suitable for the effective utilisation of the advantages of rural education will be presented by comparing them with the village institutes.

In line with the above-mentioned objectives of our study, the question of how the advantages offered by rural areas to education are found in the literature will be sought. The related sub-questions can be listed as follows:

1. How is the distribution of the studies on the advantages offered by rural areas to education according to whether they were conducted in Turkey or abroad?

2. How is the distribution of studies on the advantages of rural areas in education according to years?

3. How is the distribution of the studies on the advantages offered by rural areas to education according to the type of research?

4. How is the distribution of the studies on the advantages of rural areas in education according to the research method?

5. How is the distribution of the studies on the advantages offered by rural areas to education according to the study group?

6. How is the distribution of the studies on the advantages of rural education according to the advantages of rural education?

7. How is the distribution of the studies on the advantages of rural education according to the suggestions for increasing the utilisation of the advantages of rural education?

Method

In this section, the research model, documents analysed, data collection and data analysis are explained.

Research Model

Qualitative research perspective was adopted in the study and document analysis model was used. Qualitative research is research in which qualitative data collection methods such as observation, interview and document analysis are used and a qualitative process is followed to reveal perceptions and events in a realistic and holistic way in a natural environment (Yıldırım & Şimşek, 2013, p. 45). Document analysis can be defined as the collection and examination of written and visual materials. It can be used in both qualitative and quantitative research. In qualitative research, it is important to evaluate documents according to the structure of that culture and the meanings attributed to them (Sönmez & Alacapınar, 2021, p. 110).

Analysed Documents

Review articles are written to synthesise the responses of studies published in scientific databases and journals to a specific research question. In systematic review articles, the selection criteria of the studies should be determined (Gülpınar & Güçlü, 2013, as cited in İlker & Melekoğlu, 2017). In this study, it is aimed to compile the advantages that rural areas offer to students and expressed in the literature. For this purpose, national theses and articles and international theses and articles were collected. The number of studies directly addressing the advantages of rural education is very few. For this reason, studies that address the advantages and disadvantages of rural education together, studies that offer solutions to take advantage of the opportunities of the countryside, and studies that examine the village institutes that have been successfully implemented in rural areas in Turkey were included. A total of 38 national and international studies, including 24 articles, 8 master's theses, 1 doctoral thesis, 1 book, 2 reports and 2 studies accessed from secondary sources, were analysed. Since the number of qualified studies related to the problem of our research in the literature is small, the studies that can be accessed from secondary sources were not eliminated. The original texts of these studies could not be accessed from the databases. It was considered that the selected studies belong to different cultures and different years. Because this diversity will increase the generalisability of the study in the context of different rural definitions and rural characteristics.

Data Collection

The documents were accessed from Google Scholar, Eric index, National Thesis Centre and Dergipark databases. The search words were "rural education", "rural mathematics education", "rural and urban schools", "village schools", "the advantages of rural education", "village institutes", "regional boarding schools". The 187 articles and theses that were thought to be related were downloaded. The abstracts, sub-headings and findings of the studies obtained from the databases were analysed and a categorisation was made according to whether they expressed the opportunities of rural education or not. Ethnomathematics studies, studies examining the effectiveness of a certain teaching method in rural areas and place-based mathematics education studies were excluded from the review. In the selection of the studies, no limit was set in terms of year, method, study group, etc., and the studies that could be accessed were categorised. As a result, a total of 38 studies were evaluated to be suitable for the purpose of our study.

Data Analysis

The collected documents were classified according to the years of publication, the type of the research, the method used and the sample of the research, and frequency and percentage values were tabulated.

Internal validity (credibility) in qualitative research requires that the findings are presented in a consistent and confirmable manner by different researchers. Lincoln and Guba (1985) state that one of the methods recommended to ensure credibility is triangulation (Yıldırım & Şimşek, 2021). In order to increase the internal validity of our research, the study on which each finding is based is indicated in the writing of each finding. External validity (transferability) in qualitative research can be defined as the applicability of the results in environments with similar characteristics. Detailed description and purposive sampling methods are recommended to increase transferability (Yıldırım & Şimşek, 2021). In our study, it was ensured that the reader could clearly see the raw data organised according to themes and the sources that led to this data. In addition, in the selection of the documents analysed, attention was paid to diversity in terms of research method, research type and rural area studies of different cultures. Reliability was aimed to be ensured by the authors coding separately while determining the content of the themes and assigning the agreed codes to the common theme.

The advantages of rural education identified in the collected documents were analysed by inductive content analysis method. Inductive content analysis is based on the analysis of the examined data with the help of codes created around a certain subject (Yıldırım & Şimşek, 2021). As a result of the examination of the collected studies, the situations presented as the advantage of studying in the countryside were associated with the components of the learning process and codes were obtained. The codes obtained were analysed according to their reasons, and the reasons they were associated with formed themes. Advantages arising from similar reasons were grouped under a theme. The themes created as a result of the analyses are as follows:

- Healthy environment and nutrition opportunities,
- Local community values,
- Strong social function of the school,
- Teachers being active in the local role,
- Low number of students per teacher and
- Rich concrete experience.

The data were also analysed by making a comparison of rural education opportunities in domestic and international studies. Recommendations aimed at taking advantage of rural education opportunities are presented in conjunction with analyses of studies examining village institutes. At the end of each analysis, tables were created to facilitate interpretation.

Results

In this section, the distribution of the analysed studies according to years, research type, research method, study group, advantages of rural education and suggestions for increasing the utilisation of these advantages are presented in tables.

Analysed studies

First of all, all studies analysed in this study are classified in Table 2 according to whether they were conducted in Turkey or abroad.

Table 2.

Distribution of the analysed studies according to whether they were conducted in Turkey or abroad

Researches Conducted Abroad	**Researches Conducted Domestically**
Alspaugh (1992), as cited in Kaplan (2010)	Yurttaş, Yavuz and Atasan (2007), as cited in Bölükbaşı (2020)
Boylan, Sinclair, Simith and Squires (1993)	Özpınar and Sarpkaya (2010)
Batey and Hart-Landsberg (1993)	Çiftçi (2010)
Kearney (1994)	Kaplan (2010)
Salamon (1995), as cited in Taş (2010)	Taş (2010)
Arons (1997), as cited in Howley, Howley and Huber (2005)	Karadeniz and Karadağ (2014)
DeYoung ve Kannapel (1999), as cited in Howley ve Howley (2005)	Şeker (2015)
	Toker (2015)
Peltonen (2002), as cited in Kilpimaa, Määttä and Uusiautti (2012)	Gökçek and Toker (2015)
Smith (2002), as cited in Showalter (2013)	Tural (2016)
Anderson (2005)	Akbayır and Ece (2016)
Howley, Howley and Huber (2005)	Sevinç, Kantar Davran and Sevinç (2016)
Preston (2006)	Terlemez (2018)
Benjamin (2006)	Bölükbaşı (2020)
Lucas as cited in Fugitt (2007)	Metin Göksu (2020)
Onyechi and Ugwunnadi (2009)	Işıldak and Saylar (2022)
Pegg and Pannizon (2011)	
Showalter (2013)	
Feu Gelis (2003), as cited in Morales-Romo (2017)	
Palinussa, Molle and Gasperz (2017)	
Murphy (2019)	
Mohan, Swabey and Kertesz (2019), as cited in Palas (2022)	
Palinussa, Molle and Gasperz (2021)	

As seen in Table 2, 22 of the 38 studies examined (58%) were conducted abroad and 16 of them (42%) were conducted domestically. The number of foreign and domestic studies analysed is close to each other.

Distribution of the analysed studies according to years

Table 3 shows the distribution of the analysed studies according to years.

Table 3.

Distribution of the analysed studies according to years

Years		Number of Researches
1992	**There are 7 studies before 2000.**	1
1993		2
1994		1
1995		1
1997		1
1999		1
2002	**There are 10 studies between 2000 and 2010.**	2
2003		1
2005		2
2006		2
2007		2
2009		1
2010	**There are 17 researches between 2011 and 2020.**	4
2011		1
2013		1
2014		1
2015		3
2016		3
2017		1
2018		1
2019		2
2020	**After 2020, there are 4 researches.**	2
2021		1
2022		1

As seen in Table 3, the issue of the advantages of rural education has been studied since the early 1990s. The number of studies on this subject has also increased over time. Between 2000 and 2020, approximately 50 per cent of the total number of studies were conducted. Accordingly, it can be said that the advantages of rural education and suggestions for utilising these advantages have been a topic that educators have focused on after 2010. The highest number of studies was conducted in 2010 with four studies. This is followed by 2015 and 2016 with three studies.

Distribution of the analysed studies according to type

Table 4 shows the distribution of the analysed studies according to their types as article, master's thesis or doctoral thesis.

Table 4.

Distribution of the analysed studies according to their types as article, master's thesis, doctoral thesis, report or book

	Articles	**Master Theses**	**Doctoral Theses**	**Books**	**Reports**
Total	24	8	1	1	2
National	9	7	-	-	-

De Young and Kannapel (1999) and Peltonen (2002) studies could not be accessed directly and their contents were accessed from secondary sources. No information about their species could be inferred.

According to Table 4, approximately 63% of the analysed studies are articles and 21% are master's theses. All but one of the master's theses were conducted in Turkey. Only 38 per cent of the articles were written in Turkey.

When Table 2 and Table 4 are analysed together, it is seen that articles, books and reports have been written since old years, while master's and doctoral theses and dissertations belong to studies after 2005.

Distribution of the analysed studies according to research method

Table 5 shows the distribution of the analysed studies according to the research method.

Table 5.

Distribution of the analysed studies according to research method

Qualitative	Quantitative	Qualitative and Quantitative
18	10	4

Since Arons (1997) is a book and five articles were accessed from secondary sources, a total of 32 research methods were included in the table.

According to Table 5, the number of qualitative studies is more than half of the analysed studies. Qualitative studies were preferred to reveal the educational situation in rural areas because they allow in-depth data collection and interpretation of data. Three of the four studies that used both qualitative and quantitative methods together were master's theses. Among qualitative studies, document analyses and among quantitative studies, correlational studies are the majority.

Distribution of the analysed studies according to the study group

Table 6 shows the distribution of the analysed studies according to the study group.

Tablo 6.

Distribution of the analysed researches according to the study group

Student	Teacher	All stakeholders of educationı
12+4=16	7+4=11	2 students, teachers, parents, administrators, ...

Four studies, Çiftçi (2010), Kaplan (2010), Toker (2015), Gökçek and Toker (2015), were conducted with students and teachers. Above 12 refers to the number of studies conducted only with students and 7 refers to the number of studies conducted only with teachers.
Seven studies were document analyses, one study was based on a book and five studies were accessed from secondary sources. Table 6 shows 12 + 4 + 7 + 2 = 25 studies.

According to Table 6, a total of 19 studies have one study group. Only six studies collected data from different study groups. Eight of the 10 quantitative studies were conducted with students. It can be evaluated that quantitative studies are suitable for reaching a large number of students. The studies conducted with teachers were either qualitative or both qualitative and quantitative. It can be said that the small number of participating teachers is determinative in this situation. Two studies aiming to reach all stakeholders of education were also conducted with qualitative method. Three of the four studies that reached teachers and students together were master's theses that used both qualitative and quantitative methods.

Distribution of the analysed studies according to the advantages of rural education

In this section, the advantages of rural education stated in the studies examined were subjected to inductive content analysis. As a result of the examination of the collected studies, the situations presented as the advantages of rural education were associated with the components of the learning process and codes were obtained. The codes obtained were analysed according to their reasons, and the reasons they were associated with formed themes. Advantages arising from similar reasons were grouped under a theme. In order to ensure objectivity, the sources on which the codes are based are given. The themes created as a result of the analyses are as follows:

- Healthy environment and nutrition opportunities,
- Local community values,
- Strong social function of the school,
- Teachers being active in the local role,
- Low number of students per teacher and
- Rich concrete experience

Theme 1-

Advantages associated with healthy environment and nutritional opportunities:

- A quieter environment *Sinclair, Simith and Squires (1993)*
- Excess of clean and open spaces *Sinclair, Simith and Squires (1993)*
- Regular breakfast and healthier eating habits *Onyechi and Ugwunnadi (2009)*

Theme 2-

Advantages associated with local community values:

- Non-discrimination on socio-economic grounds *Alspaugh (1992)*

- Lower crime rates *Sinclair, Simith and Squires (1993)*

- Low divorce rates *Alspaugh (1992)*

- Solidarity-oriented close communication *Anderson (2005), DeYoung and Kannapel (1999), Yurttaş, Yavuz and Atasan (2007)*

- Few antisocial student behaviours *Batey and Hart-Landsberg (1993), Özpınar and Sarpkaya (2010)*

- Positive attitudes towards mathematics and seeing it as a tool to increase life well-being *Çiftçi (2010), Lucas and Fugitt (2007), Toker (2015)*

- A society willing to learn *Howley, Howley and Huber (2005)*

- Lower dropout rates *Anderson (2005)*

- High participation in extracurricular activities *Preston (2006)*

Theme 3-

Advantages associated with the strong social function of the school:

- Close co-operation between school and community *Kearney (1994)*

- Local community belief that schools are strong *Howley, Howley and Huber (2005)*

Theme 4-

Advantages associated with teachers' effectiveness in the local role:

- High level of teacher prestige *Batey and Hart-Landsberg (1993), Özpınar and Sarpkaya (2010)*

- Increased teacher dedication as a result of strong ties with the community *Anderson (2005), DeYoung and Kannapel (1999), Yurttaş, Yavuz and Atasan* (2007)

- High teacher motivation due to less bureaucratic structure and more flexible administrative structure *Kearney (1994)*

Theme 5-

Advantages associated with the low number of students per teacher:

- Direct communication in educational institutions *Batey and Hart-Landsberg (1993), Özpınar and Sarpkaya (2010)*

- Supporting creativity *Batey and Hart-Landsberg (1993), Özpınar and Sarpkaya (2010)*

- Low level discipline problems *Kearney (1994)*

- The fact that excursion activities require less effort *Batey and Hart-Landsberg (1993), Özpınar and Sarpkaya (2010)*

- Individualised teaching opportunity *Kearney (1994)*

- Easier implementation of cooperative teaching activities *Feu Gelis (2003), Kearney (1994)*

- Easier classroom management *Preston (2006)*

Theme 6-

Advantages associated with rich concrete experience:

- More time and space for extra-curricular activities *Kearney (1994)*

- Self-confident, hard-working, honest and co-operative students who have developed a sense of responsibility arising from being a partner in family life *Salamon (1995)*

- Starting preschool education naturally *Şeker (2015), Yurttaş, Yavuz and Atasan (2007)*

- Improved observation ability *Şeker (2015), Yurttaş, Yavuz and Atasan (2007)*

- Early development of psychomotor skills and cognitive and social skills *Peltonen (2002), Şeker (2015), Yurttaş, Yavuz and Atasan (2007)*

- Students who gained autonomy early *Şeker (2015), Yurttaş, Yavuz and Atasan (2007)*

- Students with developed communication skills *Howley, Howley and Huber (2005)*

- Students with developed environmental perceptions *Terlemez (2018)*

- Students with high visual perception scores *Bölükbaşı (2020)*

- Students without technology addiction *Gökçek and Toker (2015)*

Distribution of the analysed studies according to their recommendations for increasing the utilisation of educational advantages in rural areas

The suggestions offered by the studies analysed in the study to increase the utilisation of educational advantages in rural areas are as follows:

- Co-operation between rural teachers and students should be increased. *Murphy (2019), Pegg and Pannizon (2011)*

- Co-operation between rural educators and academics should be increased. *Pegg and Pannizon (2011)*

- Technological support should be increased. *Howley, Howley and Huber (2005)*

- Valuing mathematics should be emphasised. *Murphy (2019)*

- Career training should be provided to students and teachers. *Murphy (2019)*

- In-service trainings should be increased. *Murphy (2019)*

- Individualised teaching should be emphasised. *Murphy (2019)*

- Real world problems based on realistic mathematics education should be included. *Palinussa, Molle, and Gasperz (2017) and (2021), Smith (2002)*

In addition to the suggestions presented in the international literature, the following suggestions are presented in the national literature based on the example of village institutes.

- Local-based education *Metin Göksu (2020), Smith (2002)*

- Targeting applied education (learning by doing, learning by living, full learning) *Tural (2016)*

- The share of activities intertwined with nature should be increased *Tural (2016)*

- STEM-based activities should be included *Işıldak and Saylar (2022)*

Locally based education, in other words, education according to the region, harmonises culture, terrain and content. This perspective was applied in the village institutes by differentiating agricultural and technical courses according to the climate and needs of the region where the school was located. Basic cultural courses, on the other hand, were common in accordance with the goal of raising citizens with a common level of consciousness and culture.

Conclusion and Discussion

When the literature is analysed, it is seen that a significant number of studies on rural education have been conducted. In the discussion section, the relevant studies will be sampled sufficiently to emphasise the different aspects of our study from the studies in the literature.

Arnold, Newman, Gaddy, and Deen (2005) presented a review of rural education research conducted in the USA between 1991 and 2003. Howley, Howley and Huber (2005) published a study analysing the literature on rural education. As explained in the introduction, these studies analysed rural education research from a general perspective.

On the other hand, there are also some studies that directly include the advantages of rural education in different dimensions. Some of these studies are focused on education, some on mathematics education. They also reported rural educational advantages while investigating a different research question. Çiftçi (2010), Murphy (2019), Akbayır and Ece (2016), Kilpimaa, Määttä, and Uusiautti (2012), and Yağan Güder (2019) can be given as examples. Boylan, Sinclair, Simith, and Squires (1993), another study that reached the superiority of rural education as an indirect result, expressed the superiority of rural areas by analysing the results of teachers' surveys. Onyechi and Ugwunnadi (2009) focused on rural students' breakfast habits and healthy eating opportunities as advantages.

In this study, the advantages that rural education provides to the education process were compiled from the research in the literature. The advantages of rural education were categorised under the themes of healthy environment and nutrition opportunities, local community values, strong social function of the school, teachers being active in the local role, low number of students per teacher, and rich concrete experiences. Two studies, Alspaugh (1992) as cited in Kaplan (2010) and Kearney (1994), were found to compile the advantages of rural education. Since our study covers more recent research, its findings diversify the advantages of rural education. In addition, the fact that it also includes the suggestions presented in the literature for utilising the advantages of rural education is a different aspect of our study.

Studies on the advantages of rural education have increased after 2010. Although master's and doctoral theses increased after 2005, most of the relevant studies are articles. The advantages of rural education were mainly analysed through qualitative studies. The fact that the definition of rural differs across countries significantly differentiates the processes and findings of the studies and reduces their empirical generalisability. Although quantitative studies provide data from more participants, the data obtained are insufficient in determining the details of learning-teaching processes. Master's and doctoral theses, which are more long-term than articles, can be conducted by using qualitative and quantitative methods together.

While investigating the advantages of rural education, it is seen that teachers and students are mostly selected as the study group. Since students constitute crowded groups, quantitative methods were preferred to collect data. More qualitative studies were conducted with teachers. It can be said that this situation provided educators with more detailed data on rural education processes. When the distribution of the studies according to the advantages of rural education is analysed, it is seen that some of the advantages of rural education are expressed more frequently in the older studies conducted before 2005. Some of them are frequently mentioned in more recent studies and some of them are emphasised in both old and new studies. The advantages of rural education emphasised in older studies were related to the theme of the strong social function of the school and healthy environmental opportunities. The advantages of education in rural areas, which are frequently mentioned in current studies, are healthy nutrition opportunities, high environmental perception and visual perception scores, and lack of technology addiction.

The themes associated with the advantages of rural education, which were common in both old and current studies, were found to be local community values, teachers being active in the local role, low number of students per teacher and rich concrete experience. Accordingly, it can be stated that the majority of the advantages provided by rural education have been recognised since ancient times and that rural education has the power to provide new advantages as a result of the changing social structure.

It is seen that there is a consensus on suggestions for increasing the utilisation of the advantages of rural education. Another conclusion of our study is that the village institutes, as a successful example of rural education, can give direction to new and national rural education policies.

Recommendations

According to our findings, the following suggestions can be offered to our researchers:

- Qualitative studies aiming to determine the dynamics of our country regarding the advantages of rural education should be emphasised.

- Since theses can be conducted in a longer process than articles, qualitative and quantitative methods can be used together. Theses on the advantages of rural education should be encouraged since they will provide rich data.

- International literature should be followed, but care should be taken not to take educational practices directly without evaluating cultural differences.

Suggestions for determining education policies can be listed as follows:

- The different qualities of our rural regions in our country should be considered as a richness and educational contents should be differentiated according to the climate and needs of the regions. While determining the differences, the aim of raising citizens with a common consciousness and culture should be taken into consideration and basic culture courses should be preserved as common.

- The ability of schools in rural areas to be self-sufficient by creating their own resources should be taken into consideration and rural schools should be invested in this direction.

- Research on rural education should be supported.

- The results of research analysing rural education should be used in determining educational policies.

- Teachers who will work in rural areas should be trained as solution-oriented education specialists who are prepared for rural conditions before they start their service.

- Co-operation among rural teachers and in-service trainings for teachers should be increased.

- More experienced teachers should also be assigned to rural areas. Thus, increased professional sharing will support new teachers.

- It can be stated that it is the most important requirement for our educators working in rural areas to be aware of the advantages provided by rural areas.

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Determining the Level of Computational Thinking Skills of Science Teacher Candidates

***Haluk Elbahan, **Meryem Hatun Elbahan, ***Mustafa Zafer Balbağ**

Abstract. In this study, it was aimed to compare the computational thinking skills of science teacher candidates, according to some variables (gender, class level, having a computer, daily average computer usage time, following technological developments and monthly income level of families). In the study, the survey model, one of the quantitative research methods, was used. The study group of the research consists of Science Teacher Candidates studying at the Faculty of Education of a state university in Türkiye during the 2021-2022 academic year. The data collection tool of the research is the "Computational Thinking Skills Scale" developed by Dolmacı and Akhan (2020). When the results of the study were examined, it was seen that the computational thinking skills of pre-service teachers were generally high. According to the gender variable, it is seen that the statistically significant difference in sub-factors is in favour of male teacher candidates. According to the family monthly income level variable, it has been understood that the statistically significant difference is in favour of the pre-service teachers whose income level is 8001TL and above.

Keywords. Science, Science teacher candidates, computational thinking skill

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Today, when technological developments are accelerating and mechanisation is increasing, it is unthinkable for societies consisting of individuals who only assume the role of consumers to take part effectively in the international race. In every period, the education policies of societies to be included in this race have aimed to raise the needed human profile. In this context, first of all, it is necessary to determine the knowledge and skills that the next generation should possess. Recently, skills such as creativity, communication, cooperation, entrepreneurship, problem solving, and analytical thinking are frequently listed as 21st century skills (OECD, 2018). In line with technological developments, “computational thinking skill”, which can be defined as “problem solving using technology”, has been added to this list (Gretter &Yadav, 2016).

It is understood that there is no consensus on the Turkish equivalent of the expression "computational thinking". While Aldağ and Tekdal (2015); Şahiner and Kert (2016) used the non-Turkish expression "computational thinking", Korkmaz, Çakır and Özden (2015) has come up with a Turkish equivalent for the term as "computer thinking", and which means thinking like a computer. Doğan, Çınar, Bilgiç and Tüzün (2015) used the term "computational thinking" and Özkeş (2016); Dolmacı and Akhan (2020) used the term "computational thinking" as used in this study. Barut, Tuğtekin and Kuzu (2016), and Demir and Seferoğlu (2017) translated this concept into Turkish as "information processing thinking" in their studies.

According to Wing (2006), computational thinking is critical thinking or the application of existing knowledge to solve complex problems in mathematics, science, and STEM (science, technology, engineering, and mathematics) in general. Furthermore, computational thinking is considered to include problem-solving strategies such as abstraction at different hierarchical levels, algorithmic thinking, automation, decomposition, modelling, patterning, iteration, scaling, and symbolic representation. According to Aho (2012), computational thinking is formulated as problem decomposition, logical reasoning, and algorithm creation. In a study carried out in 2011, it was emphasised that computational thinking is a process that includes various characteristics. These characteristics are oriented towards solving a problem that is encountered while;

- Formulating solutions to problems using computers and other tools.
- Analysing data by organizing it logically
- Presenting data using abstractions such as models and simulations
- Automating solutions through algorithmic reasoning

- Identifying, analysing, and implementing possible solutions to ensure efficient and effective integration of solution steps and resources.
- Transferring or generalising the applied problem-solving process to other problems (ISTE & CSTA, 2011).

Within the framework of the maker movement, which integrates do-it-yourself (DIY) projects with technology, the aim is to develop individuals' production skills with technology (Bakırcı & Kutlu, 2018). In this process, where many different skills are used, the place of computational thinking skills is very important (Grover & Pea, 2013). Considering that teachers, who will be the architects of the next generation, will have their students develop these skills, they should have sufficient mastery of these skills. In order to be one step ahead of their students always and to be a role model for them, it has become important for teachers to master comprehensive skills such as computational thinking (Dolmacı & Akhan, 2020).

According to Rahayu and Osman (2019), computational thinking can help prospective science teachers solve problems in daily life more easily. They also say that they need to have knowledge and understanding of computational thinking skills so that they are confident and ready to face the challenges of learning in the 21st century. The subject of this study is also related to computational thinking skills and it aims to examine the computational thinking skills of science teacher candidates studying in the Department of Science Education in terms of different demographic characteristics. In line with this main purpose, the following questions were sought to be answered.

1- What are the computational thinking skill levels of science teacher candidates'?

2- Do science teacher candidates' computational thinking skills differ by gender?

3- Do science teacher candidates' computational thinking skills differ by grade level?

4- Do science teacher candidates' computational thinking skills differ by having a computer?

5- Do science teacher candidates' computational thinking skills differ by average daily computer use?

6- Do science teacher candidates' computational thinking skills differ according to the following technological developments?

7- Do science teacher candidates' computational thinking skills differ according to their family income level?

Method

This study, which examined the level of computational thinking skills of science teacher candidates, used the survey model, one of the quantitative research methods. Survey models are research approaches that aim to describe a past or present situation as it exists. In addition, it attempts to define the event, individual, or phenomenon that is the subject of the research within its own conditions and as it exists (Karasar, 2009). In this study, the relational survey model was used in accordance with the purpose.

Study Group

The study group of the research consists of undergraduate students studying in the Department of Science Teaching at the Faculty of Education of a state university during the 2021-2022 academic year. Among the teacher candidates participating in the study group, 142 (72.8%) were female and 53 (27.2%) were male. According to the results frequency analysis of the participants' grade level variable, 47 of the teacher candidates were in the 1st grade (24.1%), 43 were in the 2nd grade (22.1%), 49 were in the 3rd grade (25.1%), and 56 were in the 4th grade (28.7%). Additional information about the study group is presented in Table 1.

Table 1.

Demographic Characteristics of Prospective Science Teachers

Variables		f	%
Gender	Female	142	72.8
	Male	53	27.2
Class Level	Grade 1	47	24.1
	Grade 2	43	22.1
	Grade 3	49	25.1
	Grade 4	56	28.7
Computer Ownership Status	Has a computer	170	87.2
	No computer	25	12.8
Daily Average Duration of Computer Use	Less than 1 hour	61	31.3
	1-3 hours	66	33.8
	3-6 hours	49	25.1
	More than 6 hours	19	9.7
Fallowing Technological Developments	I do not follow	9	4.6
	I rarely follow	99	50.8

	I often follow	87	44.6
Monthly İncome Level Of The Family	Less than 1000TL	5	2.6
	Between 1001-4000TL	67	34.4
	Between 4001-8000TL	93	47.7
	8001TL and over	30	15.4

Data Collection Tool

The data collection tool used in the study is the "Computational Thinking Skills Scale (CTS)" developed by Dolmacı and Akhan (2020). The scale consists of 40 items and 5 sub-dimensions and is a five-point Likert scale consisting of "strongly agree", "agree", "undecided", "disagree", and "strongly disagree" options. The sub-dimensions are: Factor 1: Ability to Use Computers (M1, M2, M3); Factor 2: Algorithmic - Analytical Thinking (M4, M5, M6, M7, M8, M9, M10, M11, M12, M13, M14); Factor 3: Creative Problem Solving (M15, M16, M17, M18, M19, M20, M21, M22, M23, M24, M25, M26, M27); Factor 4: Collaboration (M28, M29, M30, M31, M32, M33, M34); Factor 5: Critical Thinking (M35, M36, M37, M38, M39, M40). The reliability of the scale was re-tested and the internal consistency coefficient (Cronbach's Alpha) was calculated. Accordingly, the reliability coefficient values for the scale and factors are shown in Table 2.

Table 2.

Reliability Coefficient Values of the Scale and its Subdimensions

	Cronbach's Alpha	
Scale Dimensions	**Dolmacı & Akhan (2020)**	**This Research**
Computer Use Skills	.91	.77
Algorithmic- Analytical Thinking Skills	.87	.93
Creative Problem Solving Skills	.88	.87
Ability to Collaborate	.83	.92
Critical Thinking Skills	.74	.88
Total	.94	.96

Data Analysis

The analysis of the data obtained in the study was carried out through the SPSS program. Skewness and kurtosis values were examined for the normality test of the data and the results of the analysis are given in Table 3.

Table 3.

Analysis Results Regarding the Distribution of Data

Factors	Skewness	Kurtosis
Factor 1: Computer Use Skills	-.787	.722
Factor 2: Algorithmic- Analytical Thinking Skills	-.03	.418
Factor 3: Creative Problem Solving Skills	.274	-.121
Factor 4: Ability to Collaborate	-.356	.276
Factor 5: Critical Thinking Skills	-.051	.719
General	.251	.602

By analysing the results in Table 3, it has been determined that the research data is normally distributed. The fact that the skewness and kurtosis values are between - 1.5 and + 1.5 supports that the data distribution found within the study is normal (Tabachnick & Fidell, 2013). In accordance with the results of the normality test, the independent samples t-test and one-way ANOVA were used to evaluate the data.

Results

In this section, the findings obtained for the whole scale and sub-problems of the study are presented. Table 4 presents descriptive statistics related to the item averages of teacher candidates' computational thinking skills.

Table 4**.**

Descriptive Statistics Related to Item Means of Teacher Candidates' Computational Thinking Skills Scores

Computational Thinking Skills Scale				
	Articles	$\bar{X}$	**Total**	**Sd**
M1	I use technological tools to solve the problems I encounter in my daily work.	4.17	814	0.71
M2	I use computers and similar technological tools when necessary in my lessons and homework.	4.48	873	0.73
M3	I use computers and similar technological tools in all problems I encounter.	3.72	725	0.97
M4	I understand the connections and meanings between numbers and formulas.	3.92	765	0.76

M5	I try to solve problems that seem complex or of different types.	3.86	752	0.73
M6	I understand explanations using mathematical expressions.	3.94	768	0.73
M7	I solve problems using abstractions in different ways.	3.68	717	0.85
M8	I break the problem into smaller parts when necessary.	3.95	771	0.68
M9	I evaluate the variables in the right place to solve the problem.	3.88	757	0.74
M10	When faced with a problem, I construct an equation to solve it.	3.96	773	0.62
M11	I visualize the solution of the problem in my mind.	4.04	788	0.72
M12	When finalising a problem, I perform all phases step by step in a planned manner.	3.95	771	0.78
M13	I show data in different ways such as simulations or models in problem solving.	3.55	693	0.95
M14	I can apply the solution methods I have designed in order and according to their level.	3.84	749	0.81
M15	I can reformulate a problem into a problem that I know how to solve.	3.81	743	0.84
M16	When solving problems, I carry out the tasks necessary to achieve a common goal simultaneously.	3.85	751	0.76
M17	I am curious when I start researching a new topic.	4.23	824	0.65
M18	I am always prepared to discover something new.	4.06	791	0.79
M19	I find new ways to learn difficult things.	3.89	759	0.79
M20	I develop new and original ways of solving a problem.	3.74	730	0.81
M21	I enjoy thinking about the solution to a problem.	3.85	751	0.84
M22	I think about a situation in detail and come up with innovative ways.	3.83	746	0.80
M23	I read thoughtfully.	4.23	824	0.66
M24	I do not hesitate to explain my solutions to others.	3.98	776	0.88
M25	I produce many solutions to a problem in a small amount of time.	3.48	678	0.89
M26	I give my own answers to the hypotheses I generate for a problem.	3.89	759	0.65

M27	Not all information is always right for me.	4.19	817	0.67
M28	I get better results through cooperative learning approach.	3.90	760	0.83
M29	I prefer cooperative learning to solve problems.	3.69	720	0.95
M30	I come up with more ideas for solving problems in cooperative learning.	3.92	764	0.74
M31	I learn cooperatively with my friends in the group.	3.92	764	0.81
M32	I exchange ideas with representatives of different ideas in the group.	4.09	797	0.67
M33	I contribute to cooperative working.	4.15	810	0.63
M34	I increase group dynamics in cooperative learning.	3.91	762	0.83
M35	I take into account the positive and negative aspects when presenting a solution to a problem.	4.21	820	0.60
M36	I see the problem in the subject I aim to study.	4.05	789	0.58
M37	I consider the possible consequences of different ways of solving the problem.	4.01	781	0.63
M38	I structure the process of solving a problem according to the problem.	3.99	779	0.55
M39	I try to determine the most appropriate one among the possible solutions.	4.16	812	0.56
M40	I organise information from different sources appropriately to solve the problem.	4.13	805	0.62
Total		3.95	771	0.75

As seen in Table 4, the overall mean of the scale aiming to determine the computational thinking skills of prospective science teachers was found as 3.95. In the scale, 21 items (M3, M4, M5, M6, M7, M9, M13, M14, M15, M16, M19, M20, M21, M22, M25, M26, M28, M29, M30, M31 and M34) were below the mean and there were no items with a mean below 3. The item with the highest mean was item 2 while the item with the lowest mean was item 25.

In Table 5, the examination of the averages of science teacher candidates' computational thinking skills according to the whole scale and sub-dimensions is discussed.

Table 5.

Examination of the Averages of Science Teacher Candidates' Computational Thinking Skills According to the Whole Scale and Sub-Dimensions

Sub - dimension (Factors)	N	Min	Max	$\bar{X}$	Sd
Factor 1: Computer Use Skills	195	2.00	5.00	4.12	.68
Factor 2: Algorithmic- Analytical Thinking Skills	195	2.08	5.00	3.87	.57
Factor 3: Creative Problem Solving Skills	195	2.91	5.00	3.94	.51
Factor 4: Ability to Collaborate	195	1.86	5.00	3.94	.64
Factor 5: Critical Thinking Skills	195	2.67	5.00	4.09	.47
Total	195	2.65	5.00	3.95	.47

Table 5 shows the averages of science teacher candidates in the total and sub-dimensions of the scale for computational thinking skills. Accordingly, when analysed in terms of total and sub-dimensions, it is seen that all of the averages are above 3.5. When the data in the table are analysed, it could be said that the computational thinking skills of the science teacher candidates are generally high, "computer usage skills" among the sub-dimensions is higher than the other dimensions, and the lowest sub-dimension is "algorithmic - analytical thinking skills".

In the study, an answer to the question "Do the computational thinking skills of science teacher candidates differ according to gender?" has been sought. The results of the findings are given in Table 6.

Table 6.

Examination of t-test Results of Computational Thinking Skills of Science Teacher Candidates According to Gender

Factors and Total	Gender	N	$\bar{X}$	Sd	Std. Error Mean	t	p
Factor 1: Computer Use Skills	Female	142	4.09	.64	.05	-0.82	.409
	Male	53	4.18	.75	.10		
Factor 2: Algorithmic-Analytical Skills	Female	142	3.79	.52	.04	-2.98	*.003
	Male	53	4.05	.62	.08		
Factor 3: Creative Problem Solving Skills	Female	142	3.87	.47	.03	-3.11	*.002
	Male	53	4.12	.55	.07		
Factor 4: Ability To Collaborate	Female	142	3.88	.63	.05	-1.92	.055
	Male	53	4.08	.65	.09		

Factor 5: Critical Thinking Skills	Female	142	4.06	.42	.03	-1.10	.275
	Male	53	4.16	.58	.07		
Total	Female	142	3.89	.41	.03	-2.542	.013
	Male	53	4.10	.54	.07		

*p<.005

Table 6 shows the results of the independent sample t-test analysis to examine the results of the computational thinking skills scale of science teacher candidates according to the gender variable. According to the test results, there was a significant difference in Factor 2 sub-dimension (t:-2.98, p<.005) and Factor 3 sub-dimension (t:-3.11, p<.005) and this difference was in favour of male teacher candidates. There was no significant difference in the overall scale and other sub-dimensions according to gender.

Another question that an answer has been sought within the study was "Do the computational thinking skills of science teacher candidates differ according to grade level?". The results of the findings are given in Table 7.

Table 7.

ANOVA Results of the Investigation of the Computational Thinking Skills of Science Teacher Candidates According to the Grade Level Variable

Class levels		**Sum of squares**	**sd**	**Mean squares**	**F**	**p**
Computer Use Skills	Between Groups	1.353	3	0.451	0.987	0.400
	Within Groups	87.249	191	0.457		
	Total	88.602	194			
Algorithmic-Analytical Skills	Between Groups	0.179	3	0.060	0.183	0.908
	Within Groups	62.118	191	0.325		
	Total	62.297	194			
Creative Problem Solving	Between Groups	0,334	3	0.111	0.426	0.735
	Within Groups	49.905	191	0.261		
	Total	50.239	194			
Ability to Collaborate	Between Groups	0.175	3	0.058	0.139	0.937
	Within Groups	80.186	191	0.420		
	Total	80.361	194			
Critical Thinking Skills	Between Groups	0.361	3	0.120	0541	0.655
	Within Groups	42.428	191	0.222		
	Total	42.788	194			
Total	Between Groups	0.101	3	0.034	0.153	0.928
	Within Groups	42.086	191	0.220		
	Total	42.186	194			

Table 7 shows the results of one-way analysis of variance (ANOVA) in order to test the differentiation of the results of the computational thinking skills scale of science teacher candidates according to the grade level variable. When the table is examined, it is seen that there is no significant difference in all factors and the scale in general according to the grade level variable (p>.005).

In the study, an answer to the question "Do the computational thinking skills of science teacher candidates differ according to having a computer?" was sought. The results of the findings are given in Table 8.

Table 8.

Investigation of t-test Results of Science Teachers Candidates' Computational Thinking Skills According to the Variable of Having a Computer

Factors and Total	**Computer Ownership Status**	**N**	$\bar{X}$	**Sd**	**Std.Error Mean.**	**t**	**p**
Computer Use Skills	Has A Computer	170	4.20	.615	.047	4.94	*.000
	No Computer	25	3.53	.781	.156		
Algorithmic-Analytical Thinking Skills	Has A Computer	170	3.89	.560	.043	1.61	.109
	No Computer	25	3.69	.590	.118		
Creative Problem Solving Skills	Has A Computer	170	3.94	.506	.038	0.45	.648
	No Computer	25	3.89	.530	.106		
Ability to Collaborate	Has A Computer	170	3.93	.640	.049	-0.22	.826
	No Computer	25	3.96	.678	.135		
Critical Thinking Skills	Has A Computer	170	4.11	.445	.034	2.03	.043
	No Computer	25	3.91	.589	.117		
Total	Has A Computer	170	3.97	.455	.035	1.53	.126
	No Computer	25	3.81	.522	.104		

*****p<.005

Table 8 shows the results of independent sample t-test analysis in order to examine the results of the computational thinking skills scale of pre-service science teachers according to the variable of having a computer. According to the test results, it was seen that there was a significant difference in Factor 1 sub-dimension (t: 4.94, p<.005) and this difference was in favour of the pre-service teachers who had a computer. There is no statistically significant difference in the overall scale and other sub-dimensions according to the status of having a computer.

In the study, an answer to the question "Do the computational thinking skills of pre-service science teachers differ according to the average daily computer usage time?" was sought. The results of the findings are given in Table 9.

Table 9.

Analysis of ANOVA Results According to the Average Daily Computer Usage Time Variable of Science Teacher Candidates' Computational Thinking Skills

Average Daily Computer Time		Sum of Squares	sd	Mean Square	F	p	Significance
Computer Use Skills	Between Groups	9.96	3	3.32	8.06	*.000	4>1 3>1 2>1
	Within Groups	78.63	191	0.41			
	Total	88.60	194				
Algorithmic-Analytical Thinking Skills	Between Groups	2.29	3	0.76	2.43	.066	
	Within Groups	60.00	191	0.31			
	Total	62.29	194				
Creative Problem Solving Skills	Between Groups	2.39	3	0.80	3.19	*.025	4>1
	Within Groups	47.84	191	0.25			
	Total	50.23	194				
Ability to Collaborate	Between Groups	1.64	3	0.54	1.33	.265	
	Within Groups	78.71	191	0.41			
	Total	80.36	194				
Critical Thinking Skills	Between Groups	1.70	3	0.56	2.64	.050	
	Within Groups	41.08	191	0.21			
	Total	42.78	194				
Total	Between Groups	2.37	3	0.79	3.80	*.011	4>1
	Within Groups	39.81	191	0.20			
	Total	42.18	194				

*p<.005 1=Less than 1 hour 2=between 1-3 hours 3=between 3-6 hours 4=More than 6 hours

Table 9 shows the results of one-way analysis of variance (ANOVA) to test the differentiation of the results of the computational thinking skills scale of pre-service science teachers according to the variable of average time of daily computer use. When the table is examined, it is seen that there is a significant difference between Factor 1, Factor 3 and the overall scale according to the average daily computer usage time variable (p<.005). There is no statistically significant difference in other sub-dimensions.

In the study, an answer to the question "Do the computational thinking skills of pre-service science teachers differ according to the status of following technological developments?" was sought. The results of the findings are given in Table 10.

Table 10.

Analysis of ANOVA Results According to the Variable of Following Technological Developments of Science Teacher Candidates' Computational Thinking Skills

Following Technological Developments		**Sum of Squares**	**sd**	**Mean Squares**	**F**	**p**	**Significance**
Computer use skills	Between Groups	20.620	2	10.310	29.118	*.000	3>1 3>2 2>1
	Within Groups	67.982	192	0.354			
	Total	88.602	194				
Algorithmic-Analytical Thinking Skills	Between Groups	7.010	2	3.505	12.171	*.000	3>1 3>2
	Within Groups	55.287	192	0.288			
	Total	62.297	194				
Creative Problem Solving	Between Groups	5.450	2	2.725	11.681	*.000	3>1 3>2
	Within Groups	44.789	192	0.233			
	Total	50.239	194				
Ability to Collaborate	Between Groups	4.985	2	2.493	6.350	*.002	3>1 3>2
	Within Groups	75.375	192	0.393			
	Total	80.361	194				
Critical Thinking Skills	Between Groups	5.630	2	2.815	14.547	*.000	3>1 3>2
	Within Groups	37.158	192	0.194			
	Total	42.788	194				
Total	Between Groups	6.543	2	3.272	17.624	*.000	3>1 3>2
	Within Groups	35.643	192	0.186			
	Total	42.186	194				

* p<.005 1=I do not follow 2=I rarely follow up 3=I often follow up

Table 10 shows the results of one-way analysis of variance (ANOVA) to test the differentiation of the results of the computational thinking skills scale of science teacher candidates according to the variable of following technological developments. According to the data, it was seen that there was a significant difference in all factors and the scale in general according to the variable of following technological developments (p<.005). In the study, an answer to the question "Do the computational thinking skills of science teacher candidates differ according to their family income levels?" was sought. The results of the findings are given in Table 11.

Table 11.

Investigation of ANOVA Results of Science Teacher Candidates' Computational Thinking Skills According to Family Monthly Income Level Variable

Family Monthly Income Level		**Sum of Squares**	**sd**	**Mean Squares**	**F**	**p**	**Significance**
Computer Use Skills	Between Groups	9.943	3	3.314	8.048	*.000	2>1 3>1 4>1 4>2 4>3
	Within Groups	78.658	191	0.412			
	Total	88.602	194				
Algorithmic-Analytical Thinking skills	Between Groups	7.537	3	2.512	8.763	*.000	2>1 3>1 4>1 4>2 4>3
	Within Groups	54.760	191	0.287			
	Total	62.297	194				
Creative Problem Solving Skills	Between Groups	4.866	3	1.622	6.827	*.000	4>1 4>2 4>3
	Within Groups	45.373	191	0.238			
	Total	50.239	194				
Ability to Collaborate	Between Groups	3.029	3	1.010	2.493	0.061	–
	Within Groups	77.332	191	0.405			
	Total	80.361	194				
Critical Thinking Skills	Between Groups	2.940	3	0.980	4.697	*.003	4>2 4>3
	Within Groups	39.848	191	0.209			
	Total	42.788	194				
Total	Between Groups	5.140	3	1.713	8.833	*.000	4>1 4>2 4>3
	Within Groups	37.047	191	0.194			
	Total	42.186	194				

*p<.005 1: Less than 1000TL, 2: 1001-4000TL, 3: 4001-8000TL, 4: 8001TL and above

Table 11 shows the results of one-way analysis of variance (ANOVA) to test the differentiation of the results of the computational thinking skills scale of science teacher candidates according to the variable of family income level. According to the data, it was seen that there was no significant difference in Factor 4: Collaboration Skill sub-dimension according to the family income level variable (p>.005). However, there is a significant difference in Factor 1, Factor 2, Factor 3, Factor 5 and the overall scale according to the family income level variable (p<.005).

Discussion and Conclusion

When the data obtained within the study have been analysed; it has been observed that the participants have medium and high level computational thinking skills. Korkmaz et al. (2015) reached similar results in their research in which they made a research on 1245 university students. When the general averages were analysed in the context of factors, the lowest average of computational thinking skills was seen in the "analytical - algorithmic thinking skill" sub-dimension. In the study conducted by Sarıtepeci (2017) on the 10th grade students, the lowest sub-dimension was found in the "creative problem solving skill" dimension.

In the study, "computer usage skill" of computational thinking skills was found to be the highest sub-dimension skill average of the participants. The results of computational thinking skills according to gender variable showed that the mean of male participants was higher than that of female participants. However, it was concluded that this difference was not significant. Partially similar to this result, Roman-Gonzales (2017) found that there was a significant difference in favour of male participants.

In the study, it was seen that the significant difference according to the gender factor was in favour of male participants in the sub-dimensions of "analytical - algorithmic thinking skills" and "creative problem solving skills". Again, in the study conducted by Korkmaz et al. (2015) with university students, it was seen that there was a significant difference in favour of male students in the sub-dimension of "critical thinking skills".

In the analysis, it was observed that the participants with computers had higher computational thinking skills in general, and there was a significant difference in the sub-dimension of "computer usage skills" and this difference was in favour of the participants with computers. In different studies, it has been observed that "participants with high level of access to technology" have higher computational thinking skills in general. Since it is known that another definition of computational thinking skill is "computer thinking", it is thought that it is natural that the result is in this way.

Sarıtepeci (2017) examined the variable of daily technology use time in his study, and it was observed that the participants with the highest technology usage (4-6 hours) had higher averages than general results and sub-dimensions. Similarly, in this study, the computational thinking skills of participants whose computer usage time was 4-6 hours and more were significantly higher than that of students whose computer usage time was less than 1 hour.

In this study, computational thinking skills of the participants were examined according to the variables of "following technological developments" and "family monthly income level". Accordingly, when the computational thinking skill levels of individuals who "frequently" follow technological developments were examined, it was seen that they were statistically significantly higher both in general and in all sub-dimensions compared to the participants who answered as "I do not follow" and "I rarely follow" technological developments. In addition, it was seen that the computational thinking skills of individuals with a family monthly income level of 8000 Turkish Liras and above were significantly higher than the participants with lower monthly income in general average and in all sub-dimensions except the sub-dimension of "ability to cooperate".

Recommendations

As a result of this study, it is believed and recommended that qualitative research on the computational thinking skills of pre-service teachers should also be conducted, and that the subject can be enriched with studies conducted in different branches. Additionally, studies can be conducted that include different demographic characteristics that link computational thinking with 21st century skills.

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Conflict of Interest

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Should I Learn Division Algorithm?: An Investigation of Elementary School Students' Solution Strategies on Realistic Division with Remainder Problems***

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Abstract. The division with remainder (DWR) problems offer significant potential for students to make sense of the division operation. The purpose of the study is to investigate elementary school students' solution strategies for DWR problems. In particular, this study aims to compare the problem-solving strategies in DWR problems employed by second-grade students, who are versed in multiplication, but have not been introduced to division; with those of third and fourth-grade students who are familiar with division but not have yet to engage with the interpretation of remainders. This qualitative research obtained data from 144 students in second, third, and fourth-grades in a public primary school. A total of six different DWR problems were presented to the students, including types as remainder divisible, remainder not divisible and remainder as a whole. The findings indicated that the strategies used by students in solving DWR problems differed. While second-grade students prefer strategies such as repetitive addition, repetitive subtraction, grouping, verbal explanation and using models, there is a noticeable tendency to use the division algorithm by fourth-grade students. However, it was noticed that students were unable to interpret the remainder in a meaningful way, especially from the third-grade, when they began to learn the division algorithm. According to the study, it is suggested that rather than moving immediately to the division algorithm, teachers should spend more time helping students understand division through contextual problems and representations.

Keywords. Realistic problems, context, division algorithm, division with remainder (DWR) problems, student strategies.

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Division is the most difficult and complex arithmetical operation to teach and learn among the four operations in terms of semantic structures (Kouba, 1989) comprehending both its meaning (Steffe, 1988), operation technique (Bağdat, 2020; Doruk & Doruk, 2019) and requiring preliminary knowledge such as multiplication (Kaasila, Pehkonen, & Hellinen, 2010). There are many reasons for its difficulty and complexity: (1) the lack of knowledge about the partitioning and measurement meanings of division is one of the primary reasons for students' difficulties with division (Doğan-Coşkun & Ev-Çimen, 2019a), (2) insufficient understanding of the functions of the divisor, dividend, quotient, and remainder in division as well as their relationships with one another (Correa, Nunes, & Bryant, 1988; Squire & Bryant, 2002; Doğan-Coşkun & Ev-Çimen, 2019a), (3) requiring good estimation skills and (4) inadequate consideration of the meanings of quotative and partitive division (Anghileri, Beishuizen, & van Putten, 2002). According to earlier research, teaching division should not only concentrate on rehearsing the division algorithm but also incorporate contextual issues that allow students to examine the various interpretations of division, the connections between the division algorithm phases, and the meaning of the quotient and remainder (Van de Walle, 2007). This is where Division with Remainder problems (DWR) differentiates itself as a noteworthy option for the sense-making division operation.

Division with Remainder Problems

Mathematics problems require students make sense of the context, comprehend the problem, consciously select problem-solving strategies, apply selected strategies, and consider whether the outcome is sensible (Polya, 2004). However, while solving problems, students usually focus on some phrases in the problem text, apply computational procedures, do not think about the context and consequences of the problem, and provide arithmetically correct, but senseless answers (İncikabı, Ayanoglu, & Uysal, 2020; Li & Silver, 2000; Rodríguez, Lago, Hernández, Jiménez, Guerrero, & Caballero, 2009; Silver, 1988; Silver, Mukhopadhyay, & Gabriele, 1992; Verschaffel, 2000). DWR problems can be defined as problems that involve a daily life context and are aimed at interpreting the meaning of the remainder obtained in a division problem. A number of researchers have an interest in DWR problems because they are regarded as non-routine problems (Rodríguez, et al. 2009; Arıkan & Ünal, 2016) and offer a tremendous potential to help students learn division by sense-making (Li & Silver, 2000; Silver, Shapiro, & Deutsch, 1993). Consider, for instance, a problem that asks how many buses are required for a 350-person trip where the students would travel in 40-person buses. Students would divide 350 by 40 in this problem, finding that the remaining would be 30 and the result would be eight. Because the quotient is eight, some of the students would think that the result is eight. In the upper classes, students may even divide the remaining 30 by eight and find the result 8.75. However, in this case, students should note that the correct response is nine, given that the remaining 30 passengers must board a different bus. While the quotient in conventional division problems provides the answer, in this case, the quotient obtained is insufficient for the solution, and the student needs to interpret the remainder. In DWR problems, the remainder can be interpreted differently depending on the context. In this respect, DWR problems can be classified into three different categories: 1) remainder divisible, 2) remainder not divisible and 3) remainder as a whole. For instance, if you were to divide five liters of water into four bottles, you would divide the five into four and then divide the remaining one so that each container would hold 1.25 liters of water. If an individual desires to share five balloons among four people, he would find one by ignoring the last balloon because he is unable to distribute it after giving each of them a balloon. If a group of five individuals decides to take a taxi that accommodates four passengers, they must divide the group by four and then call another taxi to accommodate the fifth passenger. Thus, by adding the remaining one to the quotient, he will find the result two. As noticed, in all three problems, the number five is divided by four, but different answers are obtained by interpreting the remainder according to the context.

Since 90s', many different groups of participants', ranging from young students (Arıkan & Ünal, 2016; Cai & Cifarelli, 2004; Cai & Silver 1995; Cooper & Harries, 2005 Guerrero & Riveira, 2001; Li & Silver, 2000; Silver, et. al, 1993) to teachers' (Chen, van Dooren, Chen & Verschaffel, 2010; Doğan-Coşkun & Ev-Çimen, 2019b) performance were examined on DWR problems. Li and Silver (2000) asked DWR problems to third-grade students who had not yet learned the division algorithm. Although third-grade students had not yet learned the formal division algorithm, their various strategies such as repetitive addition or subtraction enabled them to interpret the remainder successfully. Guerrero and Riveira (2001) investigated the difference between third-grade students before and after they were taught the division algorithm by asking them numerical computation and DWR problems. The results showed that learning the division algorithm improved students' performance in division with small integers, but not in solving DWR problems. Some of the students who learned the division algorithm thought that the quotient obtained by using the division operation in DRW problems would always lead to the correct answer, thus they obtained incorrect results. Even though they learned the division algorithm, the majority of students continued to use alternative approaches and had comparable results.

Contrary to popular belief, studies conducted with middle school students indicated that students experienced considerable difficulties (e.g., Silver et. al, 1993; Cooper & Harries, 2005). Cai and Silver (1995), who examined the performance of Chinese and American middle school students on DWR problems, indicated that although students showed high achievement in performing operations and only one out of four students from both countries were able to interpret the remainder correctly. Cai and Cifarelli (2004) discovered that Chinese and US students, similarly, performed better on DWR problems in a study concentrate more on computational skills rather than comprehension. These findings demonstrate that even after learning the division method, students still struggle to understand the remainder in DWR problems. This study intends to look into primary school children's approach in DWR problems. Considering this significance, the purpose of this study is to compare the problem-solving strategies in DWR problems employed by second-grade students, who are versed in multiplication, but have not been introduced to division; with those of third and fourth-grade students who are familiar with division but have yet to engage with the interpretation of remainders.

Methodology

The qualitative design was used in this study's data gathering, analysis, and interpretation procedures. In qualitative research, students' perspectives and interpretations are revealed in a flexible manner through the use of data gathering methods like observation, interviews, and document analysis (Yıldırım & Şimşek, 2011). Consequently, the goal of the current study was to compare the strategies used by students in the second, third, and fourth-grades when solving DWR problems.

Participants and Data Collection Process

This study was carried out with primary school students studying in Eskişehir province of Türkiye. A total of 144 students, including 54 second-grade, 51 third-grade and 39 fourth-grade students in six different classes, participated in the study. The data were obtained from the open-ended forms including a total of six DWR problems. These problems consisted of three different categories: 1) remainder divisible, 2) remainder not divisible and 3) remainder as a whole. Table 1 shows the problems posed to the students.

Table 1.

DWR Problems

Remainder divisible problems	
1	If Murat and Selin share 23 cookies, how many cookies will each of them have?
2	When we divide 26 litres of milk equally into 4 bottles, how many litres of milk will fill each bottle?
Remainder not divisible	
3	There are 35 scouts in a scout group. How many tents are required for the scouts who will stay in tents for 4 people each?
4	Hilal reads a book of 18 pages a day. How many days will Hilal finish a 80-page book?
Remainder as a whole	
5	Two brothers will share the 13 balloons their father bought them. How many balloons will each of them get?
6	13 pencils will be divided equally among 4 people. How many pencils will each person get?

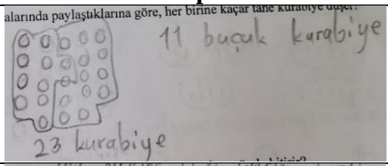
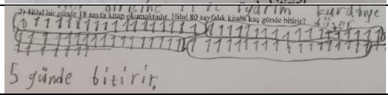
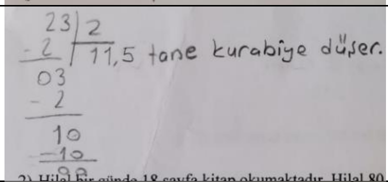
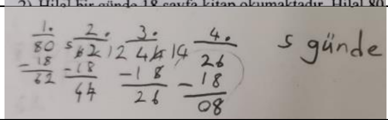
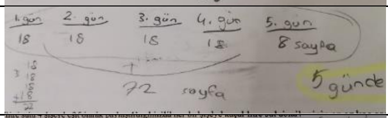
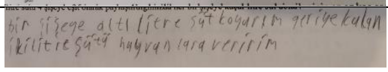
In the first and second problems in Table 1, students are expected to obtain a decimal number by dividing the remaining. For instance, the student should be capable to share the cookies as 11.5 in the first problem. In the third and fourth problems, since one remaining value cannot be ignored, the quotient value should be increased by one. For example, in the third problem, eight tents won't be sufficient; in order to accommodate the remaining three people, one more tent would be required, hence the correct response is 8+1 = 9. In the fifth and sixth problems, students are expected to ignore the remainder by thinking that the balloon and the pencil cannot be shared in half. In the study, these six problems were mixed and the students were asked to explain their solutions in detail and not to use erasers. Particular attention was paid to the fact that second-grade students had learned multiplication but not division during the data collection phase. Students in the third and fourth-grades learned division, but they didn't formally learn how to find the decimal values needed for division. On the other hand, it is assumed that students might develop a variety of strategies based on their experiences in daily life. The purpose of this study was to compare and determine the extent to which the strategies employed by students who learned division differ from those who didn't learn division algorithm.

Data Analysis

This study utilized content analysis method which provides to bring together similar data within the framework of certain concepts and themes and to interpret them by organizing them in a way that the reader can understand (Yıldırım & Şimşek, 2011). In the current study, strategies employed by students were examined to discern both their similarities and differences, leading to the establishment of pertinent categories. These strategies were also analysed in terms of the accuracy of the solution. As a result, the findings were presented with frequency tables in terms of solution strategies and accuracy of solutions. The sample student strategies that arose from the data analysis are shown in Table 2.

Table 2.

Sample Student Strategies Arose From Content Analysis

Strategy	Sample solution	Explanation
Modelling		Correct response to the first problem: 11.5 cookies for each person.
Grouping		Correct response to the fourth problem: Hilal completes a 80-page book in 5 days
Division algorithm		Correct response to the first problem: 11.5 cookies for each person
Repetitive substraction		Correct response to the fourth problem: Hilal completes a 80-page book in 5 days
Repetitive addition		Correct response to the fourth problem: Hilal completes an 80-page book in 5 days
Verbal explanation		Incorrect response to the fourth problem: I fill each bottle with six litres of milk and give the remainder to the animals.

The data were analyzed by two experts in the field. These experts reached a consensus regarding the accuracy of the solutions. To establish a shared understanding of the strategies employed in the solutions, they initially analyzed several problems collaboratively, aiming to develop a consistent terminology for strategies. As a matter of fact, the following categories emerged as a result of the analysis as division algorithm, verbal responses, model utilization, repetitive additition and subtraction. In the following problems, they carried out this analysis process separately and reached a consensus over 90%. Here, especially in the problem of dividing the balloons to ignore the remainder, they discussed whether it would be a mistake or a strategy for the students to divide balloons 6 to 7 for example, and they agreed that it was an erroneous answer.

Findings

The findings presented under three different headings in order to interpret three different problem types of DWR problems.

Findings of the Remainder Divisible Problems

Table 3 shows the findings of the first problem:

Table 3.

Findings of the First Problem

If Murat and Selin share 23 cookies, how many cookies will each of them have?		
Grade	**Correct**	**Incorrect**
2	29 (%54)	25 (%46)
	➨ 18 students sketched a model. ➨ 10 students provided a verbal answer and found the answer 11 and a half. ➨ 1 student used a division algorithm.	➨ 3 students sketched a model and divided 11 to 12. ➨ 2 students sketched a model and divided 12 to 12. ➨ 2 students found 46 by dividing each of the 23 pieces by 2. ➨ 1 student divided it as 10, 10, 3. ➨ 1 student divided it as 10, 13. ➨ 16 students provided blank, incomplete or irrelevant solutions.
3	1 (%2)	51 (%98)
	➨ Provided a verbal answer	➨ 18 students divided the number 23 by 2 using the division algorithm and did not make any explanation. ➨ 26 students divided the number 23 by 2 using the division algorithm and found 11 cookies. ➨ 7 students provided blank, incomplete or irrelevant solutions.
4	3 (%8)	36 (%92)
	➨ The division algorithm was used.	➨ 7 students divided the number 23 by 2 using the division algorithm and left it halfway and did not make an explanation. ➨ 26 students divided the number 23 by 2 using the division algorithm and found 11 cookies. ➨ 1 student sketched a model and found the answer 11 cookies. ➨ 2 students provided blank, incomplete or irrelevant solutions.

As seen in Table 3, 18 (54%) of second-graders solved the problem correctly by sketching models. The responses of two second-graders who sketched models are displayed in Figure 1.

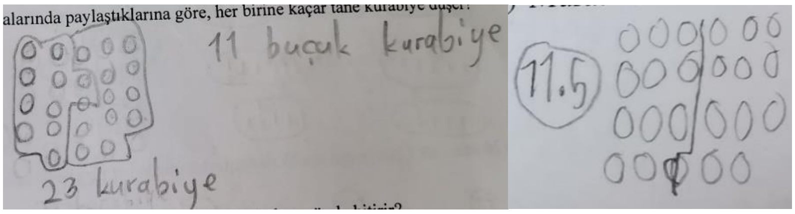


Figure 1. Sample Second-Graders' Response Illustrating the Correct Solution to the First Problem via Modelling.

In the second-grade, 10 students provided verbal responses and obtained the result 11.5, while one student reached the correct response by using the division algorithm. In the third and fourth-grades, students did not prefer to use models and very few students (one student in the third-grade and three students in the fourth-grade) solved the problem correctly. While 25 (46%) second-grader, 51 (98%) third-graders and 36 (92%) fourth-graders reached incorrect responses. In the second-grade, students reached incorrect responses by inaccurate reasoning without using the division algorithm, third and fourth-graders mostly used division algorithm and found the result 11 by ignoring the remainder. Figure 2 shows the solution of a fourth-grader who reached the correct response using the division algorithm.

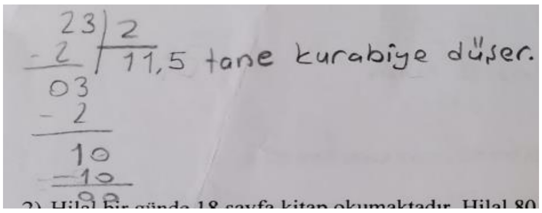


Figure 2. Sample Fourth-Grader's Response Illustrating the Correct Solution to the First Problem via Division Algorithm.

Table 4 represents the findings of the second problem:

Table 4.

Findings of the Second Problem

When we divide 26 litres of milk equally into 4 bottles, how many litres of milk will fill each bottle?		
Grade	**Correct**	**Incorrect**
2	5 (%9)	49 (%91)
	➨ 2 students sketched a model. ➨ 2 students provided verbal answers. ➨ 1 student used a division algorithm.	➨ 8 students filled 6 litres of milk for each bottle and ignore 2 litres of milk. ➨ 3 students provided incorrect repetitive subtraction. ➨ 1 student provided incorrect repetitive addition. ➨ 2 students used a division algorithm. ➨ 35 students provided blank, incomplete or irrelevant solutions.
3	0 (%0)	51 (%100)
		➨ 26 students divided 26 by 4 with the division algorithm and did not continue. ➨ 20 students found the answer 6 by dividing 26 by 4 with the division algorithm. ➨ 1 student found the answer 6 by dividing 26 by 4 with the division algorithm and completed it to 7. ➨ 4 students provided blank, incomplete or irrelevant solutions.
4	6 (%15)	33(%85)
	➨ 5 students found the answer 6.5 using the division algorithm. ➨ 1 student found the answer 6.5 using a model.	➨ 10 students divided 26 by 4 with the division algorithm and did not continue. ➨ 21 students found the answer 6 by dividing 26 by 4 with the division algorithm. ➨ 2 students divides 26 by 4 with the division algorithm and finds the answer 6 and completes it to 7.

Table 4 shows us that the majority of the second, third and fourth-graders provided incorrect solutions. Two of second-graders who provided correct responses explained the solution by sketching a model, two of them provided verbal answer and one of them used division algorithm. None of the third-graders provide correct solution and the majority of fourth-graders (85%) provided the incorrect solutions. Among the fourth-graders, one of the six students reached the correct response by using a model, and five of them reached the response of 6.5 by using the division algorithm. Figure 3 below illustrates the correct responses of the students using a model.

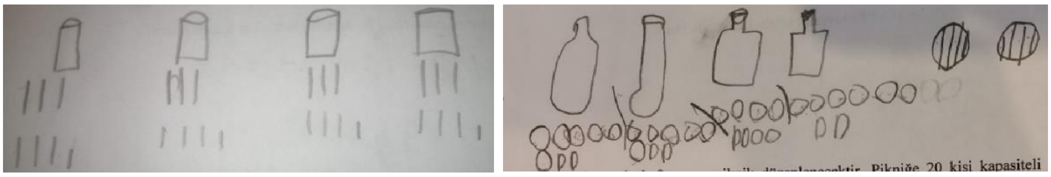


Figure 3. Sample Student Responses Illustrating the Correct Solution to the Second Problem via Modelling.

Figure 4 displays the correct response of a student who formulated a verbal explanation consistent with the solution to the problem of dividing 26 litres of milk among 4 bottles. In this solution, the student addressed the problem by disregarding the remainder.

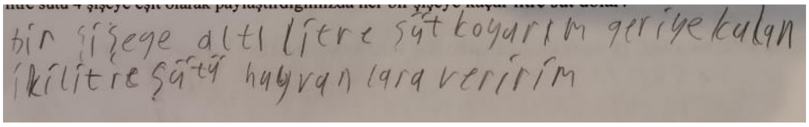


Figure 4. Sample Student Responses Illustrating the Correct Solution to the First Problem via Verbal Explanation.

Table 5 presents the findings of the third problem.

Table 5.

Findings of the Third Problem

Hilal reads a book of 18 pages a day. How many days will Hilal finish an 80-page book?		
Grade	**Correct**	**Incorrect**
2	19 (%35)	35 (%65)
	➨ 7 students provided repetitive subtraction. ➨ 7 students provided repetitive addition. ➨ 3 students provided verbal answers. ➨ 2 students developed a group formation strategy.	➨ 10 students provided repetitive subtraction as 80-18-18-18-18-18, but could not reach the correct response. ➨ 3 students provided repetitive addition but could not reach the correct response. ➨ 22 students provided blank, incomplete or irrelevant solutions.
3	12 (%23)	40 (%77)
	➨ 9 students provided repetitive addition. ➨ 1 student provided repetitive addition. ➨ 2 students reached the answer 18x5 by multiplication.	➨ 4 students used a division algorithm. ➨ 5 students provided repetitive addition but could not reach the correct response. ➨ 1 student provided repetitive subtraction but could not reach the correct response.

		➨ 30 students provided blank, incomplete or irrelevant solutions.
4	7 (%18)	33 (%82)
	➨ 5 students found 4+1 = 5 days using the division algorithm. ➨ 1 student using the division algorithm $4\frac{8}{18}$ day. ➨ 1 student divided 80 by 18 using the division algorithm and found 4.5 days.	➨ 28 students used division algorithm, divided 80 by 18 and could not reach correct response. ➨ 4 students provided an incorrect operation. ➨ 1 student provided repetitive addition but could not reach the correct response.

Table 5 shows the findings of the third problem. While the majority of the second, third and fourth-graders reached incorrect response, the most successful group was the second-graders (35%). In second-grade, the students mostly reached the correct solution by repetitive addition or repetitive subtraction strategy. In addition, three students provided the correct response verbally and two students responded correctly by grouping strategy. Figure 5-6 illustrate the solution examples of second-graders who provided different solutions.

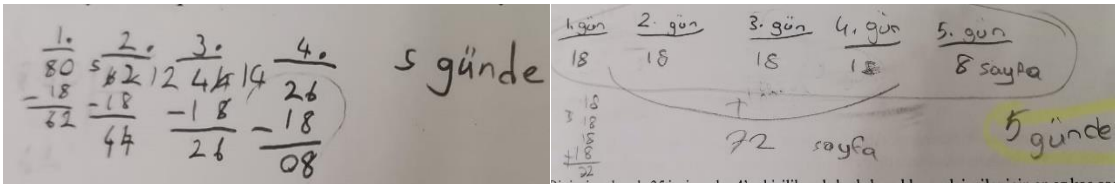


Figure 5. Sample Second-Graders' Responses Illustrating the Correct Solution to the Third Problem via Repetitive Addition and Repetitive Subtraction Strategies.

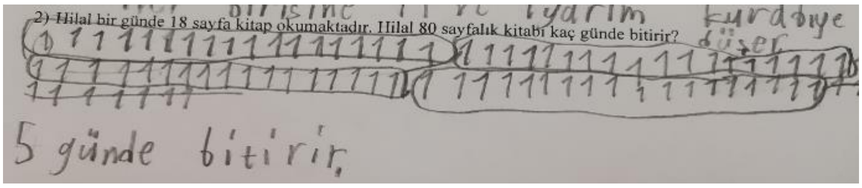


Figure 6. Sample Second-Grader's Response Illustrating the Correct Solution to the Third Problem via Grouping Strategy.

The third-graders' responses show us that there were more students (77%) who reached incorrect result than the second-graders. It was observed that most of the third-graders preferred repetitive addition while solving the problem. In comparison to students in third-grade, more fourth-graders (82%) provided incorrect responses. Four of fourth-graders who reached correct solution used division algorithm while the other two students made an effort to illustrate the day using fractional expressions.

Table 6 shows the findings of the fourth problem:

Table 6.

Findings of the Fourth Problem

There are 35 scouts in a scout group. How many tents are required for the scouts who will stay in tents for 4 people each?		
Grade	Correct	Incorrect
2	25 (%35)	29 (%65)
	➨ 6 students used repetitive subtraction strategy. ➨ 7 students used repetitive addition strategy. ➨ 12 students sketched a model.	➨ 4 students sketched a model. ➨ 5 students used repetitive addition strategy. ➨ 3 students used repetitive subtraction strategy ➨ 17 students provided blank, incomplete or irrelevant solutions.
3	5(%10)	46(%90)
	➨ 5 students found the quotient 8 with the division algorithm and added 1 to the result.	➨ 23 students divided 35 by 4 and found the answer 8 with the standard division algorithm. ➨ 16 students divided 35 by 4 with standard division algorithm but could not reach the correct response. ➨ 7 students provided incorrect, blank or irrelevant responses.
4	7 (%18)	32 (%82)
	➨ 7 students found the quotient 8 with the division algorithm and added 1 to the result.	➨ 18 students divided 35 by 4 and found the result 8 with the standard division algorithm. ➨ 11 students divided 35 by 4 with standard division algorithm but could not reach the correct response. ➨ 1 student left it blank. ➨ 1 student found 8¾ tents with the division algorithm. ➨ 1 student found 8.15 with the division algorithm.

Table 6 demonstrates that students in the second-grade scored the best performance (%25). Almost half of the students who solved the problem correctly used repetitive subtraction or repetitive addition, and half of them reached the correct answer by sketcing a model. 90% of third-graders reached incorrect answers. All of the students who reached correct answers found the quotient eight by using the division algorithm and obtained nine by adding one. 82% of the fourth-graders provided incorrect solutions to the problem. The students who reached at the solution correctly, on the other hand, employed the division algorithm. Figure 7-9 show examples of various types of student solutions.

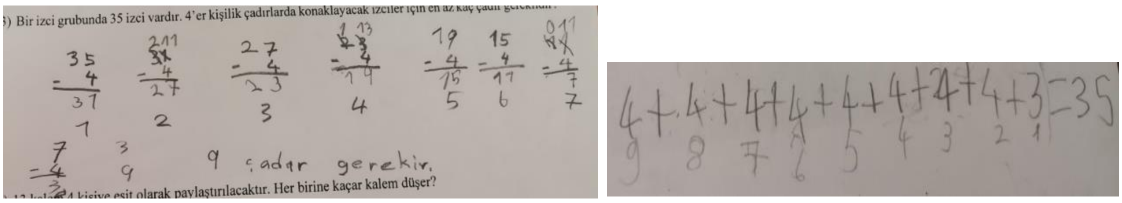


Figure 7. Sample Second-Graders' Responses Illustrating the Correct Solution to the Fourth Problem via Repetitive Subtraction and Repetitive Addition Strategies.

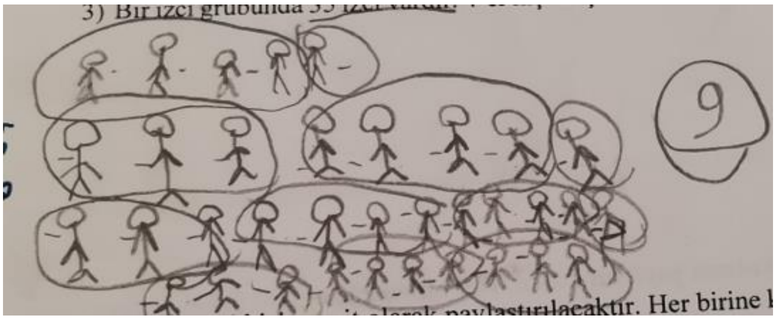


Figure 8. Sample Second-Grader's Response Illustrating the Correct Solution to the Fourth Problem via Grouping Strategy.

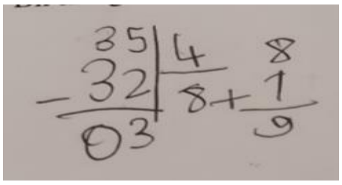


Figure 9. Sample Third-Grader's Response Illustrating the Correct Solution to the Fourth Problem via Division Algorithm.

Table 7 shows the findings of the fifth problem:

Table 7.

Findings of the Fifth Problem

13 pencils will be divided equally among 4 people. How many pencils will each person get?		
Grade	**Correct**	**Incorrect**
2	16 (%30)	38 (%70)
	➨ 2 students reached the solution by using repetitive subtraction strategy. ➨ 3 students provided verbal solutions. ➨ 11 students reached the solution by drawing a model.	➨ 7 students divided 3 whole pencils and 1 quarter pencil. ➨ 4 students divided 3 whole pencils and 1 half pencil. ➨ 1 student reached the incorrect solution by repetitive subtraction. ➨ 2 students reached the incorrect solution by repetitive addition. ➨ 24 students obtained blank, incomplete or irrelevant solutions.
3	46 (%90)	5 (%10)
	➨ 46 students reached the solution using the division algorithm.	➨ 5 students provided an operation error.
4	35 (%90)	4 (%10)
	➨ 35 students reached the solution using the division algorithm.	➨ 2 student found 3.25. ➨ 1 student found 3.5. ➨ 1 irrelevant answer.

Table 7 presents the results for the fifth problem. From the data, it is evident that 70% of the second graders' arrived at an incorrect solution. Among those who responded correctly, the majority

(16 students) utilized models for their solutions, while three students employed verbal explanations, and two students relied on repetitive subtraction strategies. Responses of third and fourth-graders reveal a significant rise in the proportion of correct answers. 90% of third-graders and 90% of fourth-graders responded the problem correctly using the division algorithm. Figure 10-12 show the sample student solutions.

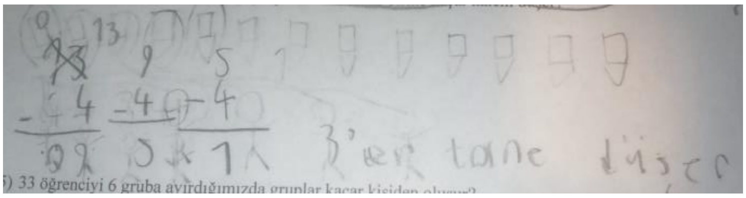


Figure 10. Sample Second-Grader's Response Illustrating the Correct Solution to the Fifth Problem via Repetitive Subtraction Strategy.

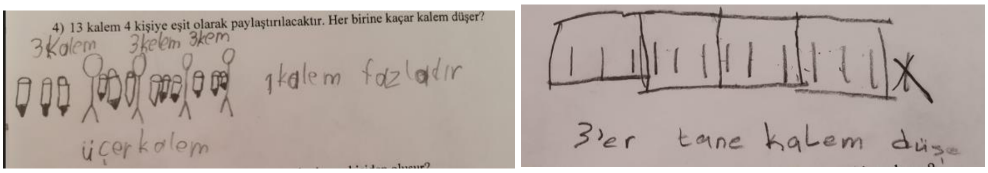


Figure 11. Sample Second-Graders' Responses Illustrating the Correct Solution to the Fifth Problem via Modelling.

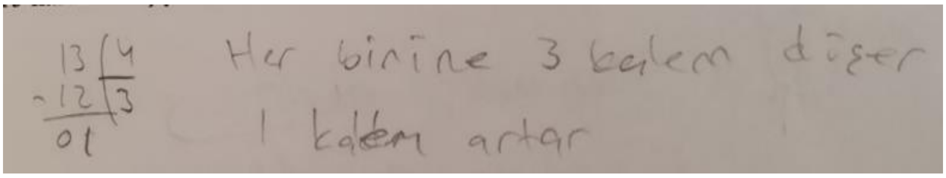


Figure 12. Sample Fourth-Grader's Response Illustrating the Correct Solution to the Fifth Problem via Using the Division Algorithm.

In this problem, since the remainder did not affect the solution in any way, it was sufficient to obtain a solution using the division algorithm. It is thought that this situation caused an increase in the success of third and fourth-graders.

Table 8 shows the findings of the sixth problem.

Table 8.

Findings of the Sixth Problem

Two brothers have to share the 13 balloons their father bought them. How many balloons will each em get?		
Grade	**Correct**	**Incorrect**
2	10 (%19)	44 (%81)
	➨ 10 students sketched a model for dividing by 6 and ignoring the remainder.	➨ 16 students found 6 and a half. ➨ 2 students divided 6 by 7. ➨ 2 students divided 7 by 7.

		➨ 24 students provided blank, incomplete or irrelevant solutions.
3	44 (%86)	7 (%14)
	➨ 44 students used division algorithm and found the answer 6.	➨ 1 student divided 13 balloons into 2 and found 6+1=7. ➨ 6 students provided blank, incomplete or irrelevant solutions.
4	32 (%82)	7(%18)
	➨ 31 students used division algorithm and found the answer 6. ➨ 1 student said that 6 balloons fall for two siblings and the remaining 1 balloon is popped.	➨ 3 students found 6 and a half. ➨ 4 students provided blank, incomplete or incorrect solutions.

Table 8 shows the findings of the sixth problem. In contrast to the preceding problems, second graders were the group that struggled with this problem the most, 81% of second-graders responded the balloon problem incorrectly. All of the students who responded correctly preferred to sketch models. On the other hand, third and fourth-graders had a great increase in the number of correct responses compared to second-graders. 86% of third-graders and 82% of fourth-graders responded the problem correctly and almost all of the students reached the correct solution by using the division algorithm. Similar to the fifth problem, it was sufficient to obtain a solution by using the division algorithm since the remainder did not affect the result in any way. Figure 13 shows the solution of the second-grader who provided a model, and Figure 14 illustrates the solution of the third-grader who provided an incorrect response.

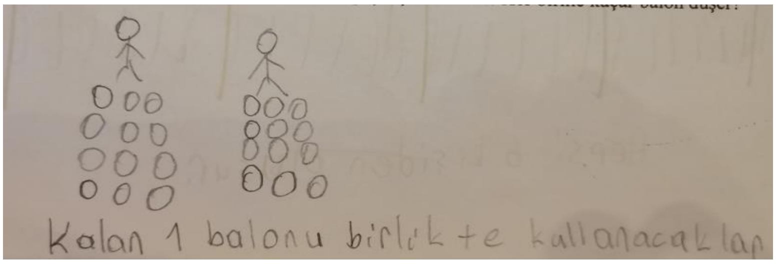


Figure 13. Sample Secon-Grader's Response Illustrating the Correct Solution to the Sixth Problem via Modelling.

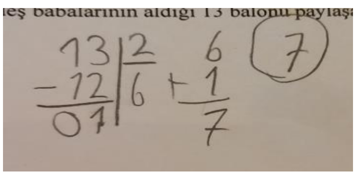


Figure 14. Sample Third-Grader's Response Illustrating the Incorrect Solution to the Sixth Problem via Using the Division Algorithm.

Conclusion and Discussion

The purpose of the study is examining the solution strategies of primary school students in DWR problems. In particular, this study aims to compare the problem-solving strategies in DWR problems employed by second-grade students, who are versed in multiplication, but have not been introduced to division; with those of third and fourth-grade students who are familiar with division but have yet to engage with the interpretation of remainders. The results indicated that the methods used by primary school second, third and fourth-grade students while solving DWR problems differed. While second-grade students prefer to use strategies such as repetitive addition, repetitive subtraction, grouping and using models, it is noticeable that there is a tendency to use the division algorithm towards the fourth-grade. Robinson et al. (2006) reported similar results with upper-grades, showing that strategies shifted in step with age. Students in fourth-grade employed the repetitive addition strategy, whereas those in fifth through seventh-grade utilized the multiplication strategy more frequently. On the other hand, it was noticed that especially from the third-grade, when the division algorithm began to be learned, students could not interpret the remainder in a meaningful way, many of them left the operations with remainders by applying the division algorithm and obtained incorrect results. Although the accuracy of the results varied according to the grades and problems, it was observed that, contrary to expectations, there was no significant increase in the number of correct solutions as students progressed to higher-grades, and even the success decreased significantly, especially at the third-grade level. Silver et al. (1993) found that students who performed repetitive subtraction or repetitive subtraction were highly successful in interpreting the remainder problems. In the current study, it was observed that second-grade students preferred similar strategies and achieved higher success, perhaps these strategies allowed students to reason about the problem. Guerrero and Riveira (2001) asked numerical calculation and DWR problems to third-grade students before and after teaching the division algorithm, and found that the most successful students were the students who used alternative approaches such as repetitive addition and repetitive subtraction. Li and Silver (2000), in their study in which they asked third-grade students who had not yet learnt the division algorithm to solve DWR problems, discovered that students similarly achieved high levels of success by using alternative approaches. This study does not claim that students should continue to solve problems in traditional ways, but it points to the problems that arise when the division algorithm is launched in a meaningful way. On the other hand, it was observed that students' solutions were algorithmic (division algorithm) towards the upper-grades, and the diversity of solutions and using representations decreased, as in the study conducted with sixth-grade students by

Incikabı et al. (2020). It can be expected that students use the division algorithm they have learned instead of making long repetitive subtraction or modelling this subtraction, but the use of representation is also a way for students to express their reasoning, so in this study, it was seen that students abandoned reasoning strategies very early in problems. Li and Silver (2000) stated in their study that it is necessary to observe how the depth of students' strategies in problems changes with the school mathematics launched.

While second-grade students were more successful in remainder divisible and remainder not divisible problems, third and fourth-grade students were more successful in remainder as a whole problems. However, it was seen that the success of third and fourth-grade students in remainder as a whole problem was due to the nature of the problem. In these problems, it can be claimed that the remainder has no impact on the solution, therefore, students would reach the correct answer even if they do not interpret the remainder. As a matter of fact, the students reached the quotient they obtained as a response and found the correct result. In other words, since these types of problems can be solved only by using the division algorithm without sufficient reasoning, it can be said that third and fourth-grade students showed higher success in these problems unlike other problems. On the other hand, it is seen that the reasoning used by second-grade students in Problems 5 and 6, in which they were unsuccessful compared to other problems, was not meaningless. For example, in the problem where two brothers should share 13 balloons (perhaps due to an error caused by the fact that equal sharing was not mentioned in the way the problem was asked), the students divided the balloons 7 by 8, many of them left the problem blank and the majority of them found the answer 6.5 with an erroneous reasoning. These results indicate that second-grade students mostly provide solutions based on reasoning, while third and fourth-grade students provide standard solutions using the division algorithm. In a study conducted by Li and Silver (2000) with students who did not learn division, they stated that students prefer the way that makes the most sense to them. In addition, while second-grade students focused more on the context, it was observed that third and fourth-grade students focused on the necessary operation without focusing on the context. Cooper and Harries (2005), Graeber, Tirosh and Glover (1989) and Kaasila et al. (2009) emphasised similar points in their study by stating that students do not think and reason sufficiently on realistic contexts. Finally, while second-grade students were more successful in the first problem about dividing the remainder, they had difficulty in solving the second problem. This situation can be explained by the difference in context or the fact that the divisor was two in the first problem while the divisor was four in the second problem may have made the problem difficult. In the fourth-grade, on the contrary, it was observed that the success increased in favour of the second problem. The growth of the divisor in division caused the second-graders to have more difficulty in reasoning.

Recommendations

Based on the findings of this study, several recommendations emerge. Firstly, educators should ensure a gradual transition to the division algorithm in problem-solving, and alongside this, discussions can be facilitated around student-invented strategies related to the division algorithm. Moreover, the use of multiple representations in problem-solving should be promoted. The study suggests a pedagogical shift towards an approach centered on reasoning and problem-solving skills, emphasizing "using division for problem-solving" rather than focusing solely on specific solution methods for "solving problems that require division." To foster this mindset, the significance of employing realistic contexts and fostering a deep understanding of problems is underscored (Cooper & Harries, 2005; Verschaffel et al., 2000). Consistent with the principles of realistic mathematics education (Gravemeijer, 1994), arithmetic operations should be introduced and mastered within the framework of solving realistic problems, rather than being treated as isolated subjects.

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Review of Studies on Feedback Types: Systematic Review Study

***Ayhan Dönmez, **İbrahim Seçkin Aydın**

Abstract. In this research, it is aimed to determine how the studies conducted within the framework of teacher, peer and self-evaluation feedback types using the systematic compilation method are related to students' attitudes, motivation and success. The studies selected for the research were included in the research through certain criteria depending on the systematic review method. 2438 studies were reached in the research, and this number was reduced to 35 depending on the criteria. As a result of the research, it was determined that the studies conducted in this field increased the teacher, peer and self-evaluation feedback types and the students' attitudes, motivation and success towards the course.

Keywords. Feedback, teacher feedback, peer feedback, self-evaluation.

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Feedback is a communication element often used by the educator in order to learn the student's level of cognition in the educational environment. Feedback, which also has the function of providing information about the outcome of a behavior (Alavi and Kaivanpanah, 2007), is information provided only to the student in order to close the gap between the student performance and the desired performance. Morry (1992) defined feedback as performance information given to the student in order to make changes at the cognitive and behavioral level and increase learning. According to Bloom (1984), feedback is the data conveyed to the individual who is in the learning process. Carlson (1979) defined feedback as information given by the teacher to help students with the lesson, support them, and make changes to what they do when necessary. Ellis (1994) explained feedback as the information developed by the listener to receive or interpret messages. Hattie and Timperley (2007) defined feedback as information about an individual's learning or performance provided by an agent such as a teacher, peer, book, or parent.

The purpose of feedback is to reduce the discrepancy between performance and target within the framework of existing understanding and to increase students' performance (Duijnhouwer, 2010; Hattie and Timperley, 2007). Learning reaches a good quality when feedback provides not only whether a learning is right or wrong, but also information on how to improve learning (Barrera-Corominas, Ion and Tomàs-Folch, 2016). The feedback process should start with a summary that includes the student's performance (Roediger, 2007; Sternberg, 2002). Eikenberry, (2007) states that the following steps should be taken to increase the efficiency of feedback:

- The last feedback given should be remembered.

- It should be questioned to what extent the feedback given is successful and how the recipient responds to this feedback.

- When giving feedback, it should be considered which sources are used.

- In the next step, it should be considered how to strengthen the feedback given and make it more useful.

- Many observations should be made and notes should be taken.

Feedback is information that changes the learner's performance as a result of certain guidance (Nelson and Schunn, 2009). Feedback, which is at a critical point in the teaching process, has a very important effect on the individual's decision to accept, reject or change a behavior. Careful receipt of feedback supports learning and/or performance (Bangert Chapter Drowns et al., 1991; Salomon and Globerson, 1987). Feedback constitutes one of the cornerstones of success and also stands out as an important feature of the learning process (Brown, 1994; Gipps, 1994). Using feedback in the education and training process is important in many aspects. According to Rodgers (2006), feedback involves the teacher and student in the process and provides the participants with the opportunity to slow down and calm down. Thus, it tells the individual exactly what level he is at, how he got there, where he will be at the next stage, and what method he should use to get to that stage. The characteristics of good feedback are listed as follows by Macfarlane-Dick and Nicole (2006):

- Contributes to specifying the desired performance.

- It helps to develop self-evaluation skills during the learning process.

- Provides high-level information to learners at the point of learning.

- Provides both teacher and peer interaction.

- Allows motivation and self-esteem to increase.

- It prepares the necessary ground for closing the gap between the desired performance and the current performance.

When the literature is examined, we see that there are many types of feedback. Schimmel (1998) examined feedback types under four headings and divided them into confirmatory feedback, corrective feedback, error feedback and explanatory feedback. Eikenberry (2007) examined feedback in four categories: positive feedback, negative feedback, positive feedback and negative feedback. Schmidt and Wrisberg (2008) examined feedback types under only two headings and classified them as internal feedback and external feedback. Coşkun and Tamer (2015) examined the types of feedback more comprehensively and identified feedback in terms of the person who evaluates the text, feedback in terms of communication style, feedback in terms of praise or criticism, feedback according to the attitude of the evaluator, specific or general feedback, feedback in terms of form or style. It is divided into eight headings: content-oriented feedback, clear or ambiguous feedback, and in-text or extra-text feedback. However, as seen in the research, teacher feedback, peer feedback and self-evaluation were generally emphasized and the studies were carried out based on the feedback in question.

Teacher feedback is the information the teacher provides about student behavior. While the teacher exhibits an open attitude in some feedback, in some cases he or she may offer feedback indirectly. Sometimes, it can even guide the student to acquire the target behavior and help him reach the determined goal. Teacher feedback should be clear, descriptive, non-judgmental and appropriate to student development (Beach and Friederich, 2006), should have constructive and developmental features whenever possible (Overall and Sangster, 2006), and teachers should be sincere, helpful, self-confident, guiding and critical when making evaluations. (Hyland and Hyland, 2006). It is also important how the type of feedback in question is perceived by students. According to research, teacher feedback is perceived by students as a practical tool used in education and as a helpful resource for them, and there is a prevailing understanding among teachers that the quantity, center point, format and sufficiency of feedback are different (Carvalho, Martins, Santana and Feliciano, 2014; Carvalho, Santos, Conboy and Martins, 2014). In addition, studies have revealed that students desire teacher feedback more as their grade level increases, that students who ask for feedback are more successful than students who do not, and that students want to receive more feedback from teachers (Alavi and Kaivanpanah, 2007; Elwood and Bode, 2014; Kahraman and Yalvaç, 2015; Ülper, 2011).

Student peers also have an important share in the learner's behavior. Peer feedback consists of students making positive and/or negative comments on their friends' writings (Özşavli, 2017). Students face different obstacles when giving feedback because they do not have sufficient language and content knowledge. They may also have difficulty criticizing their friends, being serious in their comments, and providing constructive feedback. Such obstacles can become surmountable through peer feedback (Hanjani and Li, 2014). When students communicate with their peers, the feedback they receive from them becomes more effective (Fathman, Kesser, and Quinn, 1992). In peer feedback, peer feedback can be more efficient if students are trained on feedback, provided with an environment where they can communicate more effectively, and provided the necessary experience in the process (Tamer, 2013). Peer feedback, as opposed to teacher feedback to 'correct' students' writing, particularly during the writing process, is seen as a way of giving students control and autonomy (Mendoca and Johnson, 1994). Carnell (2000) stated in a study that students like to receive feedback from their peers, that talking to them is easier than talking to teachers and that they feel freer. Another study showed that peer feedback may be stronger than teacher feedback because students' interests are similar to their peers (Fathman, Kesser and Quinn, 1992).

At this point, self-evaluation is also effective in providing feedback to the student. According to Logan (2009), self-assessment, defined as a process in which the individual evaluates his own learning through predetermined criteria, is the student's evaluation of his own work or learning process only by himself (Montgomery, 2000). Self-assessment helps students focus and makes them more effective (Harris, 1997). It gives students the awareness of being independent from teachers (Pierce, 2003). Self-assessment teaches students about their strengths and weaknesses, as well as giving them the opportunity to look at themselves objectively and share responsibility with the teacher for what they have learned or not (Boud, 1995; Falchikov, 1986; Noonan and Randy, 2005). In addition, it helps not only students but also teachers to question their professional competence and determine their current situation (MoNE, 2017).

During the education process, students generally provide feedback by receiving feedback from teachers or peers or by self-assessment (i.e. self-evaluation). Students' attitudes, motivation and success towards the course are also affected by the nature of the feedback given. Studies emphasize that feedback is a very important method in the education-training process. Systematic review is a method generally used in the field of education. The reason why systematic review was chosen in this study is that it is more objective than other methods, contains fewer errors, addresses much more comprehensive areas and is repeatable, studies are selected within the framework of clearly determined criteria, systematic review can be repeated and the results can be verified (Moule and Goodman, 2009). Considering all these data, it is predicted that healthier results will be obtained. In addition, no systematic review study on this subject has been conducted in Turkey before and it has been observed that there are gaps in this field. Thus, it is anticipated that this study will contribute to reducing the gap in the field. In this context, the purpose of this systematic evaluation is to determine the views of the research conducted within the scope of teacher, peer and self-assessment feedback types on students' attitudes, motivation and success. In this context, the problem statement of the research is "What are the attitudes, motivation and success views of students in studies conducted within the framework of teacher feedback, peer feedback and self-evaluation?" in the form.

Method

The systematic review method used in this research is a research method developed based on synthesizing and summarizing the results of research on the same subject (Gökdemir and Dolgun, 2020). In this method, which is frequently used especially in educational research (Bearman et al., 2012), the studies to be included or excluded from the research are determined in line with the criteria determined by the researcher. The systematic compilation method is more objective and contains fewer errors than other compilation methods and provides a more comprehensive research opportunity (Moula and Goodman, 2009). According to Newman and Gough (2020), the process of preparing a systematic review consists of 9 dimensions within the framework of educational research.

1. Determining the research question
2. Creating the conceptual framework
3. Determination of selection criteria
4. Development of search strategy
5. Selecting studies reached through selection criteria
6. Coding studies
7. Evaluation of the quality of studies
8. Examining the synthesis results of individual studies to answer the research question
9. Reporting the findings

The criteria determined by Polit and Beck (2009) were used to evaluate the quality of the studies reached within the scope of the research. Each study was examined according to the determined criteria, and the studies included in the research were evaluated by giving 1 point to those that met the criteria and 0 to those that did not meet the criteria. The criteria used are as follows:

1- Have the purpose and questions of the research been presented appropriately?

2- Have appropriate answers been given to the research questions?

3- Are the concepts used in the research clearly defined?

4- Are the characteristics of the sample adequately explained?

5- Is the number of samples sufficient?

6- Are the materials and methods used appropriate to the subject of the research?

7- Is the equipment used in the research valid and reliable?

8- Are the findings clear and appropriately organized?

9- Have all the important results been discussed?

10- Are the discussion and findings compatible with each other?

11- Are the results presented in summary?

12- Have the limitations been declared?

Data Collection Tools and Process

In this study, the first research question is "What are the attitudes, motivation and success views of students in studies conducted within the framework of teacher feedback, peer feedback and self-evaluation?" The problem statement was determined, then the literature was examined and 2438 studies were found. However, these studies were evaluated within the scope of certain selection criteria and included in the research. The content validity of the criteria in question was ensured by taking expert opinions, and the selection criteria for the studies were determined as follows:

- Studies should examine the effects of feedback types on students' attitudes, motivation or achievement within the scope of teacher feedback, peer feedback and self-evaluation,
- The studies must have been carried out domestically,
- Studies should be published between January 2013 and September 2023,
- The full text of the studies should be accessible,
- The language of publication must be English or Turkish.

Relevant studies were searched in ULAKBİM, Tr Dizin, Dergipark, YÖK Thesis Center and Google Scholar electronic databases with the keywords "feedback, teacher feedback, peer feedback, self-assessment, feedback, feedback, peer feedback, teacher feedback, self-assessment". . The titles and abstracts of the studies in electronic databases were independently examined by the researchers. Although there were 2438 studies within the scope of the study, 35 studies that met the limitations were included in this study. 13 of these studies are articles and 22 are thesis studies. In the research, coding studies were included, details of the selected studies were specified, and the quality of the studies was evaluated. At the end of the process, the study results were examined and the findings were reported. The process steps of the research are shown in Format 1.

Format 1.

Process steps of the research

ULAKBİM, Tr Dizin, Dergipark, YÖK Thesis Center and Google Schoolar electronic databases were scanned with keywords (feedback, teacher feedback, peer feedback, self-assessment, feedback, feedback, peer feedback, teacher feedback, self-assessment)..

A total of 2438 studies were accessed.

The studies were listed and evaluated according to the determined limitations.

1129 studies were excluded because they were not within the scope of teacher feedback, peer feedback and self-evaluation and did not examine attitudes, motivation and achievements.

342 studies were excluded because they were not conducted domestically.

865 studies were excluded because they did not meet the publication requirement between January 2013 and September 2023.

67 studies were excluded because the full text could not be accessed.

35 studies included in the study were evaluated in terms of the results obtained.

Data Analysis

Descriptive content analysis was used to analyze the data. The data obtained during the research process was converted into a table. The table includes the name of the study, its authors, the year of publication, the effect of the method used on the student, and the scores for evaluating the quality of the studies. In addition, the content of the studies included in the research was analyzed and the results were examined according to various factors. The findings were interpreted qualitatively. The findings were converted into tables and examined within the scope of success, attitude and motivation variables.

Results

By analyzing the content of 35 studies included in this research, the appearance of teacher feedback, peer feedback and self-evaluation on student attitudes, motivation or achievements was examined in line with the determined studies. Within the scope of the systematic review study, studies examining the effects of teacher, peer and self-assessment feedback types on students were analyzed and some findings were reached. The studies included in the research were examined in tables. The tables were prepared taking into account the success, attitude and motivation variables evaluated within the scope of the study.

Table 1

The Effect of Feedback Methods on Student Achievement in the Studies Included in the Research

	Name of the Study	Year	Author(s)	The Effect of Used Feedback on Student Achievement	Quality Evaluation Score Average
1	Feedback Practices in Teaching Turkish as a Foreign Language Effect on Writing Skills	2023	Münevver Nuriye SERPEN Aliye Uslu ÜSTTEN	As a result of this research, it was observed that the students in the experimental group were more successful and exhibited better writing skills compared to the students in the control group, based on the feedback given by the teacher.	10
2	The Effect of Peer Feedback on the Writing Skills of Students Learning Turkish As a Foreign Language	2023	Mehmet ÖZŞAVLI	As a result of the research, an increase was observed in the writing scores of the experimental group, where peer feedback practices were effectively included, and it was concluded that the students improved themselves in terms of word choice, content, language use and form.	11
3	Investigating The Effect of Peer Assesment on Preservice Teacher's to Professional Knowledge and Skills	2019	Vural TÜNKLER	In this research, it was concluded that peer evaluation practices improved the professional knowledge and skills of teacher candidates, helped them realize their shortcomings and faults, and contributed to their critical thinking.	9
4	The Effect of Giving Feedback and Correction Species on Sixth Grade Students' Writing Skills	2016	Nurettin YILDIZ	In this study, it was concluded that the feedback and correction practices provided by the teacher positively affected the students' writing skills.	10
5	The Impact Of Self-Assessment: A Case Study on a Tertiary Level EFL Writing Class	2019	Vedat KIZIL Hülya YUMRU	In this study, it was concluded that self-assessment practices contributed to students' English writing and metacognitive skills.	10
6	The Role of Peer Feedback on Ambiguity Reduction in Turkish as a Foreign Language Learners' Writing	2018	Bülent ARI Mustafa Burak TOP	In this study, it was concluded that peer evaluation detected 25.96% of the expression disorders applied in the experimental group. For this reason, it has been concluded that using peer evaluation as an application at C1 and above level in teaching Turkish to foreigners will contribute to the teaching process.	9
7	Effect of Feedback on Turkish Fourth-Grade Elementary School Students' Fluent Writing Skills	2019	Bengisu KAYA Seyit ATEŞ Kasım YILDIRIM	In this study, it was concluded that the feedback given by the teacher was effective in the development of students' fluent writing skills.	11

			Timothy RASİNSKİ		
8	The Effect of Self-Evaluation Implementations on Students' Performance And Attitude in Violoncello Teaching	2016	Bahar GÜDEK Devrim ÖZTÜRK	In this study, it was determined that the performance of students who self-evaluated for 13 weeks improved their cello playing skills.	10
9	The Effect of Peer Assessment on Speaking Skill in Teaching Turkish as a Foreign Language	2018	Emre BAYRAKDAR Saadet MALTEPE	As a result of this research, it was determined that peer assessment in teaching Turkish as a foreign language positively affects students' speaking skills.	9
10	The Role of Self Assessment Practices in The Improvement of Freshman Students' Writing Performance and Awareness	2014	Seda BANLI	As a result of the study, it was determined that students' self-evaluation of writing skills positively affected their writing performance.	11
11	The Use of Peer Assessment in Distance Education and its Effects on Academic Success	2016	Mustafa Serhat DÜNDAR	It was concluded that the peer assessment method used in this research increased the academic achievement of students.	10
12	The Effect of Self-Assessment on the Achievement in Writing in English	2017	Melike CÖMERT	As a result of this study, it was determined that feedback based on self-assessment was more effective than writing lessons conducted with traditional methods.	10
13	The Effect of Peer Feedback on Turkish as a Foreign Language Students' Writing	2017	Mehmet ÖZŞAVLİ	According to the results of this research, it was observed that peer feedback increased the writing skills of students learning Turkish as a foreign language.	11
14	Effect of Web Based Peer and Self Evaluation on Student Achievement in Communication And Human Relations	2015	Adem ÇIRAK	As a result of the research, it was determined that the web-based peer and self-assessment method increased students' communication and human relations skills.	10
15	Effect of Peer Instruction Enriched by the Web Based Peer and Self Assessment System on the Achievement and Attitude of the 7th Grade Students in Rational Numbers	2014	Osman Cevat YAVUZ	According to the results of the feedback type applied in the research, it was seen that the success score of the experimental group increased compared to the control group.	11
16	The Effect of Verbal Feedback on Primary Pupils' Academic Achievement, Attitudes Towards the Lesson and Metacognitive Awareness	2014	Mustafa Feyyaz ÇETİN	As a result of this study, it was determined that the effective feedback given by the teacher positively affected the academic success of the students.	9
17	The Effect of Self-Assessment Applications Under the Guidance of Supervisor on Teachers' Self-Assessment,	2018	İzzet ÖZDEMİR	As a result of the research, it was determined that self-evaluation implemented under the guidance of inspectors improved teachers' teaching skills.	10

	Reflective Thinking and Teaching Skills				
18	The Effect of Argument Maps Scaffolded with Peer Feedback on Students' Argumentation Skills	2018	Beyza UÇAR	As a result of the research, it was determined that argument maps supported by peer feedback were more effective on the experimental group and increased their skills.	11
19	Exploring The Effects of Feedback Types and Wiki on EFL Learners' Writing Performance	2018	Ayşe ALTAY	In line with this study, it was concluded that teacher and peer feedback were not effective on students' writing success.	10
20	The Effect of Providing Self and Anonymous Peer Feedback on Writing Assignments in a Digital Environment Among Turkısh EFL High School Learners	2017	Ayten KAYACAN	As a result of the study, it was determined that peer and self-assessment practices had a positive effect on the writing skills of the experimental group.	11
21	The Effects of Peer Assessment Applıcatıon On Seventh Grade Students' Mathematical Achievements in the Teaching of Equations	2017	Sinem Ceren ÇOLAK	As a result of this research, it was determined that the peer assessment method increased students' success in mathematics lessons.	11
22	An Analysis of the Effect of Peer and Teacher Feedback on EFL Learners' Oral Performances and Speaking Self Efficacy Levels	2019	Hong Yu Connie AU	According to the results of this research, it was determined that peer and teacher feedback methods increased the success of students learning English as a foreign language.	9
23	A Comparison of The Impact of Teacher Feedback Within and Irrespective of the English as a Foreign Language Learners' Zone of Proximal Development	2018	Hasan SAĞLAMEL	As a result of this research, it was determined that the feedback given to students by the educator in the field of proximal development increased their success scores.	11
24	The Effect of the Self-Assessment-Based Reading Aloud Method on Reading Fluency and Reading Comprehension in Primary School	2019	Ferhat SAAT	As a result of the research, it was determined that the self-assessment-based oral reading method was effective in fluent reading and comprehension.	10
25	The Effect of Written Peer Feedback Training on Turkish EFL Students' Feedback Types and Writing Performance	2019	Esma CAN	As a result of the research, it was determined that peer feedback positively affected the writing skills of the experimental group.	10
26	The Effects of Different Corrective Feedback Methods on Improving Writing Skills of Teenage EFL Students	2023	Şeyda BEDİZ	As a result of the research, it was determined that indirect teacher feedback was more reliable and effective in improving students' writing skills.	11
27	The Impact of Self Assessment and Peer	2023	Burcu EREN	As a result of this study, it has been determined that	9

	Assessment on EFL Learners' Writing Performance			individuals learning English as a foreign language, depending on the self-assessment and peer assessment methods, make many contributions to the writing performance of these methods.	
28	The Effect of Pronunciation Teaching With The Model of Self-Listening and Self-Assessment on the Voiceness Skills of Foreign Students Learning Turkish	2021	Rümeysa UÇAR	As a result of this study, it was determined that pronunciation teaching implemented with the self-listening and self-evaluation model increased pronunciation skills.	9
29	The Effect of Peer Feedback in the Online Environment on Collaborative Problem Solving Skills	2022	Yeşim KARADAĞ	As a result of this study, it was determined that peer feedback had positive effects on collaborative problem solving skills.	11

When Table 1 is examined, 29 studies examining the effects of teacher, peer and self-assessment feedback types on student success were found. While 28 of these studies concluded that feedback types positively affected student success, only 1 found that feedback types did not create a significant change on success. In summary, 96.56% of the studies examined found that feedback types positively affected student success. When the average quality evaluation score of the studies is examined, it is seen that 7 of them have 9 points, 11 of them have 10 points and 11 of them have 11 points. It was also determined that 10 studies examined the effect of teacher feedback, 16 studies examined the effect of peer feedback and 11 studies examined the effect of self-assessment on students.

Table 2

The Effect of Feedback Methods on Student Attitudes in the Studies Included in the Research

	Name of the Study	Year	Author(s)	The Effect of Used Feedback on Student Achievement	Quality Evaluation Score Average
1	Effect of Primary School Teachers' Feedback on Students' Extracurricular Mathematics	2015	Gülçin ERAZ Cumali ÖKSÜZ	As a result of this study, it was determined that the feedback given by the teacher regarding extracurricular mathematics activities increased the attitude scores in the experimental group.	11
2	The Effect of Verbal Feedback on Primary Pupils' Academic Achievement, Attitudes Towards The Lesson And Metacognitive Awareness	2015	Mustafa Feyyaz ÇETİN Çiğdem ŞAHİN-TAŞKIN	As a result of this study, it was determined that the effective feedback given by the teacher significantly affected the students' attitudes towards the course.	10
3	Effects of Video Self Modeling on Development of Fluent Readıng Skills	2013	Mustafa ULU Mustafa BAŞARAN	As a result of this study, it was determined that the video self-assessment technique developed positive attitudes in the experimental group.	9
4	The Influence of Peer Feedback on Students' Writing Performance and Their Attitudes Towards Writing	2014	Mehmet Veysel BİLEN	As a result of the peer feedback applied in this research, it was determined that the attitudes of the students in the experimental group increased.	10
5	The Effect of Peer Feedback on Turkish as a Foreign Language Students' Wrıtıng	2017	Mehmet ÖZŞAVLİ	According to the results of this research, it was observed that peer feedback positively affected the attitudes of students learning Turkish as a foreign language.	9
6	Effect of Peer Instruction Enriched by the Web Based Peer And Self Assessment System on the Achievement And Attitude of the 7th Grade Students in Rational Numbers	2014	Osman Cevat YAVUZ	According to the results of the feedback type applied in the research, it was determined that there was no change in the attitudes of the experimental and control groups.	11
7	The Effect of Effective Feedback on	201	Mustafa Feyyaz	As a result of this study, it was determined	10

	Academic Achievement, Attitude Towards the Course and Metacognitive Awareness	4	ÇETİN	that the effective feedback given by the teacher positively affected the students and their attitudes towards the course..	
8	The Effects of Peer Assessment Applıcatıon On Seventh Grade Students' Mathematıcal Achievements In The Teachıng of Equations	201 7	Sinem Ceren ÇOLAK	As a result of this research, it was determined that the peer assessment method positively increased students' attitudes towards mathematics course.	9
9	An Analysis of the Effect of Peer And Teacher Feedback on EFL Learners' Oral Performances and Speaking Self Efficacy Levels	201 9	Hong Yu Connie AU	According to the results of this research, it was determined that peer and teacher feedback methods positively affected the attitudes of students learning English as a foreign language.	9

When Table 2 was examined, 9 studies were found examining the effects of teacher, peer and self-evaluation feedback types on student attitudes. 8 of these studies concluded that feedback types positively affected student attitudes. The remaining 1 study shows that feedback types do not affect student attitudes. In line with the findings, 88.89% of the studies indicate that feedback types improve student attitudes. When the average quality evaluation score of the studies is examined, it is seen that 4 of them have 9 points, 3 of them have 10 points and 2 of them have 11 points. It was also determined that 4 studies examined the effect of teacher feedback, 5 studies examined the effect of peer feedback and 2 studies examined the effect of self-assessment on students.

Table 3

The Effect of Feedback Methods on Student Motivation in the Studies Included in the Research

	Name of the Study	Year	Author(s)	The Effect of Used Feedback on Student Achievement	Quality Evaluation Score Average
1	The Predictive Effect of Perceived Teacher Feedback and Motivational Climate on Enjoyment And Motivation in Physical Education and Sport Lessons	2018	F. Hülya AŞÇI, Gökçe ERTURAN İLKER	In this study, it was concluded that positive non-verbal feedback given by teachers gave positive results.	10
2	Exploring Students' Attitudes Toward Motivation, Satisfaction, and Perceived Learning Outcomes Using Online Feedback in Writing Argumentative Essay	2023	Marzieh PARVANEH Akhteh KHANEH	As a result of this study, it was determined that peer feedback positively affected students' motivation levels.	11

When Table 3 was examined, two studies were found examining the effects of teacher and peer feedback types on student motivation. Both of these studies found that feedback types increase student motivation, and in line with the findings, these studies show that feedback types improve student motivation. When the average quality evaluation score of the studies is examined, it is seen that 1 of them has 10 points and 1 of them has 11 points. Additionally, it was determined that 1 study examined the effect of teacher feedback and 1 study examined the effect of peer feedback on students.

Discussion and Conclusion

This study aimed to determine how students' attitudes, motivation and success are viewed in studies on teacher feedback, peer feedback and self-evaluation. For this reason, various limitations were introduced to the research by using the systematic review method and the studies obtained in this context were examined. Within the scope of the study, 35 studies were reached, 13 of which were articles and 22 thesis studies. The findings show that teacher feedback, peer feedback and self-evaluation increase students' attitudes, motivation and success towards the course. Due to the limitations determined in the research, foreign sources were not examined, and only studies that had the opportunity to be published in our country were included in the research. In the field of education and training in our country, based on the studies on the feedback given, it has been frequently encountered that the opinions of students or teachers are taken on the types of feedback (Bayat, 2010; Bozpolat, Hazar and Yıldız, 2021; Dilbaz Sayın and Arslan, 2017; Kırbaç, Balı and Macit, 2017; Öntaş and Kaya, 2019; Şahin and Şahin Kalyon, 2018 etc.; Ülper and Çetinkaya, 2016; Ülper, 2012; Yılmaz, 2019). Although the abundance of such studies contributes to the literature, it is seen that the studies examining student success, attitude and motivation based on feedback in Turkey are quite few in number, especially when compared to foreign sources.

It has been determined that studies conducted abroad have found findings that support the research results. Studies have shown that the feedback given by the teacher positively affects the academic success of the students, and that the students who are not given feedback are less careful in correcting their mistakes, thus increasing the success of the students who are given feedback by the teacher (Black et al., 2002; Butler, 1987; Cooper, 2001; Crooks, 1998; Elawar and Corno, 1985; Hattie and Timperley, 2007; Knight, 2003; Li and Steckelberg, 2004; Rowntree, 1987; Sadler, 1989; Schoen and Kreye 1974; Torrance and Pryor, 1998; Weaver, 2006). Similarly, it is possible to come across studies where teacher feedback increases students' interest and desire for the course and positively affects their attitudes (Cooper, 2001; Hagger et al., 2015; Wang et al., 2008). There are also studies concluding that teacher feedback increases student motivation (Deci, Koestner and Ryan, 1999; Koka and Hein, 2005; Mouratidis et al., 2008; Mouratidis, Lens and Vansteenkiste, 2010).

Studies conducted on peer feedback from abroad have found studies concluding that the feedback students give to each other increases their academic success (Berggren, 2014; Chang, 2015; Chibsa, 2008; Grami, 2010; Huisman, Saab, van Driel and van den Broek, 2018; Liou and Peng, 2009; Min, 2006). In addition to these studies, studies have also been found to show that peer feedback increases students' attitudes towards the course (Hu, 2005; Katsra, Tollefson, and Gilbert, 1987; Lee, 1997; Min, 2005; Shao 2009; Tang and Tithecott, 1999). There are also studies showing that as a result of self-assessment practices, students develop positive attitudes towards the course and positively affect student motivation (Black, Harrison, Lee, Marshall and Wiliam, 2003; Morrison et al., 2004). In this context, studies have also been found that self-assessment affects students' academic success (Andrade and Boulay, 2003; Andrade, Du and Mycek, 2014; Hirvela and Pierson, 2000; Lam, 2010; Meihami and Varmaghani, 2013; Oscarson, 2009; Ross, 2006; Ross, Rolheiser and Hogaboam-Gray, 1999; Sajedi, 2014).

Recommendations

As a result of this study, the following recommendations can be given to researchers:

- Before starting their studies, researchers should try to prevent possible problems that may arise, especially in peer feedback, by providing feedback training to the study groups through an expert.
- Studies examining the effects of feedback types on motivation and self-efficacy factors, as well as success and attitude factors, are quite limited in the literature. Such studies need to be increased.
- Researchers who comparatively examine the effects of feedback types should not ignore the principle of correct and timely use. In environments where friendship relations are strong, teacher feedback may be less effective than peer feedback, or in times requiring individual effort, self-evaluation may be more effective than peer feedback.
- Following this study, future studies should not only select topics related to feedback types, but also include systematic review studies in different disciplines.
- It is seen that there are few systematic review studies in the field of Turkish teaching in the literature. For this reason, it is recommended that researchers conduct systematic studies in this field by examining Turkish teaching practices within the framework of different variables.

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Conflict of Interest

It has been reported by the authors that there is no conflict of interest.

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Since this study was a compilation study and the data source of the study was open access, ethics committee approval was not required.

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Web 2.0 Rapid Content Development Self-Efficacy Perception Levels of English Teachers

***Meryem Arslan, **Cavide Demirci**

Abstract. The aim of this research is to determine the Web 2.0 rapid content development self-efficacy perception levels of English teachers. In this study general survey model, one of the quantitative research methods, was used as the research design. For this purpose, "Web 2.0 Rapid Content Development Self-Efficacy Scale for Educational Purposes" was used to obtain quantitative data. The research group consists of English teachers working at different schools and levels in Konya city center and its districts. In this study, Mann Whitney-U and Kruskal Wallis tests, which are non-parametric tests, were used because the data collected in the study did not meet the assumption of normal distribution. According to the results of the research, there was no significant difference in any of the Web 2.0 rapid content development self-efficacy perception levels of English teachers according to the variables of gender, working time and school level. In different studies, the working group can be expanded, and experimental studies can be included. When the results obtained from the study are analyzed in general, it is seen that English teachers are competent in developing content using Web 2.0 applications. In this context, it is important for curriculum developers to prepare programs in which technology-supported content can be integrated more while creating new curricula in order to achieve positive results in the field of education.

Keywords. Web 2.0, Self-efficacy, Educational technology, Instructional technology

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In recent years, technology has been widely used in all areas of education. For this reason, teachers and administrators are expected to review their own technological knowledge and integrate technology into their education curricula (Büyükyavuz & İnal, 2012). Considering that the contribution of technology to education and education to technology is parallel, it is necessary to benefit from technological innovations in every field of education as a requirement of the age. It is almost impossible to think independently of two areas that overlap so much. Innovations in the field of technology bring new perspectives to the education process and enable the curriculum to change and develop. Educational technology is defined by AECT (Association for Educational Communications and Technology) as “ethical practices and studies done by creating, using and managing appropriate technological resources and processes to increase performance and facilitate learning” (2004). In many studies, it has been stated that the contribution of technology to education is at a high level. Delen and Bulut (2011, p. 311), based on the results of PISA 2009 for Turkey, found a positive relationship between the use of ICT and the success of students. According to Hopson, Simms, and Knezek (2002, p. 109) “technology is a key to preparing students to meet the needs of the 21st century and to participate effectively in the work environment of today's society”. When an appropriate online activity process to be created with Web 2.0 technologies is combined with face-to-face education, it will enable the creation of a powerful and effective blended learning model (Deperlioğlu & Köse, 2010).

The term Web 2.0 was first introduced to the literature by Tim O'Reilly at a conference on Web technologies in 2004 and has since been accepted as "a radical change from the monopolistic and static use of the Internet to more effective and interactive change" (Enonbun, 2010, p. 18). The usage area of Web 2.0 technologies is expanding rapidly day by day. Web 2.0 technologies make the users’ interaction, collaborative work and access to information easy. These features have been pioneering to use of Web 2.0 technologies and its standards in the field of education (Deperlioğlu & Köse, 2010). Teachers need to develop themselves in the field of technology in order to use Web 2.0 tools effectively and efficiently in education. In this context, information should be provided about the self-efficacy levels of teachers to produce content with Web 2.0 tools.

According to Bandura (1977, p. 194) “the perception of self-efficacy is the feeling of having the skills that individuals need to cope with a task. Success is not only having the skills to accomplish a job, but also using these skills effectively and safely”. The concept of teacher self-efficacy can be defined as the capacity of teachers to develop methods suitable for the learning levels of students with different learning skills or low motivation and to cope with teaching problems (Küçükyılmaz &

Duban, 2006, p. 4). Tschannen-Moran and Woolfolk Hoy (2001, p. 783) defined teacher self-efficacy as a teacher's belief in his or her efficacy to impart desired target behaviors to a student. Studies show that teachers who do not develop self-efficacy beliefs have difficulty in solving the problems they encounter in the teaching process. For this reason, they have problems in their relations with their students and they prefer more traditional teaching methods. Contrary to this situation, teachers with high self-efficacy beliefs can find different solutions to problems and support their lessons with more student-centered and technology use instead of traditional methods (Henson, 2001, p. 8). Using, teaching and acquiring Web 2.0 tools in the classroom allows the ability to observe and interact with the environment, which is very relevant to their needs (Lemke et al., 2009). Web 2.0 self-efficacy beliefs are extremely important for teachers and a strong spread of how effective their use averages in their classrooms (Abbitt, 2011). As important as academic studies on content knowledge are in the training process of teachers, it is equally important to train teachers who are self-confident, have high self-efficacy, and can find practical and functional solutions to the problems they encounter. Teachers with high self-efficacy can both communicate better with their students and adapt more easily to the teaching methods required by the age because they are open to innovations. Besides, it can create collaborative and highly interactive learning environments, Web 2.0 applications also provide social learning environments and help improve the use of technology. For this reason, Web 2.0 applications should be included especially in teaching practice courses.

When our education system is examined, foreign language education is a serious problem that has been going on for years in Turkey and is tried to be solved by designing different teaching programs. In order for foreign language education to be effective and efficient, many different areas such as student readiness, teacher qualifications, school environment, tools and equipment used in foreign language education, methods used, and technology use in education must coexist. However, one of the most important factors for effective language education to occur is to attract students' attention and reveal their desire to learn a foreign language. The best way to do this is to increase the motivation of students and remove their prejudices against learning a foreign language. In order to achieve this, it is necessary to make the best use of the world of technology, where new developments are experienced every day, in the field of education. In order for this to happen, teachers especially need to develop themselves technologically and be able to use educational technologies efficiently in their lessons.

In order to develop teachers' self-efficacy in the field of technology, activities such as making comments, multiple interactions and observing different experiences should be included, especially in practice lessons. The use of Web 2.0 applications in lessons will both contribute to the development of teachers' self-efficacy and help to create more social, collaborative, highly interactive and participatory lesson environments (Durusoy, 2011). Furthermore, digital technology can help create immersive and authentic tasks. Students can work with real-world problems and, due to the simplifed access to information, also deal with a variety of new problems. In this way, the tasks become relevant and meaningful to the students, which Walkington and Bernacki (2018) emphasize as a crucial aspect of personalized instruction.

The developments in the field of Computer and Communication Technologies (ICT) are closely followed by the Ministry of National Education and it is aimed to be used in all areas of education. For this purpose, it is important to provide adequate infrastructure in educational institutions. In this context, it is aimed to use educational technologies effectively by students and teachers. “However, the technological development of learning environments alone may not be sufficient to increase the quality of educational activities in these environments” (Sezgin, Erdoğan, & Erdoğan, 2017, p.196). In order for the existing resources to be efficient and effective, the most responsibility falls on the teachers. Teachers' attitudes towards educational technologies and their frequency of use significantly affect success in education.

The use of Web 2.0 applications, the popularity of which is increasing day by day, plays an important role in making students love foreign language learning. There are web 2.0 applications used for many different purposes in the education and training process. When these applications are preferred, their suitability for the purpose of the course and the desired outcomes are taken into consideration. Web 2.0 applications are used by teachers for many different purposes such as measurement and evaluation, game creation, presentation preparation, digital story preparation, survey preparation, 3D tools, digital board preparation, animation preparation, mind mapping. With Web 2.0 applications, more entertaining lessons can be designed, students' interest and motivation in the lesson can be increased, and thus a more permanent learning can be achieved. According to Coşgun & Savaş (2019), ICT integration in language classrooms makes language classes more interactive, flexible, and innovative due to various online resources as tools for valuable professional development. Harris and Rea (2009, p. 137) stated that Web 2.0 technologies have expanded classrooms and made the world itself a classroom. Grosseck (2009, p. 478) lists the advantages of using Web 2.0 applications in education as follows;

- Reduction of costs,

- Flexibility in choosing technologies,

- Easy and fast access to information anytime and anywhere,

- Integrating Web 2.0 technologies into teaching-learning activities,

- Provision of information and collaboration opportunities by social bookmarking services,

- Control access to resources by authenticating users,

- Share accumulated experiences and resources (blogs, microblogs, wikis, flickr, youtube),

- Platform independence; a computer with a browser and internet connection is sufficient,

- Compatibility with elements of the educational field and current contextual dynamics;

- Ease of use (minimum skills in using the Internet),

- Reliability over a long period of use,

- Less time and energy spent searching and managing information,

- Focusing mainly on didactic innovation, not on technology,

- Creating digital content.

In summary, in-class or out-of-class activities prepared with Web 2.0 applications help students acquire all four language skills that constitute the basic basis of foreign language education. In this study, the competencies of English teachers to develop fast content with Web 2.0 applications were investigated. For this purpose, answers to the following problems and sub-problems were sought.

1. What is the Web 2.0 rapid content development self-efficacy perception level of English teachers?

a) Do English teachers' educational Web 2.0 rapid content development self-efficacy perception levels change according to the gender variable?

b) Do English teachers' Web 2.0 rapid content development self-efficacy perception levels change according to their working time in the profession?

c) Do English teachers' Web 2.0 rapid content development self-efficacy perception levels change according to the type of school they work in?

Method

Research Design

This study was produced from the quantitative research method part of a comprehensive master's thesis using a mixed research method. General survey model, one of the quantitative research methods, was used as the research design. With the general survey model, it is aimed to reach a general judgment about a sample group that can represent the universe in a universe with a large number of members (Karasar, 2005).

Sample Group

The scale used to collect data was applied to English teachers working in primary, secondary and high school schools in Konya. If the whole universe cannot be reached in a study, a study group (sample) can be selected to represent the universe. This will make it easier for the researcher to continue his research (Ural & Kılıç, 2010). For this reason, English teachers working at different schools and levels in Konya were included in the study as a sample group. In the selection of the sample, no restrictions were made in areas such as age, seniority, level of employment (primary school, secondary school, high school) and gender. A total of 225 English teachers; 161 women, 64 men, participated in the study. Demographic characteristics of the participants are given in Table 1.

Table 1.

Demographic Characteristics of the Participants

		n	%
Gender	Female	161	71.6
	Male	64	28.4
	Total	225	100
Working experience in the profession	1-5	18	8
	6-10	47	20.9
	11-15	61	27.1
	16-20	64	28.4
	21 years and above	35	15.6
	Total	225	100
School level you work at	Primary School	29	12.9
	Secondary School	124	55.1
	High School	72	32.0
	Total	225	100

As can be seen in Table 1, 71.6% of the English teachers participating in the research are women and 28.4% are men. When we look at the working experience of the participants in the profession, it is seen that 8% of them are 1-5 years, 20.9% are 6-10 years, 27.1% are 16-20 years and 15.6% are 21 years or more. According to these results, it is seen that the highest participation in the survey is made by teachers who have worked for 11-20 years. When the school level is examined, it is seen that 12.9% of the participants are primary school teachers, 55.1% are secondary school teachers and 32% are high school teachers.

Data Collection Tools and Methods

The 'Educational Web 2.0 Rapid Content Development Self-Efficacy Perception Scale' developed by Birişçi, Kul, Aksu, Akaslan, and Çelik (2018) was used to collect data. The developed scale consists of 21 items under 3 factors. These factors are; preparation, presentation and evaluation. A 5-point Likert-type rating was used in the scale. The items in the scale are as follows; 5= 'I am very competent', 4= 'I am sufficient', 3= 'I am moderately competent', 2= 'I am inadequate', and 1= 'I am very inadequate'. The possible scores for this scale range from 21 to 105. According to this, the high scores that people get from “EW2RCDSPS” mean that they have a high level of self-efficacy perceptions in terms of using Web 2.0 tools educationally. The reliability and validity scores of the original scale used in the study are as follows; The Cronbach's Alpha reliability coefficient obtained for the entire scale was calculated as .955, .935 for the preparation sub-dimension, .854 for the sharing sub-dimension, and .848 for the measurement and evaluation sub-dimension. According to this result, the reliability of the scale and its sub-dimensions is high. After the EFA and CFA analyzes of the scale, it was stated that the scale had construct validity.

Data Collection Process

The scale used to collect the data was converted into a questionnaire in two parts via Google Forms and sent to the participants via e-mail and the data were collected online. The first part was prepared as the "Teacher Information Form", which includes demographic information, namely, the participants' gender, seniority year and the type of school they worked at, and the second part was prepared to include scale items. Participants were informed by stating that participation in the survey was on a voluntary basis and no special information was requested.

Data Analysis

The data obtained from the scale applied to English teachers were analyzed and interpreted through the SPSS 23 package program. Descriptive statistical methods such as number, percentage, mean and standard deviation were used for the analysis of the data. In line with the data obtained, teachers' self-efficacy in developing fast content with Web 2.0 applications was evaluated according to gender, seniority and school types.

Results

In the study in which English teachers' Web 2.0 applications and rapid content development self-efficacy perception levels were investigated, the "Web 2.0 Rapid Content Development Self-Efficacy Scale for Educational Purposes" was applied to the teachers. First of all, three different normality analyses were performed in order to understand whether the obtained data showed a normal distribution. While performing the normality analysis, the whole scale and its sub-factors consisting of "preparation, presentation and evaluation" sections were examined separately. Table 2 shows the results of the normality analysis.

Table 2.

Normality Analysis Results of the Web 2.0 Rapid Content Development Self-Efficacy Scale for Educational Purposes

Analysis	Scale Mean	1^{st} Factor	2^{nd} Factor	3^{rd} Factor
Skewness/Kurtosis Analysis	+/+	+/+	+/+	+/+
Kolmogorov-Smirnova Analysis	-	-	-	-
Frequency Distribution Chart	-	-	-	-

(+): Normal Distribution (Parametric)

(-): Non-Normal Distribution (Non-parametric)

As can be seen in Table 2, the scale was evaluated as a whole with its sub-dimensions, and as a result of the analyses made, the data did not show a normal distribution according to the "skewness-kurtosis" values. According to “Kolmogorov-Smirnova” values and “histogram” graphs, it was determined that the data did not show normal distribution, that is, they were non-parametric. The analyses made are analyzed in detail in Tables 3, 4 and 5.

Table 3.

Skewness-Kurtosis Analysis Results of Sub-Dimensions for Web 2.0 Rapid Content Development Self-Efficacy Scale for Educational Purposes

		Statistic	Std. Error
Preparation Mean	Skewness	-0.446	0.162
	Kurtosis	0.783	0.323
Presentation Mean	Skewness	-0.687	0.162
	Kurtosis	0.886	0.323
Evaluation Mean	Skewness	-0.463	0.162
	Kurtosis	0.516	0.323

Table 4.

Skewness-Kurtosis Analysis Results for the Web 2.0 Rapid Content Development Self-Efficacy Scale for Educational Purposes

		Statistic	Std. Error
Total Mean	Skewness	-0.443	0.162
	Kurtosis	0.831	0.323

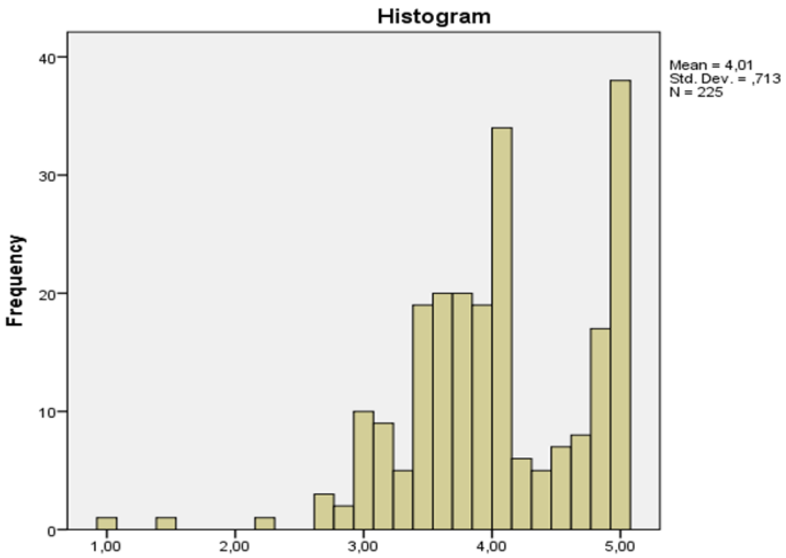
When Tables 3 and 4 are examined, since the Skewness-Kurtosis values of the total and sub-dimensions of the scale are between -1 and +1, the data show a normal distribution according to these tests. According to Büyüköztürk (2011, p. 21), if the arithmetic mean, median and mode are close to each other in the distribution of scores in a data set, and if the Skewness - Kurtosis values are between -1 and +1, it can be said that the scores show a normal distribution. However, since it cannot be assumed that the data are normally distributed based on only one analysis, other analysis results are also considered.

Table 5.

Kolmogorov-Smirnova and Shapiro-Wilk Analysis Results for Web 2.0 Rapid Content Development Self-Efficacy Scale for Educational Purposes and Its Sub-Dimensions

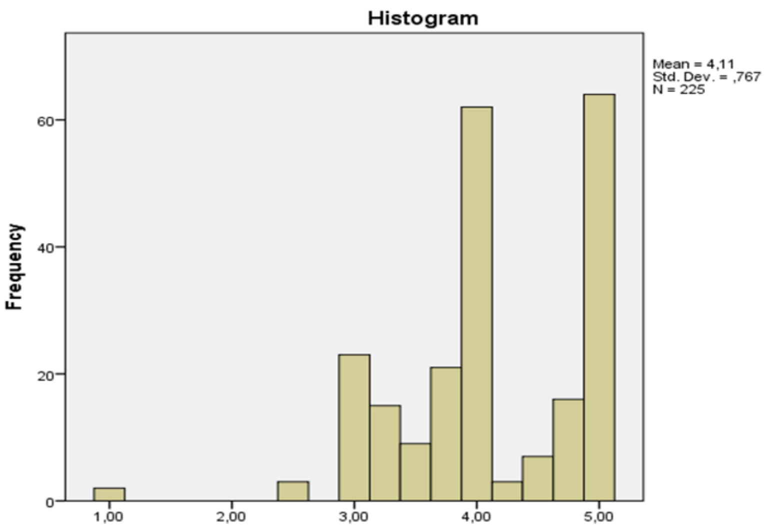
	Kolmogorov-Smirnova			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Preparation	0.127	225	0	0.932	225	0
Presentation	0.16	225	0	0.882	225	0
Evaluation	0.152	225	0	0.906	225	0
Total Mean	0.114	225	0	0.924	225	0

If the sample size is greater than 35, the Kolmogorov-Smirnov test (McKillup, 2012, p. 77) and if it is small, the Shapiro-Wilk test should be considered (Shapiro and Wilk, 1965, p. 594). Since the sample size was larger than 35, Kolmogorov-Smirnova test results were taken into consideration in the study. According to the results of the analysis, it is seen that the data are not normally distributed because the self-efficacy perception scores of the teachers participating in the research were Sig.=.0 and p<.05.



Preparation Mean

Figure 1. Histogram Chart for the Preparation Sub-Dimension of the Web 2.0 Rapid Content Development Self-Efficacy Scale for Educational Purposes



Presentation Mean

Figure 2. Histogram Chart for the Presentation Sub-Dimension of the Web 2.0 Rapid Content Development Self-Efficacy Scale for Educational Purposes

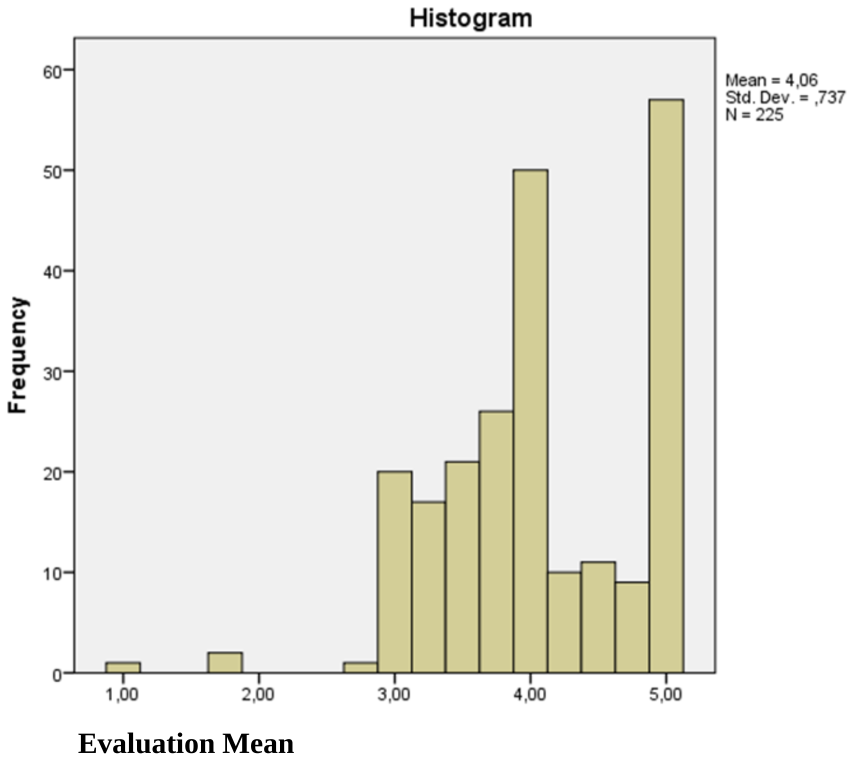


Figure 3. Histogram Chart for the Evaluation Sub-Dimension of the Web 2.0 Rapid Content Development Self-Efficacy Scale for Educational Purposes

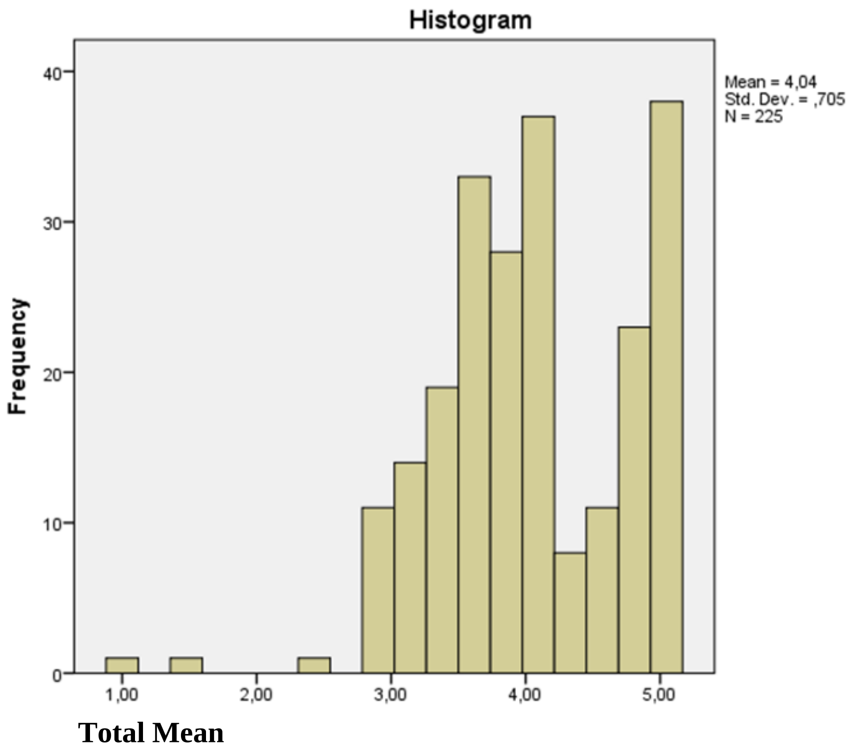


Figure 4. Histogram Chart for the Web 2.0 Rapid Content Development Self-Efficacy Scale for Educational Purposes

Figures 1, 2, 3 and 4 show the graphs of the Educational Web 2.0 Rapid Content Development Self-Efficacy Scale and its sub-factors applied to English teachers. When the graphs are examined, it is clearly seen that the data are concentrated in a right skewed way and the data do not show a normal distribution. Therefore, non-parametric tests were used in the analysis of the data. In this context, Mann Whitney-U and Kruskal Wallis tests, which are non-parametric tests, were used because the data collected in the study did not meet the assumption of normal distribution. First of all, the first sub-problem of the research, "Does English teachers' educational Web 2.0 rapid content development self-efficacy levels change according to the gender variable?" search for an answer to the question. For this purpose, the non-parametric Mann-Whitney U test was used to compare two independent groups. Test results are shown in Table 6.

Table 6.

Investigation of English Teachers' Perceptions of Self-Efficacy for Educational Web 2.0 Rapid Content Development by Gender Variable

Gender	N	Mean Rank	Sum Rank	U	Z	P
Female	161	109.85	17685.500	4644.500	-1.155	.248
Male	64	120.93	7739.500			

When the scores obtained from the total test are examined, it is seen that there is no significant difference between the Web 2.0 rapid content development self-efficacy of English teachers in terms of gender (p=.248). In other words, Web 2.0 rapid content development self-efficacy levels of female and male teachers are close to each other. The results obtained from the examination of the sub-dimensions of the scale according to the gender variable are shown in Table 7.

Table 7.

Examination of the Sub-Dimensions of the Web 2.0 Rapid Content Development Self-Efficacy Scale for Educational Purposes by Gender

Sub-Dimensions	Gender	N	Mean Rank	Sum Rank	U	Z	P
Preparation	Female	161	110.48	17786.50	4745.500	-.926	.354
	Male	64	119.33	7638.50			
Presentation	Female	161	108.68	17498.00	4457.000	-1.616	.106
	Male	64	123.86	7927.00			
Evauation	Female	161	108.99	17547.50	4506.500	-1.489	.137
	Male	64	123.09	7877.50			

When the “preparation, presentation and evaluation” sub-dimensions of the scale are examined separately according to gender, it is seen that the Web 2.0 rapid content development self-efficacy perception levels of male and female teachers do not change according to gender (p=.354, p=.106, p=.137).

Secondly, the second sub-problem of the research, “Do English teachers' Web 2.0 rapid content development self-efficacy levels change according to their working time in the profession?” search for an answer to the question. In order to find an answer to this problem, the Kruskal Wallis test was applied. The Kruskal Wallis test is a method used to test the significance of the difference between the means of three or more groups in data that do not show normal distribution. The results of the Kruskal Wallis test are given in Table 8.

Table 8.

Examination of English Teachers' Self-Efficacy on Web 2.0 Rapid Content Development for Educational Purposes According to the Variable of Working Time in the Profession

Working Time	N	Mean Rank	sd	x	p
1-5 years	18	122.33			
6-10 years	47	125.32			
11-15 years	61	111.18	4	3.085	0.544
16-20 years	64	106.9			
21 years and over	35	105.99			
Total	225				

As can be seen in Table 8, the years of experience of the teachers participating in the research is concentrated in the groups of 11-15 years and 16-20 years, but as a result of the test, it is seen that there is no significant difference between the Web 2.0 rapid content development self-efficacy perceptions of the English teachers according to the working time (p=.544). The results obtained from the examination of the sub-dimensions of the scale according to the working time variable are shown in Table 9.

Table 9.

Examination of Scale Sub-Dimensions According to Working Time

Sub-Dimensions	Working Time	N	Mean Rank	sd	x	p
Preparation	1-5 years	18	122.25	4	2.67	.614
	6-10 years	47	123.85			
	11-15 years	61	112.33			
	16-20 years	64	107.08			
	21 years and over	35	105.67			
	Total	225				
Presentation	1-5 years	18	128.81	4	6.783	.148
	6-10 years	47	129.98			
	11-15 years	61	110.10			
	16-20 years	64	105.62			
	21 years and over	35	100.63			
	Total	225				
Evaluation	1-5 years	18	114.86	4	2.119	.714
	6-10 years	47	124.74			
	11-15 years	61	109.24			
	16-20 years	64	109.65			
	21 years and over	35	108.96			
	Total	225				

When the test results are examined according to the "preparation, presentation and evaluation" sections of the scale, which consists of three sub-dimensions, it is seen that there is no significant difference between the Web 2.0 rapid content development self-efficacy perceptions of English teachers according to their working time in the profession, as in the whole scale (p=.614, p=.148, p=.714).

The last sub-problem of the research, “Does the Web 2.0 rapid content development self-efficacy levels of English teachers change according to the type of school they work in?” In order to find an answer to the question, the Kruskal Wallis test was conducted. Teachers are divided into three sections according to the school level they work in: primary school, secondary school and high school. The test results obtained are shown in Table 10.

Table 10.

Examination of English Teachers' Perceptions of Self-Efficacy for Educational Web 2.0 Rapid Content Development According to the Variable of School Level

School Level	N	Mean Rank	sd	x	p
Primary School	18	124.55			
Secondary School	47	105.83	2	3.440	.179
High School	61	120.69			

According to the results obtained for the whole scale, it was seen that the self-efficacy perceptions of English teachers for educational Web 2.0 rapid content development did not show a significant difference according to the school level variable (p=.179). In other words, the Web 2.0 rapid content development self-efficacy perceptions of English teachers working in primary, secondary and high schools are close to each other. The results of the sub-dimensions of the scale are shown in Table 11.

Table 11.

Examination of Scale Sub-Dimensions by School Level

Sub-Dimensions	School Level	N	Mean Rank	sd	x	p
Preparation	Primary School	29	123.95	2	3.368	.186
	Secondary School	124	105.89			
	High School	72	120.83			
	Total	225				
Presentation	Primary School	29	121.50	2	3.822	.148
	Secondary School	124	105.53			
	High School	72	122.44			
	Total	225				
Evaluation	Primary School	29	120.84	2	2.635	.268
	Secondary School	124	106.74			
	High School	72	120.62			
	Total	225				

When the sub-dimensions of the scale were examined according to the school level, it was seen that the English teachers' educational Web 2.0 rapid content development self-efficacy perceptions did not show a significant difference according to the school level variable ($p=.186$, $p=.148$, $p=.268$).

Discussion and Conclusion

This study, in which English teachers' Web 2.0 applications and rapid content development self-efficacy perception levels were taken, was carried out with English teachers working in primary and secondary education institutions in Konya. In line with the findings obtained in the research, the following results were obtained.

The first sub-problem of the study, “Does the level of self-efficacy of English teachers for educational Web 2.0 rapid content development change according to the gender variable?” When the scores obtained from the total of the test and the "preparation, presentation and evaluation" sub-dimensions of the scale were examined separately according to gender, it was seen that there was no significant difference between the Web 2.0 rapid content development self-efficacy perceptions of English teachers in terms of gender. In other words, it was concluded that the Web 2.0 rapid content development self-efficacy perception levels of female and male teachers were close to each other. Keskin (2021), in his study, stated that when the self-efficacy status of physical education teachers against Web 2.0 tools is examined according to the gender variable, there is a statistically significant difference in the sub-dimensions of preparation and evaluation in the scale used. He concluded that the difference in the presentation sub-dimension was not statistically significant. In a different study, it was concluded that the Web 2.0 rapid content development self-efficacy perception levels of male and female participants were close to each other (Eser, 2020). In another study, it was concluded that the scores of pre-service teachers' Web 2.0 rapid content development self-efficacy belief levels did not differ significantly according to the gender variable (Say & Yıldırım, 2020). In his study on secondary school teachers, Onbaşılı (2020) concluded that there was no significant difference in the self-efficacy of Web 2.0 tools between male and female teachers, that is, gender did not have any effect on Web 2.0 tools self-efficacy. As can be seen, similar results have been found in many studies. Akkoyunlu and Orhan (2003) concluded in their study that men have more computer skills necessary for Web 2.0 rapid content development. However, when the studies conducted in recent years are examined, there are fewer differences in terms of gender variable. The reason for this can be thought of as the increasing interest and necessity in educational technologies over the past years. It can be concluded that the transition to distance education, especially due to the Covid-19 pandemic, and that teachers may have improved themselves more in the field of technology in this process. For instance, in his study, Moorhouse (2023) stated that “most of the teachers started using digital technologies regularly due to the online teaching necessitated by the pandemic but decided to continue to use them even after in-person teaching resumed”.

For the second sub-problem of the research, the working hours of the English teachers participating in the research were divided into five groups as “1-5 years, 6-10 years, 11-15 years, 16-20 years, 21 years and above”. The second sub-problem, “Does the Web 2.0 rapid content development self-efficacy perception levels of English teachers change according to their working time in the profession?” According to the data obtained from both the total of the scale and the sub-dimensions of the scale for the question, it was seen that there was no significant difference between Web 2.0 applications and rapid content development self-efficacy perception levels according to the variable of teachers' working time in the profession. In a similar study, when the awareness levels of faculty members and lecturers for Web 2.0 applications were analyzed according to their working time in the field, it was revealed that the highest level of awareness about Web 2.0 tools belonged to the participants with 6-10 years of experience (Daşkın, 2017). In other words, while there is no difference between the teachers working in primary and secondary education according to their working hours, there is a significant difference among the instructors working in higher education according to their working hours. It can be thought that this difference arises due to the fact that teachers working in primary and secondary schools mostly use Web 2.0 applications in their lessons in order to motivate students to the lesson, to attract their attention or to make the lessons more enjoyable. Keskin (2021, p. 58) stated in his study that there was a statistically significant difference in the preparation and evaluation sub-dimensions of physical education teachers' Web 2.0 rapid content development self-efficacy beliefs according to the variable of years of service, but there was no significant difference in the presentation sub-dimension.

Regarding the third sub-problem of the research, “Do the Web 2.0 rapid content development self-efficacy perception levels of English teachers change according to the type of school they work in?” search for an answer to the question. When the data obtained were examined, it was seen that there was no significant difference between Web 2.0 applications and rapid content development self-efficacy perception levels according to the school type variables grouped as primary school, secondary school and high school. However, when the literature was searched, no study was found that investigated this variable. The reason for this can be explained by the fact that the studies conducted were mostly on pre-service teachers or instructors. This can be explained by the fact that international projects such as eTwinning and Erasmus Plus are usually carried out by English teachers at all school levels and Web 2.0 applications are frequently used in these projects.

When the results obtained from the study are analyzed in general, it is seen that English teachers are competent in developing content using Web 2.0 applications. In this context, it is important for curriculum developers to prepare programs in which technology-supported content can be integrated more while creating new curricula in order to achieve positive results in the field of education. In addition, the fact that many Web 2.0 applications are paid over time or the ability to use basic features for free is often a problem for teachers. In order to prevent this situation, the Ministry of National Education should develop free applications within its own organization and make them available to teachers.

Recommendations

1. The research is limited to English teachers working in public and private primary and secondary schools affiliated to Konya Provincial Directorate of National Education. Further studies can be done with a larger study group.

2. The data obtained from the research could only be collected online due to the Covid 19 pandemic, it is assumed that the data obtained may mostly belong to the participants with high technological competences. Therefore, in future studies, more detailed results can be obtained by collecting data both face-to-face and online.

3. Only teachers working in primary and secondary education were included in the study. Comparisons can be made by including academicians working in higher education in future studies.

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