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Nesibe Aydın Okulları tarafından hazırlanan *Eğitim ve Gelecek Dergisi*'nin yirmi sekizinci sayısıyla siz değerli okuyucularımızla yeniden buluşmanın mutluluğunu yaşıyoruz. Bu sayımızda, eğitim bilimleri alanında güncel, özgün ve nitelikli araştırmaların yer aldığı birbirinden değerli on altı makaleyi sizlere sunuyoruz. Dergimizin bu sayısında yer alan çalışmalar; okul öncesinden yükseköğretime, sınıf içi uygulamalardan öğretmen eğitimi ve psikolojik danışma süreçlerine, STEM ve artırılmış gerçeklik gibi yenilikçi yaklaşımlardan afet sonrası eğitim bağlamlarına kadar uzanan geniş bir yelpazeyi kapsamaktadır.

Eleştirel düşünme, çevrim içi mahremiyet, topluluk önünde konuşma kaygısı ve kişilik özellikleri gibi bireysel farklılıklara odaklanan çalışmaların yanı sıra; öğretmen adaylarının uygulama deneyimlerini, beden eğitimi tutumlarıyla okul aidiyeti ilişkisini ve ikinci dil olarak Türkçe öğretimi alanındaki araştırma eğilimlerini ele alan nitel ve nicel araştırmalar bu sayıda öne çıkmaktadır. Ayrıca, TIMSS verileri üzerinden Türkiye'nin fen başarısını etkileyen faktörlerin analiz edildiği ve afet durumlarında sosyal medya duyarlılığına yönelik ölçek geliştirme çalışmasının yer aldığı bu sayı hem akademik hem de uygulama düzeyinde katkı sağlamayı amaçlamaktadır.

Eğitim teknolojilerinin etkisine ışık tutan artırılmış gerçeklik ve tersyüz sınıf uygulamaları üzerine yapılan araştırmalar, öğretim sürecinin yeniden yapılandırılması noktasında öğretmenlere ve eğitim liderlerine önemli ipuçları sunmaktadır. Benzer şekilde, romantik ilişkilerde doyum, yakınlık ve aşk stilleri arasındaki ilişkilerin incelendiği psikolojik temelli çalışmalar da sosyal bilimler ekseninde disiplinlerarası katkılar sağlamaktadır.

Bu sayımızda yer alan çalışmaları bilimsel titizlikle değerlendirerek yayın sürecine katkı sunan tüm hakemlerimize, emek veren yazarlarımıza ve yayın kurulumuza teşekkür ederiz. Eğitim ve Gelecek Dergisi olarak amacımız, eğitim alanında bilimsel bir tartışma zemini oluşturmak, yenilikçi ve uygulamaya dönük bilgi üretimini desteklemek ve bu bilgiyi hem ulusal hem de uluslararası düzeyde paylaşmaktır.

Bir sonraki sayımızda buluşmak dileğiyle, dergimizde yer alan çalışmaları ilgiyle okumanızı diler, bilimsel üretiminizle katkı sunmanızı temenni ederiz.

Prof. Dr. Erten GÖKÇE ve Doç. Dr. Aliye ERDEM

Eğitim ve Gelecek Dergisi Editörleri

Editorial

We are delighted to reconnect with our valued readers with the twenty-eighth issue of the *Journal of Education and Future* prepared by Nesibe Aydın Schools. In this issue, we present sixteen valuable articles featuring current, original, and high-quality research in the field of educational sciences. The studies featured in this issue of JEF cover a wide range of topics, from preschool to higher education, classroom practices to teacher training and psychological counseling processes, innovative approaches such as STEM and augmented reality, and post-disaster education contexts.

In addition to studies focusing on individual differences such as critical thinking, online privacy, public speaking anxiety, and personality traits, this issue highlights qualitative and quantitative research examining teacher candidates' practical experiences, the relationship between physical education attitudes and school belonging, and research trends in the field of Turkish language education as a second language. Furthermore, this issue aims to contribute both academically and practically by analyzing the factors affecting Turkey's science achievement based on TIMSS data and presenting a scale development study on social media sensitivity in disaster situations.

Research on augmented reality and flipped classroom applications, which shed light on the impact of educational technologies, provides important insights to teachers and educational leaders on restructuring the teaching process. Similarly, psychology-based studies examining the relationships between satisfaction, intimacy, and love styles in romantic relationships also contribute to interdisciplinary studies in the social sciences.

We would like to thank all our reviewers, authors, and editorial board members who contributed to the publication process by evaluating the studies in this issue with scientific rigor. As the *Journal of Education and Future*, our goal is to create a scientific discussion platform in the field of education, support innovative and application-oriented knowledge production, and share this knowledge both nationally and internationally.

We look forward to seeing you in our next issue and hope you will read the studies in our journal with interest and contribute to scientific production.

Prof. Dr. Erten GÖKÇE and Assoc. Prof. Dr. Aliye ERDEM

Editors of Journal of Education and Future

Analysing the Effect of eTwinning Projects on Teachers' Critical Thinking Disposition*

Article Type	Received Date	Accepted Date
Research	13.03.2024	20.02.2025

Fatih Kaya**

Süleyman Nihat Şad***

Abstract

The purpose of this research was to examine the impact of eTwinning projects on teachers' critical thinking dispositions based on teachers' perspectives regarding various variables. Designed as a sequential explanatory mixed-methods research, this study employed both survey and case study models. The sample consisted of 340 teachers working in public and private schools in Malatya during the 2021-2022 academic year. Among these teachers 158 were selected using criterion sampling method, i.e. participation in eTwinning projects as the key criterion, while the remaining 182 teachers were chosen through simple random sampling. Additionally, 15 participants who participated in eTwinning projects were interviewed to explore their views regarding the contribution of these projects to critical thinking. Data were collected using the Marmara Critical Thinking Dispositions Scale and semi-structured interviews. The findings revealed a statistically significant difference in critical thinking disposition scores between teachers who participated in eTwinning projects and those who did not. Teachers participated to eTwinning projects demonstrated high levels of critical thinking disposition. Regarding the contribution of eTwinning projects to critical thinking, participants highlighted that these projects “enable original thinking while avoiding dogmatism”, “enable being result-oriented, and to make perceive, analyse and evaluate accurately” and “help students acquire scientific research skills”. These results indicate that eTwinning projects make a significant contribution to the development of teachers' critical thinking skills.

Keywords: Critical thinking disposition, eTwinning, teacher training, projects.

* This article was produced from the master's thesis completed at Inonu University, Institute of Educational Science, prepared by the first author under the supervision of the second author.

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eTwinning Projelerinin Öğretmenlerin Eleştirel Düşünme Eğilimlerine Etkisinin İncelenmesi*

Makale Türü	Başvuru Tarihi	Kabul Tarihi
Araştırma	13.03.2024	20.02.2025

Fatih Kaya**

Süleyman Nihat Şad***

Öz

Bu araştırmanın amacı, eTwinning projelerinin öğretmenlerin eleştirel düşünme eğilimleri üzerindeki etkisini öğretmen görüşleri doğrultusunda çeşitli değişkenler açısından incelemektir. Çalışma, sıralı açıklayıcı karma yöntem deseninde tasarlanmış olup tarama ve durum çalışması modellerinden yararlanılmıştır. Araştırmanın katılımcıları 2021-2022 eğitim-öğretim yılında Malatya ilindeki devlet ve özel okullarda görev yapan 340 öğretmenden oluşturmaktadır. Bu öğretmenlerden 158'i, eTwinning projelerine katılmış olma kriteri göz önünde bulundurularak ölçüt örnekleme yöntemiyle belirlenmiştir. Geriye kalan 182 öğretmen ise basit seçkisiz örnekleme yöntemi kullanılarak seçilmiştir. Ayrıca, eTwinning projelerine katılan öğretmenlerin projenin eleştirel düşünmeye katkısına ilişkin görüşlerini derinlemesine incelemek amacıyla 15 katılımcı ile nitel veriler toplanmıştır. Araştırmanın verileri, Marmara Eleştirel Düşünme Eğilimleri Ölçeği ve yarı yapılandırılmış görüşme formu aracılığıyla elde edilmiştir. Araştırma bulguları, eTwinning projelerine katılan öğretmenler ile katılmayan öğretmenler arasında eleştirel düşünme eğilimi puanları açısından katılımcılar lehine anlamlı bir fark olduğunu ortaya koymuştur. eTwinning projelerine katılan öğretmenlerin eleştirel düşünme eğilimlerinin oldukça yüksek düzeyde olduğu tespit edilmiştir. Katılımcılar, eTwinning projelerinin eleştirel düşünmeye katkısına ilişkin olarak, bu projelerin “dogmatizmden uzaklaşarak özgün düşünebilmeyi”, “sonuç odaklı olmayı, doğru anlama, analiz ve değerlendirme yapabilmeyi” ve “bilimsel araştırma becerileri kazanmayı” sağladığını ifade etmişlerdir. Bu sonuçlar, eTwinning projelerinin öğretmenlerin eleştirel düşünme becerilerinin gelişimine önemli bir katkı sunduğunu göstermektedir.

Anahtar Sözcükler: Eleştirel düşünme, eTwinning, öğretmen yetiştirme, proje.

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Introduction

Teachers play a crucial role in shaping future generations, and their ability to adapt to educational innovations is essential. eTwinning as a platform aligned with 21st-century skills supports teachers' professional growth by promoting communication, collaboration, and the integration of technology into education (MEB, 2019). Through eTwinning projects, teachers collaborate with their colleagues, exchange innovative ideas, and strengthen cross-cultural communication (MEB, 2019; Ruiz & Lopez, 2018). Research shows that teachers involved in eTwinning projects prefer activity-based teaching methods, reflecting a shift toward interactive and student-centered learning (Avcı, 2021). This approach highlights the platform's role in modernizing education and preparing teachers for a digital, interconnected world.

As education increasingly demands technological integration and cross-cultural collaboration, eTwinning has become a vital tool for empowering teachers. The platform enhances teachers' professional development by improving their use of technology and foreign language skills (Avcı, 2021; Yılmaz, 2012). It also fosters effective communication among educators, building collaborative networks (Camilleri, 2016). Additionally, eTwinning enriches learning by exposing participants to diverse perspectives and cultures (Crişan, 2013). These activities boost teachers' motivation and engagement (Ruiz & Lopez, 2018). Participation in eTwinning offers benefits such as cultural exploration, improved language skills, social connections, self-awareness, and confidence through knowledge sharing (Yılmaz, 2012). The platform also provides insights into European educational developments, promotes intercultural interaction, and enhances technological literacy, all essential for 21st-century skills (eTwinning, 2023). By integrating these elements, eTwinning equips teachers to thrive in a digital and interconnected educational landscape (Huertas-Abril & Muszyńska, 2022).

In a globalized and technology-driven era, eTwinning prepares teachers with essential 21st-century skills (Alkan & Kavcar, 1998; Bolat, 2017). Teachers are key to societal progress, and eTwinning helps them develop digital literacy, language proficiency, and intercultural understanding (eTwinning, 2023; MEB, 2019). The platform fosters collaboration, knowledge exchange, and the sharing of best practices (Papadakis, 2016). It also enhances the reputation of educational institutions by promoting innovation and collective growth (Napal-Fraile et al., 2024). Through real-world learning experiences, eTwinning increases student engagement and motivation (Huertas-Abril & Muszyńska, 2022).

Critical thinking is a vital skill in 21st-century education, fostering innovation and adaptability. Teachers need critical thinking to navigate social changes, solve problems, and think creatively (Acar & Peker, 2021). Critical thinking involves evaluating information objectively and seeking solutions free from bias (Facione, 2015). Teachers with strong critical thinking skills are open-minded, analytical, and able to discern cause-and-effect relationships (Paul & Elder, 2006). These skills help teachers organize information, reason analytically, and maintain unbiased perspectives, which are essential in modern education (Facione, 2015).

To achieve educational excellence, teachers must foster critical thinking in students (Ekinci & Aybek, 2010). Teachers who encourage critical thinking help students develop original and analytical thought, applicable in diverse contexts (Paul & Elder, 2006). Educators who promote critical thinking enhance students' cognitive development and foster positive attitudes toward this skill (Seferoğlu & Akbıyık, 2006). Higher-order thinkers are curious, original, and consistently engage in critical thought (Holma, 2015). By prioritizing critical thinking, teachers prepare students to tackle complex challenges with creativity and rigor. Critical thinking also helps teachers address educational challenges, such as integrating technology and meeting diverse learning needs (Arce Saavedra & Blumen, 2022). It enables teachers to assess situations objectively, consider multiple perspectives, and choose effective actions. Teachers with strong critical thinking skills are more likely to engage in professional development, reflecting on and improving their practices (Liu et al., 2022). This commitment to growth benefits both teachers and students. Additionally, such teachers are more open to experimenting with innovative strategies and adapting to students' needs.

Beyond the classroom, critical thinking equips teachers to guide students in addressing global issues like climate change and social inequality (Rauscher & Badenhorst, 2021). By fostering thoughtful analysis and decision-making, teachers help students engage with these challenges constructively.

Critical thinking is thus essential for educators, enabling them to improve their teaching and prepare students for a complex world (Mao et al., 2021). Creating a respectful learning environment is crucial for developing students' critical thinking skills (Costa, 1991). However, possessing critical thinking skills is not enough; individuals must also have dispositions to use them (Paul & Elder, 2006). Without this disposition, individuals may struggle to apply their skills effectively (Holma, 2015). Therefore, fostering a critical thinking disposition is essential for both students and teachers, as it influences professional development and the ability to nurture these skills in students (Acar & Peker, 2021; Ricketts & Rudd, 2004).

This study explores how eTwinning projects affect teachers' critical thinking skills, factors like gender, age, education level, subject area, and professional experience. Gender is included because research suggests women tend to collaborate more effectively (Belenky et al., 1986). Age is considered because critical thinking often improves as people grow older (King & Kitchener, 1994). Education level is examined since higher education is linked to stronger critical thinking abilities. Subject area is analyzed because science and social science teachers may differ in their critical thinking approaches (Pithers & Soden, 2000). Finally, professional experience is evaluated because teaching skills often develop with years of practice (Hargreaves & Fullan, 2012).

The critical thinking dispositions of eTwinning teachers still remain understudied, highlighting the need to explore how eTwinning projects influence these skills. This study addresses this gap by investigating the extent to which eTwinning teachers possess critical thinking skills, how eTwinning contributes to their development, and the nature of their critical thinking dispositions. The main purpose of this research was to examine the impact of eTwinning projects on teachers' critical thinking dispositions based on teachers' perspectives, considering various variables. The study explored the following research questions to achieve this aim.

- 1) Do the critical thinking disposition levels of teachers with and without eTwinning experience differ significantly?
- 2) What is the critical thinking disposition level of teachers participating in eTwinning projects?
- 3) Does/Is the critical thinking disposition levels of teachers participating in eTwinning projects;
 - a. differ significantly in terms of gender?
 - b. significantly related to their age?
 - c. differ significantly in terms of field of expertise?
 - d. differ significantly in terms of education level?
 - e. significantly related to their professional seniority?
 - f. significantly related to the number of participation in eTwinning projects?
 - g. differ significantly in terms of having a quality label award?
- 4) What are the opinions of eTwinning teachers regarding the contribution of eTwinning projects to their critical thinking skills?

Method

Research Design

This research employed a sequential explanatory mixed-methods design, combining quantitative and qualitative approaches in order to thoroughly analyze data (Büyüköztürk et al., 2020). First, quantitative data was collected and analyzed through a survey model, a descriptive method that depicts the current state of a phenomenon (Yıldırım & Şimşek, 2018). This provides a broad understanding of the topic. Next, qualitative data was collected through interviews following a case study model, which allows for an in-depth exploration of individuals, events, and contexts, offering a holistic view of the research problem (Yıldırım & Şimşek, 2018). The interviews focused on understanding eTwinning teachers' perspectives on the impact of the projects on their critical thinking skills. By integrating these methods, it was aimed to provide a detailed and comprehensive understanding of the link between eTwinning projects and the development of critical thinking among teachers.

Research Sample / Participants

Survey models involve systematic data collection from an entire population or a selected sample to make general conclusions about a larger group (Yıldırım & Şimşek, 2018). In this study, the population and sample were first defined for quantitative data collection, followed by the selection of participants for qualitative data. The population included teachers working at public and private schools in Malatya during the 2021-2022 academic year. The sample consisted of 340 teachers: 158 were selected using criterion sampling, a purposive method where participants must meet specific criteria (Büyüköztürk et al., 2020). The criterion was experience in participation in eTwinning projects. The remaining 182 teachers were chosen through simple random sampling.

For the qualitative phase, 15 volunteer teachers with eTwinning experience were selected using criterion sampling. This method focuses on individuals with specific characteristics, ensuring a well-defined target group (Büyüköztürk et al., 2020). The primary criterion was their involvement in eTwinning projects. These participants were chosen to explore, analyze, and evaluate their perspectives on how eTwinning contributes to critical thinking development. By combining these sampling methods, the study ensured a consistent and systematic approach to data collection, enhancing the research's validity and reliability. This structured process allowed for a comprehensive understanding of the impact of eTwinning projects on teachers' critical thinking skills.

Research Instruments and Procedures

Quantitative data were collected using the Marmara Critical Thinking Dispositions Scale (Özgenel & Çetin, 2018), a valid and reliable tool designed to measure critical thinking dispositions. The scale consists of 28 items across six factors “reasoning, reaching judgment, search evidence, search the truth, open-mindedness, and systematicity” explaining 56.35% of the total variance. Its overall reliability coefficient was 0.91, with significant item-total and corrected item-total correlations (Özgenel & Çetin, 2018). In this study, the scale was administered to 340 teachers, and internal consistency analysis was conducted to assess reliability. As shown in Table 1, the Cronbach's Alpha coefficients for all factors and the overall scale were over 0.70 threshold, confirming sufficient reliability (Özçomak & Çebi, 2017). This demonstrates the scale's reliability in measuring critical thinking dispositions in the context of this research.

Table 1. Cronbach Alpha internal consistency coefficient

Factors	Number of Items	Items	Cronbach Alpha
Reasoning	6	1-6	.884
Reaching judgment	6	7-12	.840
Searching for the truth	4	13-16	.831
Searching for evidence	4	17-20	.769
Open-mindedness	4	21-24	.824
Systematicity	4	25-28	.765
Total	28	1-28	.949

For the semi-structure interviews, first an interview form was prepared and reviewed by experts for clarity, scope, and understandability. A pilot study with four teachers led to the creation of a semi-structured interview form with 11 questions, tailored for practical use. Teachers were informed that they could withdraw at any time without justification. With their consent, interviews were recorded, transcribed, and shared with participants to verify accuracy. After their feedback, the analysis began. This process ensured ethical integrity, data accuracy, and respect for participants' autonomy and perspectives.

Data Analysis

Quantitative data were analyzed using statistical software, with a significance level of $p < 0.05$. Descriptive statistics and inferential analysis were used to summarize and interpret the data, while effect size calculations were used to assess the magnitude of significant differences or associations (Özçomak & Çebi, 2017). This approach ensured a thorough evaluation of both statistical and practical significance.

For qualitative data, content analysis was employed to systematically interpret and examine interview transcripts in depth, uncovering nuanced insights (Yıldırım & Şimşek, 2018). Transcripts were shared with participants for verification to ensure accuracy. Once confirmed, the data were coded, and frequency tables were created to organize findings. A researcher-developed codebook was reviewed by an expert to ensure coding reliability and consistency. Themes were then derived by grouping related codes, with expert feedback validating their coherence. Refinements were made as needed. In the findings, relationships between codes and themes were explained and supported by direct participant quotes, providing authentic evidence for the outcomes. This method ensured a rigorous and transparent analysis process.

Ethical Procedures

Write After receiving ethical permission from İnönü University, Social and Human Sciences Scientific Research Ethics Committee dated 06/01/2022 and numbered 2022/1-7, application permission numbered E-34259660-605.01-43772458 was obtained from Malatya Provincial Directorate of National Education on 17/02/2022. Then, the data collection process was started.

Results

This section presents and interprets the findings obtained in accordance with the sub-problems established to examine the impact of eTwinning projects on teachers' critical thinking dispositions based on their perspectives.

Critical Thinking Disposition Levels of Teachers

The study's first sub-problem aimed to determine whether there is a significant difference in critical thinking dispositions between teachers who participate in eTwinning projects and those who do not. To address this, the normality of the data distribution for each scale factor and the total score was tested. Since the data did not follow a normal distribution, the Mann-Whitney U test, a non-parametric method, was used to compare the groups. This test is suitable for analyzing differences when data are not normally distributed, ensuring reliable results.

The analysis of critical thinking disposition levels between eTwinning and non-eTwinning teachers was presented in Table 2.

Table 2. *Critical thinking disposition levels of eTwinning teachers and non-eTwinning teachers*

Factors	Non-eTwinning Teachers		eTwinning Teachers		U	p
	Mean Rank	N	Mean Rank	N		
Reasoning	155.93	182	187.28	158	11726.5	.003*
Reaching judgment	148.19	182	196.20	158	10317.5	.000*
Searching for the truth	145.12	182	199.73	158	9759	.000*
Searching for evidence	142.55	182	202.69	158	9291.5	.000*
Open-mindedness	159.46	182	183.21	158	12369.5	.024*
Systematicity	144.78	182	200.13	158	9696.5	.000*
Total	146.90	182	197.68	158	10083.5	.000*

The results showed a statistically significant difference in all factors and the total score of the scale ($p < 0.05$), with eTwinning teachers scoring higher than non-eTwinning teachers. The effect sizes varied across factors: the "search the truth" factor had a medium effect size ($r = -0.311$), while the "reasoning" ($r = -0.162$), "reaching judgment" ($r = -0.246$), "search evidence" ($r = -0.284$), "open-mindedness" ($r = -0.122$), "systematicity" ($r = -0.287$), and total score ($r = -0.258$) factors had small effect sizes. These findings indicated that participation in eTwinning projects positively influences teachers' critical thinking dispositions, with varying degrees of impact across different factors.

Critical Thinking Disposition Scores of eTwinning Teachers

The second sub-problem of the study aimed to determine the level of critical thinking dispositions among teachers participating in eTwinning projects. To address this, the scores for each factor of the scale were analyzed, and the minimum, maximum, mean, and standard deviation values were calculated,

as shown in Table 3. This analysis provided a detailed overview of the distribution and variability of critical thinking dispositions among participants.

Table 3. *Statistical values of eTwinning teachers' responses to each factor*

Factors	Minimum	Maximum	Mean	S
Reasoning	19.00	30.00	27.3544	2.76713
Reaching judgment	18.00	30.00	27.0823	2.70871
Searching for the truth	12.00	20.00	18.4051	1.80600
Searching for evidence	10.00	20.00	18.0633	1.97978
Open-mindedness	9.00	20.00	17.3608	2.63784
Systematicity	9.00	20.00	18.3228	1.88953
Total	93.00	140.00	126.5886	11.43975
Average	3	5	4.52	.409

The results revealed that the lowest score was 93, the highest was 140, the arithmetic mean was 4.52, and the standard deviation was 0.409. These findings indicate that eTwinning teachers exhibited a very high level of critical thinking disposition.

Examining Critical Thinking Disposition Scores of eTwinning Teachers by Some Variables

The third sub-problem explored whether critical thinking dispositions among eTwinning teachers significantly differed/associated by/with some variables including gender, age, education level, field of expertise, seniority, number of eTwinning projects participated in, and whether they had received the Quality Label award. To address this, difference and correlation analyses were conducted for each factor and the total score of the scale. Before the analysis, the normality of the data distribution was tested to ensure the appropriate selection of statistical methods.

The difference analysis of the level of critical thinking dispositions of eTwinning teachers by gender was given in Table 4. As shown in Table 4, there was no statistically significant difference between teachers' critical thinking dispositions scores by gender ($p>0.05$) in all factors and the "total" of the scale.

Table 4. *Level of critical thinking disposition of eTwinning teachers by gender*

Factors	Female		Male		U	p
	N	Mean Rank	N	Mean Rank		
Reasoning	119	82.86	39	69.26	1921.0	.096
Reaching judgment	119	83.49	39	67.32	1845.5	.051
Searching for the truth	119	82.02	39	71.82	2021.0	.204
Searching for evidence	119	80.46	39	76.58	2206.5	.635
Open-mindedness	119	81.94	39	72.06	2030.5	.231
Systematicity	119	83.12	39	68.45	1889.5	.071
Total	119	83.23	39	68.13	1877.0	.073

The correlation analysis for the relationship between the level of critical thinking dispositions of eTwinning teachers by age was given in Table 5. According to the Table 5, there was no statistically significant relationship between age and critical thinking dispositions in either factors or in the "total" of the scale ($p>0.05$).

Table 5. *The relationship between age and level of critical thinking dispositions of eTwinning teachers*

Variable	Factors	N	r	p
Age	Reasoning	158	.000	.999
	Reaching judgment	158	-.004	.995
	Searching for the truth	158	.007	.933
	Searching for evidence	158	.006	.943
	Open-mindedness	158	.105	.188
	Systematicity	158	.060	.456
	Total	158	.052	.519

The Kruskal Wallis H analysis of the level of critical thinking dispositions of eTwinning teachers by education level was given in Table 6. According to the Table 6, there was no statistically significant difference between teachers critical thinking disposition levels by education level.

Table 6. *Level of critical thinking dispositions of eTwinning teachers by education level*

Factors	Bachelor's		Master's		Doctorate		X ²	p
	N	Mean rank	N	Mean rank	N	Mean rank		
Reasoning	116	80.99	39	77.41	3	49.17	1.628	.443
Reaching judgment	116	81.46	39	76.62	3	41.33	2.543	.280
Searching for the truth	116	81.58	39	76.77	3	34.50	3.631	.163
Searching for evidence	116	81.83	39	74.85	3	50.00	2.084	.353
Open-mindedness	116	80.82	39	78.74	3	38.17	2.681	.262
Systematicity	116	81.80	39	75.65	3	40.67	2.954	.228
Total	116	81.71	39	75.94	3	40.50	2.706	.258

The Kruskal Wallis H analysis of the level of critical thinking dispositions of eTwinning teachers by their field of expertise was given in Table 7.

Table 7. *Level of critical thinking dispositions of eTwinning teachers by field of expertise*

Factors	Language		Basic Edu.		Culture		X ²	p
	N	Mean rank	N	Mean rank	N	Mean rank		
Reasoning	66	92.27	50	78.50	42	60.62	13.172	.001*
Reaching judgement	66	91.76	50	75.64	42	64.83	9.748	.008*
Searching for the truth	66	91.99	50	73.54	42	66.96	9.874	.007*
Searching for evidence	66	88.43	50	76.89	42	68.57	5.420	.067
Open-mindedness	66	86.08	50	77.43	42	71.63	2.840	.242
Systematicity	66	88.33	50	83.19	42	61.24	10.254	.006*
Total	66	91.99	50	76.46	42	63.49	10.362	.006*

According to the Table 7, no significant difference was found between teachers' levels critical thinking disposition scores regarding "searching for evidence" and "open-mindedness" factors ($p > 0.05$). However, statistically significant differences were found between critical thinking dispositions scores of eTwinning teachers from "reasoning", "reaching judgment", "searching the truth", "systematicity" factors and the "total" scale according to their field of expertise ($p < 0.05$). The scores of eTwinning teachers taking language courses were significantly higher in the "reasoning", "reaching judgment", "search evidence", "systematicity" factors and the "total" of the scale. The calculated effect sizes for these differences were medium in the "reasoning" factor ($r = -0.337$), in the "reaching judgment" factor ($r = -0.381$), in the "search evidence" factor ($r = -0.407$), in the "systematicity" factor ($r = -0.361$), and in the "total" of the scale ($r = -0.397$).

The correlation analysis of the level of critical thinking dispositions of eTwinning teachers by professional seniority was given in Table 8.

Table 8. *The Relationship between seniority of eTwinning teachers and critical thinking dispositions*

Variable	Factors	N	r	p
Professional Seniority	Reasoning	158	.001	.987
	Reaching judgment	158	-.022	.780
	Searching for the truth	158	-.023	.770
	Searching for evidence	158	-.054	.499
	Open-mindedness	158	.072	.372
	Systematicity	158	.001	.987
	Total	158	-.022	.780

As shown in Table 8, it was seen that there was no statistically significant relationship between professional seniority and critical thinking dispositions factors and the "total" of the scale ($p > 0.05$).

The correlation analysis of the level of critical thinking dispositions of eTwinning teachers and number of participation was given in Table 9. According to the Table 9, it was found that there was a statistically significant and positive relationship between the number of eTwinning participation and "searching for evidence" ($r=0.178$; $p<0.05$). So, it was seen that when the number of participation in eTwinning projects increased, there was a significant increase in the critical thinking dispositions in terms of "searching for the truth" factor.

Table 9. *The relationship between the number of eTwinning teachers' participation in the project and their critical thinking disposition level scores*

Variable	Factors	N	r	p
Number of Participation	Reasoning	158	.131	.101
	Reaching judgment	158	.104	.195
	Searching for the truth	158	.136	.088
	Searching for evidence	158	.178	.025*
	Open-mindedness	158	.088	.269
	Systematicity	158	.131	.101
	Total	158	.104	.195

The results of difference analysis of the critical thinking disposition scores of eTwinning teachers by receiving a quality label award was given in Table 10.

Table 10. *Critical thinking disposition levels of eTwinning teachers by quality label award*

Factors	Unawarded		Awarded		U	p
	N	Mean rank	N	Mean rank		
Reasoning	83	74.71	75	84.80	2715.0	.152
Reaching judgment	83	75.83	75	83.56	2808.0	.280
Searching for the truth	83	73.55	75	86.08	2619.0	.071
Searching for evidence	83	69.36	75	90.73	2270.5	.002*
Open-mindedness	83	76.52	75	82.80	2865.0	.337
Systematicity	83	75.81	75	83.58	2806.5	.268
Total	83	73.79	75	85.82	2638.5	.098

According to the Table 10, there was a significant difference between the participating teachers' quality label award and "searching for evidence" factor ($p<0.05$). There was no statistically significant difference between the teachers' levels of critical thinking dispositions according to receiving the eTwinning quality label award in other factors and the "total" of the scale. As can be seen from the mean ranks, this difference was in favor of the quality label awarded teachers. However, the effect size of this difference in the "searching for evidence" factor in favor of receiving the quality label was small ($r = 0.048$).

The contribution of eTwinning Projects to eTwinning Teachers' Critical Thinking

The fourth sub-problem of the study was formulated as follows: "What are the perspectives of teachers participating in eTwinning projects regarding the contribution of these projects to critical thinking?" To address this question, teachers involved in eTwinning projects were asked a series of questions related to critical thinking and the role of eTwinning projects in fostering critical thinking skills.

The responses provided by the participating teachers through semi-structured interviews were analyzed using content analysis. As a result of the analysis, three main themes and thirteen sub-themes were identified, which are presented along with their corresponding frequencies. This structured approach allowed for a detailed exploration of the teachers' views, providing valuable insights into how eTwinning projects influence and enhance critical thinking dispositions among educators.

The findings derived from this analysis were presented in Table 11.

Table 11. Findings on the contribution of eTwinning projects to critical thinking

Theme	Sub-Theme	<i>f</i>	%
Enables original thinking, while avoiding dogmatism	Being open to innovations and different ideas	39	36
	Respecting different ideas	31	28
	Not being close-minded	23	21
	Being able to express one's own thoughts	16	15
	Total	109	100
Enables being result-oriented, and making accurate perception, analysis and evaluation	Obtaining information from reliable sources	41	42
	Being solution-oriented	22	23
	Questioning and reaching a judgment	20	21
	Examining from various perspectives	14	14
	Total	97	100
Helps students acquire scientific research skills	Tendency towards research	47	31
	Working in groups and collaboration	33	22
	Being open to technological innovation	30	20
	Communication skills	25	16
	Working in a disciplined manner	17	11
	Total	152	100

Enables Original Thinking, while Avoiding Dogmatism

eTwinning teachers believe that participating in eTwinning projects helps them embrace innovation and diverse ideas. One of the teachers (T3) explained: *"It brings people with different perspectives together to collaborate and create something new. This process encourages the emergence of unique solutions and products."* Through these projects, teachers learn to respect differing opinions. As another teacher (T6) noted: *"You learn to respect people even when you disagree with them."* eTwinning projects also prevent teachers from becoming rigid in their thinking. The teacher (T3) added: *"It stops you from fossilizing your ideas and makes you more open to others' perspectives."* Additionally, teachers feel empowered to express their viewpoints. The teacher (T5) shared: *"Everyone shares their opinion before a common idea is formed. We then decide which approach is more suitable and widely accepted."*

Enables Being Result-Oriented, and Making Accurate Perception, Analysis and Evaluation

eTwinning projects encourage teachers to seek reliable information and avoid misinformation. The teacher (T4) stated: *"It's crucial for cyber security and accessing accurate information online. It teaches us not to believe everything we see and helps us analyze information critically."* Teachers also learn to set clear goals and strategies, focusing on problem-solving. The teacher (T3) explained: *"Each project is created to address a specific problem or goal. The focus is on collaboration and producing meaningful outcomes."* Teachers evaluate information carefully and draw well-informed conclusions. The teacher (T14) said: *"We start by understanding the problem, conducting thorough research, and gathering necessary information. This process enhances our reasoning skills."* Furthermore, teachers examine ideas from multiple angles. The teacher (T14) added: *"We conduct multifaceted research to fully understand the topic, which allows us to explore it in depth and create effective, tangible results."*

Helps Students Acquire Scientific Research Skills

eTwinning projects encourage teachers to use scientific research methods, such as analyzing and synthesizing information, fostering a research-oriented mindset. The teacher (T3) noted: *"The research process must be scientific because it leads to a product and follows a structured plan. Every activity involves research and effort to create something meaningful."* Collaboration is another key aspect, as teachers work together to solve problems. The teacher (T12) shared: *"Joint projects and events help us find common ground and develop solutions together."* Teachers also become more open to technological innovations, learning to use Web 2.0 tools effectively. The teacher (T2) said: *"eTwinning has greatly improved my technological skills. I can now use various Web 2.0 tools in my classes, making lessons more engaging and helping students improve their tech skills."* Communication skills are also enhanced through these projects. The teacher (T6) explained: *"Teachers in eTwinning projects communicate clearly, share ideas, and develop a common plan. Collaboration and communication are at the heart of these projects."* Finally, teachers work in a structured and disciplined manner, following specific plans and strategies. The teacher (T4) added: *"eTwinning encourages project-based, planned, and disciplined work. You follow an annual plan and upload your progress regularly, ensuring consistency."*

Discussion, Conclusion and Recommendations

There was a significant difference between the critical thinking disposition scores of eTwinning teachers and non-eTwinning teachers in favor of eTwinning teachers. This result is similar with the results, eTwinning applications contributed to professional development, eTwinning activities had a positive impact on professional development, eTwinning projects increased the ability to create innovative ideas (Yılmaz, 2022) and eTwinning activities increased their professional development (Avcı, 2021).

The level of critical thinking dispositions of eTwinning teachers was very high. This result is similar with the results, Web-2.0 tools improved critical thinking (Gündüz Çetin & Gündoğdu, 2022), the critical thinking dispositions of teachers working in primary schools were at a high level (Erden, 2009), the critical thinking dispositions of science teacher candidates were at a good level (Öztürk, 2020), the critical thinking disposition level of kindergarten administrators was high (Turkut, 2020).

While there was no significant difference in the critical thinking dispositions of eTwinning teachers by gender and educational background variables, there was a significant difference in favor of the award winners in the "search the truth" factor according to the receiving a quality label variable. By field of expertise variable, significant differences were observed in the "reasoning", "reaching judgment", "searching for evidence", "systematicity" factors and the "total" of the scale in favor of language teachers. While there was no significant relationship by age and seniority; a positive and significant relationship was found between the number of participation in eTwinning projects and the "search the truth" factor scores. These results are similar with the results, professional seniority, field of expertise, education level, graduated higher education program were the predictors of critical thinking disposition (Erden, 2009), teachers' critical thinking disposition, graduated program, education level, school level, seniority, overseas experience and international project preparation were important predictors (Altaş, 2021).

Regarding to the contribution of eTwinning projects to the eTwinning teachers's critical thinking, participants stated that eTwinning projects enable them to "think originally and away from dogmatism", "be result-oriented, make correct perception, analysis and evaluation", and to "acquire scientific research skills". This result is similar with the results, eTwinning application put up teachers in point of integrating with technology and improving professional skills and a sense of success were one of the most substantial motivators of participation in eTwinning projects (Gündüz Çetin & Gündoğdu, 2022).

Considering that eTwinning projects improve the critical thinking skills of teachers, it is recommended that the projects be disseminated on a provincial basis and all teachers are encouraged to be involved in the projects. Training can be provided by the Ministry of Education to teachers to increase their interest, knowledge and experience regarding to eTwinning projects. Seminars can be organized by the Ministry of Education regarding to the use of Web-2.0 tools and their integration into courses. The problem-solving deftness and creativity degree of teachers who participate and do not participate in eTwinning projects can be investigated. The communication skills of teachers participating in eTwinning projects can be examined.

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The Relationships between Love Styles and Satisfaction in Romantic Relationships: The Mediating Role of Intimacy

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Abstract

Romantic relationships are among the important elements that enrich human life. These relationships begin to be shaped during adolescence and serve an important developmental role in the young adulthood years. Love is a pervasive topic within the field of research on romantic relationships. Theories of love offer various explanations and classifications, one of which includes Lee's Colors of Love Theory. This study aims to examine the mediating role of intimacy in the relationship between love styles and relationship satisfaction in university students. The study group comprised 349 students, 267 (76.5%) women and 82 (23.5%) men. The participants' average age was 23.39 years (SD=4.57). Data were collected through the Love Attitudes Scale: Short Form, the Intimacy Scale in Romantic Relationships, the Relationship Assessment Scale, and the Personal Information Form. The hypothetical models designed in the study were tested using structural equation modeling. The findings suggest that eros and storge have a positive direct effect on relationship satisfaction, while mania has a negative effect. Intimacy plays a crucial role in romantic relationships. It serves as a mediator in the relationship between relationship satisfaction and ludus, agape, and storge. In conclusion, love styles other than pragma are important predictors of relationship satisfaction directly and/or through intimacy.

Keywords: Romantic relationships, relationship satisfaction, love styles, intimacy.

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Romantik İlişkilerde Doyum ve Aşk Stilleri Arasındaki İlişki: Yakınlığın Aracı Rolü

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Öz

Romantik ilişkiler, insan yaşamını zenginleştiren önemli unsurlar arasında yer alır. Bu ilişkiler ergenlik döneminde ortaya çıkmaya başlar ve genç yetişkinlik yıllarında önemli bir gelişimsel görevi yerine getirir. Romantik ilişkiler konusunda yapılan araştırmalarda daha çok aşk konusu ele alınır. Aşk konusundaki kuramlarda da farklı açıklamalar ileri sürülür ve farklı sınıflamalar yapılır. Sınıflamalardan biri, Lee'nin Aşkın Renkleri Kuramında geçer. Bu çalışmada, üniversite öğrencilerinin aşk stillerinin ilişki doyumunu yordamasında yakınlığın aracı rolü incelenmiştir. Çalışma grubunu 349 öğrenci oluşturmaktadır. Katılımcıların 267'si (%76.5) kadın, 82'si (%23.5) erkektir ve yaş ortalamaları 23.39'dur (SS=4.57). Verilerin toplanmasında Kişisel Bilgi Formu, Aşka İlişkin Tutumlar Ölçeği: Kısa Form, Romantik İlişkilerde Yakınlık ile İlişki Değerlendirme Ölçekleri kullanılmıştır. Araştırmanın hipotetik modelleri yapısal eşitlik modellemeleri ile test edilmiştir. Bulgulara göre tutkulu aşk ile arkadaşça aşk ilişki doyumu üzerinde pozitif etkiye sahipken sahiplenici aşk negatif etkiye sahiptir. Oyun gibi aşkta ve özgeci aşkta ilişki doyumunun tam aracısı olan yakınlık, arkadaşça aşkta kısmi aracıdır. Sonuç olarak mantıklı aşk dışındaki aşk stillerinin doğrudan ya da yakınlık aracılığı ile ilişki doyumunun önemli birer yordayıcısı olduğu söylenebilir.

Anahtar Sözcükler: Romantik ilişkiler, ilişki doyumu, aşk stilleri, yakınlık.

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Introduction

Intimate relationships with others are among the basic human needs. Individuals' relationships with their parents, siblings, relatives, friends, partners, and spouses could greatly affect how loved, respected, and valued they feel. While relationships with parents, siblings, close relatives, and friends initially hold an important place in individuals' lives during the development process, adolescence years include relationships with romantic partners as well.

Relationships with a romantic partner may include dating, engagement, marriage, cohabitation, and other arrangements (Hendrick & Hendrick, 2006). While these relationships could provide support, love, health, and well-being, they could also lead to serious problems (Antonucci et al., 2001). Therefore, understanding relationship satisfaction and related variables is important for supporting individuals' development. Romantic relationship satisfaction refers to the quality of a romantic relationship. Although there is no precise definition, it generally represents an individual's perception and evaluation of their current relationship status (Collins & Read, 1990). Studies indicate that satisfaction in romantic relationships is associated with variables such as emotional intelligence (Jardine, Vannier, & Voyer, 2022), age (Bühler, Krauss, & Orth, 2021), perspective-taking (Cahill, Malouff, Little, & Schutte, 2020), the big five personality traits (Malouff, Thorsteinsson, Schutte, Bhullar, & Rooke, 2010), attachment (Candel & Turliuc, 2019), and empathic accuracy (Sened, Lavidor, Lazarus, Bar-Kalifa, Rafaeli, & Ickes, 2017). Love is another variable that is considered to be related to satisfaction in romantic relationships.

It is challenging to make a precise definition of the concept of love. Although love has biological foundations (Buss, 2023; Fisher, 2004, 2016), individuals' experiences, impressions, expectations, and behaviors are often influenced by contextual conditions (Myers & Shuts, 2002), which is also relevant for the theoretical explanations of love. In the field of evolutionary psychology, the concept of love is intertwined with the mechanisms of mate selection, emphasizing the behavioral expressions of affection (Buss, 1989; 1995). Neuropsychological explanations propose that all birds and mammals are equipped with three distinct emotional/motivational systems: lust, attraction, and attachment (Fisher, 2004; 2006). Attachment theory posits that love relationships are associated with the emotional bonds formed between infants and their caregivers (Hazan & Shaver, 1987; 1994). Some theories of love include classifications. The first explanation for differences and similarities in individuals' understanding of love comes from Zick Rubin (1970). Rubin (1970) distinguishes between liking for a friend and love for a lover. Liking involves positive evaluation, perceived similarity, respect, and trust, while loving involves attachment, caring, and intimacy. Elaine Hatfield categorizes love into passionate and companionate love, both of which have cognitive, emotional, and behavioral components. John A. Lee, whose perspective on love is the basis of this research, provided another categorization.

Lee (1974; 1988) defined three primary love styles in his theory, the Color Theory of Love, using a color analogy: passionate (eros), playful (ludus), and friendly (storge). He argued that their binary combination in different proportions gives rise to three secondary love styles: pragmatical (pragma), possessive (mania), and altruistic (agape). Lee believes that several other love styles combine various elements of the primary love styles in varying proportions. However, primary and secondary forms of love are the most encountered ones. According to Lee (1974; 1988), eros is characterized by strong emotions and usually begins with physical attraction. Individuals may list the physical characteristics they find attractive and sexual intimacy is important to them. They take risks in their relationships but avoid extremes. In ludus, individuals may view the relationship as a game, where the focus is on having fun and experiencing excitement. Just as individuals require specific strategies and skills when playing a game, the same applies to love relationships. If cheating can be done to win a game, cheating is also acceptable in love relationships. Ludic individuals may not be as passionate or committed in their relationships and may not demand commitment from their partner. The reason behind cheating is not related to sexuality. Instead, it is the individual's enjoyment of being able to engage in such behavior without getting caught. In storge, the bond grows gradually as partners share activities and interests. There is no set standard for an ideal partner. Sexuality is viewed as a form of self-disclosure and is typically expressed later in the relationship. Pragma emphasizes a pragmatic perspective. Individuals expect a positive and sustainable relationship based on certain criteria, such as social class, ethnicity, education level, income level, and religious beliefs. Passion and physical attraction are not considered.

Mania is characterized by intense positive and negative emotions. Individuals feel euphoric and happy when their beloved is with them but hopeless and unhappy when they are apart. When individuals' expectations for attention are not met, they may experience feelings of jealousy and insecurity. Although they may have significant issues, they cannot afford to separate. Agape is defined by strong emotions, patience, and perseverance. The lover prioritizes the well-being and happiness of their beloved above all else, accepting and loving them despite their flaws. They are generous and selfless in their relationships. Lee (1974) suggests that people's perception of love is influenced by their childhood experiences, socialization processes, lifestyle, and personality traits. Furthermore, as individuals' values and ideals evolve, so do their love styles. In addition to Lee, Robert J. Sternberg is another notable figure in the field of love studies.

In his Triangular Love Theory, Sternberg (1986, 1988, 1998) emphasizes the importance of intimacy, passion, and commitment as the basic components that define different love styles. According to Sternberg, the passion component relates to romance, physical attraction, and sexuality. The commitment component refers to the decision to love and remain dedicated to the partner to sustain the relationship. The intimacy component involves sharing, self-disclosure, and emotional support. Sternberg states that the ratio of these three components in a relationship determines eight different love styles: liking, passion, empty love, romantic love, companionate love, foolish love, consummate love, and no love. The perfect love is the love style in which intimacy, commitment, and passion are balanced. Everyone seeks consummate love, but it is difficult to achieve and maintain. For this reason, individuals strive for love that is closest to consummate. As Sternberg states, intimacy is a crucial element of love and can be considered one of the main determinants of satisfaction in romantic relationships.

As highlighted by the various definitions and measurement tools used to study intimacy, the concept of intimacy lacks clear boundaries in the field of psychology (Moss & Schwebel, 1993; Prager, 1994). Intimacy is discussed from such a broad perspective, which may be related to the diversity of individuals' experiences, differences in the perceptions and expressions of experiences, and cultural elements (Ercan, 2019). However, in all situations, intimacy is an important aspect of romantic relationships. For this reason, the execution of studies on intimacy is essential for the comprehension of individuals' romantic relationships and the characterization of these relationships.

The individuals' satisfaction with their relationships may be influenced by their love styles. Besides, as suggested by Sternberg (1986), the elements and ratios in a romantic relationship can affect the satisfaction obtained from it. Partners' feelings, thoughts, and behaviors in the early stages of romantic relationships may predict their feelings, thoughts, and behaviors in the later stages of their relationships and perhaps in their marriages (Axinn & Thornton, 1993). Individuals' subjective well-being increases when they find satisfaction in their relationships (Das & Bapu, 2024; Demistas & Tezer, 2012; Tepeli Temiz & Elsharnouby, 2022); their satisfaction with life improves (Proulx, Helms, & Buehler, 2007; Yam, 2023; Yancey & Berglass, 1991); and health indicators are positively affected (Bookwala, 2005; Robles, Slatcher, Trombello, & McGinn, 2014). The opposite occurs when they are dissatisfied with the relationship. Therefore, research on this subject may provide clues for predicting potential problems in relationships and for identifying factors that could increase the risk of terminating the relationship (Karney & Bradbury, 1995). The primary objective of this study is to examine the hypothetical model positing that the love styles of university students predict relationship satisfaction both directly and through the level of intimacy in romantic relationships.

There are two basic hypotheses in the study:

- 1) Love styles significantly predict relationship satisfaction.
- 2) Intimacy has a mediating role between love styles and relationship satisfaction.

Figure 1 displays the hypothetical model developed to test these hypotheses.

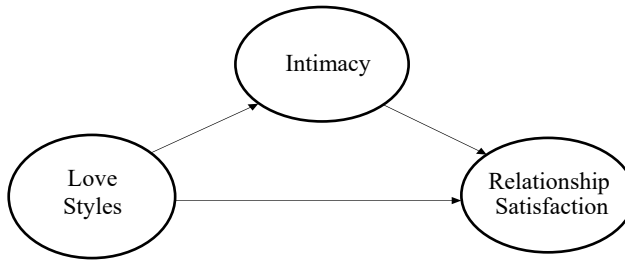


Figure 1. Hypothetical model

Method

Research Design

This study was designed using a correlational model to examine the mediating role of intimacy in the relationship between love styles and romantic relationship satisfaction among university students (Büyüköztürk et al., 2019). The research focused on relationship satisfaction as the dependent variable, love styles as the independent variable, and intimacy as the mediating variable in the relationship between love styles and romantic relationship satisfaction.

Study Group

The study group was selected using a convenience sampling technique, which involved including volunteers who were believed to possess specific characteristics under investigation (Johnson & Cristensen, 2019). Research data were collected from voluntary participants via an online form, which included 349 university students in the study. While 267 (76.5%) of the participants were women, 82 (23.5%) were men, and their ages ranged from 18 to 40 (Mean=23.39, SD=4.57). Their relationship status showed that 63% of the participants (N= 220) had a date, partner, or fiancée. Of all the participants, 33% (N=115) reported being separated from their partners and 4% (N=14) reported being married. The participants were asked about the number of romantic relationships they have had to date, which was found to range from 1 to 13 (Mean= 2.54, SD=2.23).

Research Instruments

The Love Attitudes Scale: Short form

The scale, originally developed by Hendrick et al. (1998), was designed to measure the six love styles suggested by Lee (1973). The scale was later adapted into Turkish by Büyüksahin and Hovardaoğlu (2004). The 24-item scale is responded on a 5-point Likert scale. Four to 20 points can be received for each love style in the scale. Higher scores in the sub-scales indicate that the characteristics of the love style relevant to the specific sub-scale are more prominent. Internal consistency was assessed by calculating Cronbach's alpha for the sub-scales in this study. The results were as follows: .80 for agape, .83 for storge, .72 for eros, .70 for pragma, .78 for ludus, and .75 for mania.

Intimacy Scale in Romantic Relationships

Ercan (2019) developed the scale to measure the level of intimacy in romantic relationships. The scale includes four sub-scales: self-disclosure, physical attraction, support, and trust. Each sub-scale consists of four items, making a total of 16 items on the scale. The 16-item scale is responded on a 4-point Likert scale. The total score to be obtained from the scale ranges from 16 to 64, with higher scores indicating more intimacy and lower scores indicating less intimacy. The internal consistency coefficient for the total score was calculated using Cronbach's alpha and was found to be .92 in this study.

Relationship Assessment Scale.

Hendrick (1988) developed the scale to measure romantic relationship satisfaction between individuals. The scale was adapted into Turkish by Curun (2001). Scores to be obtained from the scale range from 7 to 49, with higher scores indicating greater satisfaction within the relationship. In this

study, Cronbach's alpha coefficient was calculated to evaluate the internal consistency of the scale, which was found to be .90.

Personal Information Form

The participants were asked to fill out the Personal Information Form by providing information regarding their gender, age, relationship status, and number of relationships.

Data Analysis

During the analysis phase, the distribution of the data was analyzed using the kurtosis and skewness values. According to Tabachnick and Fidell (2012), these values should be within ± 1.5 . The kurtosis and skewness values calculated for the scores were found to meet this criterion (see Table 1), indicating that the scores demonstrate normal distribution. Descriptive statistics and Pearson correlation coefficients were calculated for the scores. Besides, structural equation modeling was used to test the hypothetical research model. In structural equation modeling, the mediating roles of intimacy were examined in the relationships between love styles and relationship satisfaction. When the model fit of the constructed structural equation model $\chi^2/df < .5$; CFI, GFI $> .90$ was analyzed; RMSEA $< .10$ was considered as a criterion (Tabachnick & Fidell, 2012). The bootstrapping method (10,000 resampling) was preferred to examine the significance of the mediating role of intimacy in romantic relationships. For the mediation in the model to be considered significant, it was determined that the confidence intervals should not include zero (Hayes, 2013). The analyses were conducted using IBM SPSS 28 and IBM AMOS 24.

Ethical Procedures

Before the study was conducted, all the participants were given an informed consent form and told that participation was on voluntary basis. The study followed the Declaration of Helsinki guidelines set out in 1975. Prior to the study, ethics committee approval was obtained from the institution where the corresponding author was affiliated (Social and Human Sciences Ethics Committee of Karamanoğlu Mehmetbey University).

Results

Table 1 displays the Pearson correlation coefficient values and descriptive statistics for the variables that were analyzed in the study.

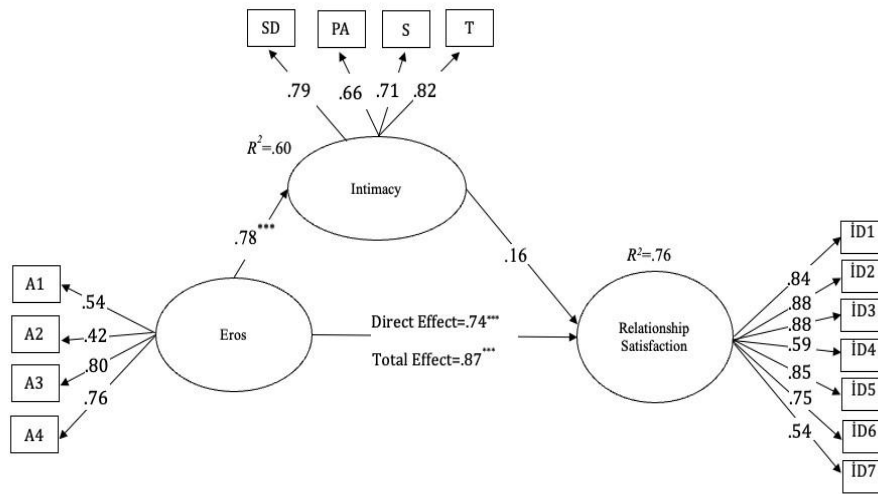
Table 1. *Pearson correlation coefficients and descriptive statistics for variables*

Variables	1	2	3	4	5	6	7	8
1. Eros	1.00							
2. Ludus	-.18***	1.00						
3. Storge	.35***	-.05	1.00					
4. Mania	.06	.18***	.01	1.00				
5. Agape	.38***	.02	.23***	.41***	1.00			
6. Pragma	.05	.11*	.11*	.11*	.08	1.00		
7. Intimacy	.62***	-.21***	.28***	-.04	.32***	-.02	1.00	
8. Relationship Satisfaction	.73***	-.15***	.30***	-.12*	.29***	-.04	.63***	1.00
Mean	14.61	9.78	12.01	12.95	11.85	12.48	51.99	34.85
Standard Deviation	2.96	2.69	4.14	2.88	3.64	3.34	8.65	9.64
Kurtosis	-.34	-.28	-.58	-.54	-.58	-.49	.03	-.17
Skewness	-.24	.13	.12	.25	.12	-.15	-.67	-.71
Reliabilities	.72	.78	.83	.75	.80	.70	.92	.90

Note: $N = 349$.

* $p < .05$, *** $p < .001$.

Table 1 demonstrates that significant relationships exist between eros, ludus, storge, and agape styles and intimacy and relationship satisfaction in romantic relationships. However, the pragma love style does not show a significant relationship with either intimacy or relationship satisfaction. Additionally, the mania love style does not show a significant relationship with intimacy in romantic relationships. It is important to highlight the positive and significant correlation between intimacy and relationship satisfaction in romantic relationships ($r = .63$, $p < .001$). The structural equation modeling findings, which include significant relationships among the variables in the hypothetical research model, are presented below. First, the model with eros, one of the primary love styles, was tested (Figure 2).



*** $p < .001$, SD: Self-disclosure, PA: Physical attraction, S: Support, T: Trust.

Figure 2. Findings Regarding the Model (Eros)

The model presented in Figure 2 exhibits goodness of fit indices within acceptable limits [$\chi^2 = 303.252$, $df = 87$, $p < .001$, $\chi^2/df = 3.61$; GFI = .901; CFI = .928; RMSEA = .087]. According to the model, eros style directly and positively predicts intimacy in romantic relationships ($\beta = .78$, $p < .001$) and relationship satisfaction ($\beta = .74$, $p < .001$). However, eros style does not seem to predict relationship satisfaction through intimacy in romantic relationships. In other words, the eros style does not have a significant indirect effect on relationship satisfaction. Therefore, intimacy in romantic relationships does not mediate the relationship between eros style and relationship satisfaction. Table 2 presents the confidence interval values.

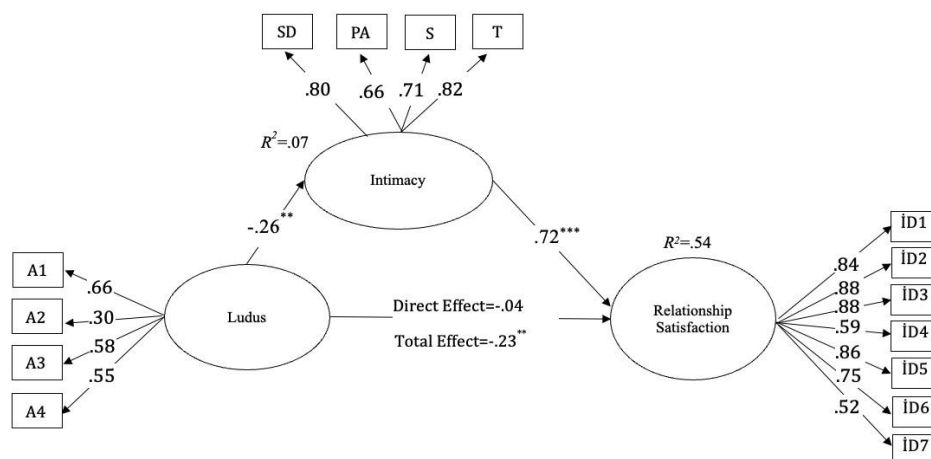
Table 2. Findings Regarding Mediation Analysis (Eros)

Pathway	B	S.E.	C.R.	Coefficient	CI Lower-bound	CI Upper-bound
Total Effect						
Eros → RS				.87***	.81	.91
Direct Effects						
Eros → RS	1.14	.15	.86	.74***	.58	.93
Eros → Int	1.35	.13	.54	.78***	.71	.84
Int → RS	.15	.07	.98	.16	-.04	.34
Indirect Effect						
Eros → Int → RS				.13	-.03	.26

*** $p < .001$; $N = 349$.

Note: CI: 95% Confidence Intervals; RS: Relationship Satisfaction; Int: Intimacy.

Figure 3 displays the results of the ludus style model, which is one form of love.



** $p < .01$, *** $p < .001$, SD: Self-disclosure, PA: Physical attraction, S: Support, T: Trust.

Figure 3. Findings Regarding the Model (Ludus)

The model presented in Figure 3 has goodness of fit values that fall within acceptable limits [$\chi^2=273.514$, $df=85$, $p<.001$, $\chi^2/df=3.22$; GFI=.906; CFI=.927; RMSEA=.080]. Specifically, the ludus style seems to have a negative effect on intimacy in romantic relationships ($\beta=-.26$, $p<.01$). However, the ludus style does not seem to directly predict relationship satisfaction to a significant degree. Instead, the ludus style seems to affect relationship satisfaction indirectly through its effect on intimacy in romantic relationships. In other words, the ludus style has a significant indirect effect on relationship satisfaction ($\beta=-.19$, $p<.01$). Thus, in romantic relationships, intimacy has a mediating role in the association between ludus style and relationship satisfaction. Table 3 presents the confidence interval values.

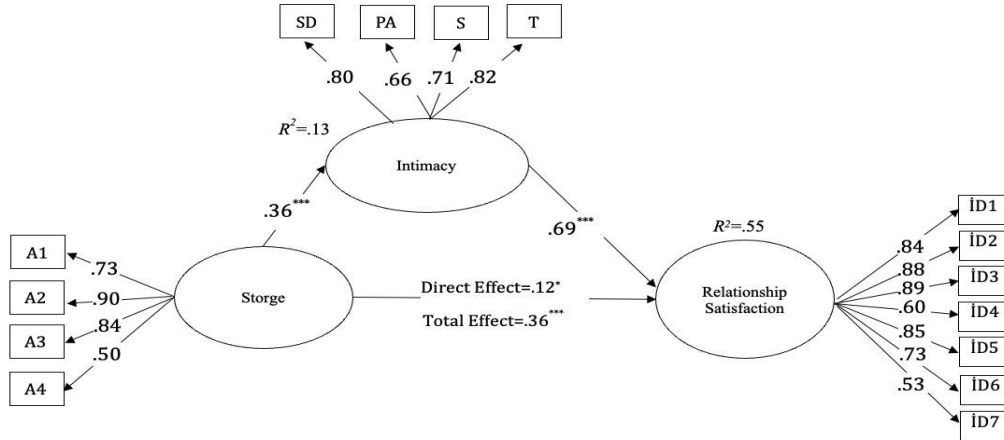
Table 3. Findings Regarding Mediation Analysis (Ludus)

Pathways	B	S.E.	C.R.	Coefficient	CL Lower-bound	CL Upper-bound
Total Effect						
Ludus → RS				-.23**	-.35	-.11
Direct Effects						
Ludus → RS	-.07	.11	.70	.04	-.14	.07
Ludus → Int	-.55	.17	3.28	-.26**	-.41	-.11
Int → RS	.64	.06	.83	.72***	.64	.80
Indirect Effect						
Ludus → Int → RS				-.19**	-.31	-.08

** $p < .01$; *** $p < .001$; $N = 349$.

Note: CI: 95% Confidence Intervals; RS: Relationship Satisfaction; Int: Intimacy.

Figure 4 presents the results of the model created using storge, one of the forms of love.



* $p < .05$, *** $p < .001$, SD: Self-disclosure, PA: Physical attraction, S: Support, T: Trust.

Figure 4. Findings Regarding the Model (Storge)

The model in Figure 4 has goodness of fit values that fall within acceptable limits [$\chi^2=262.848$, $df=87$, $p < .001$, $\chi^2/df=3.02$; GFI=.906; CFI=.942; RMSEA=.076]. According to the model, storge style has a direct and positive effect on intimacy in romantic relationships ($\beta=.36$, $p < .001$) and relationship satisfaction ($\beta=.12$, $p < .05$). It was also found that storge style affected relationship satisfaction through intimacy in romantic relationships, which means that the indirect effect of storge style on relationship satisfaction is significant ($\beta=.25$, $p < .001$). Hence, in romantic relationships, intimacy plays a mediating role in the association between the storge style and relationship satisfaction. Table 4 displays the confidence interval values.

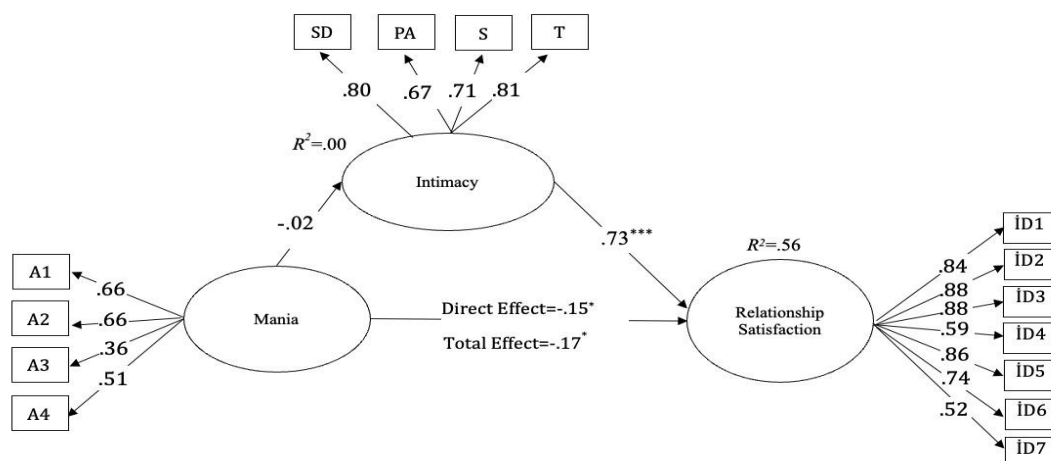
Table 4. Findings Regarding Mediation Analysis (Storge)

Pathways	B	S.E.	C.R.	Coefficient	CL Lower-bound	CL Upper-bound
Total Effect						
Storge → RS				.36***	.27	.45
Direct Effects						
Storge → RS	.27	.11	.35	.12*	.04	.20
Storge → Int	.92	.18	.05	.36***	.26	.45
Int → RS	.61	.06	0.47	.69***	.60	.77
Indirect Effect						
Storge → Int → RS				.25***	.18	.32

* $p < .05$; *** $p < .001$; $N = 349$.

Note: CI: 95% Confidence Intervals; RS: Relationship Satisfaction; Int: Intimacy.

Figure 5 presents the results of the model, which was created using mania as one of the love styles.



* $p < .05$, *** $p < .001$, SD: Self-disclosure, PA: Physical attraction, S: Support, T: Trust.

Figure 5. Findings Regarding the Model (Mania)

The model in Figure 5 has goodness of fit values that fall within acceptable limits [$\chi^2=242.565$, $df=85$, $p < .001$, $\chi^2/df=2.85$; GFI=.915; CFI=.937; RMSEA=.073]. This model indicates that mania style does not predict intimacy in romantic relationships. However, the mania style exerts a direct, negative, and significant effect on relationship satisfaction ($\beta = -.15$, $p < .05$). On the other hand, intimacy affects relationship satisfaction in romantic relationships directly, positively, and significantly ($\beta = .73$, $p < .001$). The findings suggest that intimacy in romantic relationships does not mediate the relationship between mania style and relationship satisfaction. Table 5 presents the confidence interval values.

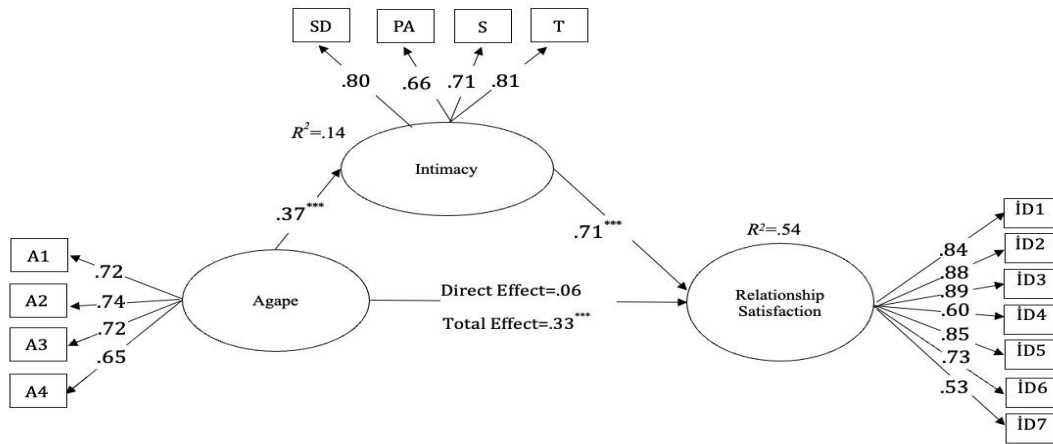
Table 5. Findings Regarding Mediation Analysis (Mania)

Pathways	B	S.E.	C. R.	Coefficient	CI Lower-bound	CI Upper-bound
Total Effect						
Mania $\rightarrow$ RS				-.17*	-.29	-.04
Direct Effects						
Mania $\rightarrow$ RS	-.34	.13	-2.69	-.15*	-.26	-.05
Mania $\rightarrow$ Int	-.05	.19	-.26	-.02	-.16	.12
Int $\rightarrow$ RS	.64	.06	11.22	.73***	.65	.79
Indirect Effect						
Mania $\rightarrow$ Int $\rightarrow$ RS				-.01	-.12	.09

* $p < .05$; *** $p < .001$; $N = 349$.

Note: CI: 95% Confidence Intervals; RS: Relationship Satisfaction; Int: Intimacy.

Figure 6 presents the findings of the model created using agape, one of the love styles.



*** $p < .001$, SD: Self-disclosure, PA: Physical attraction, S: Support, T: Trust.

Figure 6. Findings Regarding the Model (Agape)

The fit indices for the model depicted in Figure 6 fall within acceptable ranges [$\chi^2 = 269.950$, $df = 87$, $p < .001$, $\chi^2/df = 3.10$; GFI = .905; CFI = .935; RMSEA = .078]. The model indicates that agape style positively predicts intimacy in romantic relationships ($\beta = .37$, $p < .001$). However, the agape style does not predict relationship satisfaction directly and significantly. Instead, the agape style seems to predict relationship satisfaction indirectly through intimacy in romantic relationships. In other words, the indirect effect of agape style on relationship satisfaction is significant ($\beta = .27$, $p < .001$). Thus, in romantic relationships, intimacy plays a mediating role in the association between the agape style and relationship satisfaction. Table 6 presents the confidence interval values.

Table 6. Findings Regarding Mediation Analysis (Agape)

Pathways	B	S.E.	C.R	Coefficient	CL Lower-bound	CL Upper-bound
Total Effect						
Agape $\rightarrow$ RS				.33***	.23	.42
Direct Effects						
Agape $\rightarrow$ RS	.11	.09	.19	.06	-.02	.15
Agape $\rightarrow$ Int	.73	.14	.33	.37***	.27	.47
Int $\rightarrow$ RS	.63	.06	.44	.71***	.62	.79
Indirect Effect						
Agape $\rightarrow$ Int $\rightarrow$ RS				.27***	.19	.35

*** $p < .001$; $N = 349$.

Note: CI: 95% Confidence Intervals; RS: Relationship Satisfaction; Int: Intimacy.

Discussion, Conclusion and Recommendations

This study explored whether university students' love styles could predict relationship satisfaction depending on the degree of intimacy in romantic relationships. The results indicate that while eros style and storge style have a positive direct effect on relationship satisfaction, mania style has a negative effect. In addition, intimacy serves as a mediator in the relationship between relationship satisfaction and the ludus, agape, and storge styles. It was found that love styles other than pragma could predict relationship satisfaction both directly and through the degree of intimacy in romantic relationships. The findings regarding the prediction of relationship satisfaction through intimacy in direct and romantic relationships by eros, ludus, storge, mania, and agape are discussed below.

The initial model showed that the eros style had a direct and positive effect on relationship satisfaction. However, it was found that intimacy did not mediate the prediction of relationship satisfaction. Previous studies also reported that eros style positively predicted relationship satisfaction (Beştav, 2007; Budak, 2011; Fricker & Moore, 2002; Gana, Saada, & Untas, 2013; Goodboy & Booth-Butterfield, 2009; Morrow, Clark, & Brock 1995; Rohmann, Führer, & Bierhoff, 2016; Türk & Yıldız, 2017; Uysal, 2016; Vedes, Hilpert, Nussbeck, Randall, Bodenmann, & Lind, 2016). The lack of a mediating effect of intimacy suggests that relationship satisfaction in eros style may be associated with strong emotions and physical attraction (Lee, 1974; 1988).

This study indicated that the ludus style did not directly predict relationship satisfaction in the second model tested. However, the data showed that intimacy had a full mediating effect in the prediction of relationship satisfaction. The participants' relationship satisfaction increased as their levels of ludus decreased, through their levels of intimacy. Previous studies found that ludus had a negative effect on relationship satisfaction (Beştav, 2007; Budak, 2011; Fricker & Moore, 2002; Türk & Yıldız, 2017; Uysal, 2016; Vedes et al., 2016). The finding that intimacy within the ludus style functions as a crucial mediator of relationship satisfaction is of utmost importance, representing a groundbreaking revelation in this area of study. In the ludus style, individuals perceive their relationship as a game or source of entertainment. This approach often entails having multiple partners at the same time and a lack of commitment to any specific relationship (Lee, 1974; 1988). These characteristics could have a detrimental effect on partners' ability to trust each other, communicate openly, and seek support, when necessary, thereby impeding the development of intimacy. It is worth noting that this love style is generally regarded as undesirable. According to Lee (1974; 1988), the ludus style involves viewing relationships as a game or entertainment tool, accepting the possibility of having multiple partners simultaneously and having a low commitment to the relationship. These characteristics are generally considered negative. This leads to low commitment to the relationship, which can negatively affect partners' ability to trust each other, open up to each other, and ask for support when needed. However, increasing intimacy in individuals with ludus may also improve low relationship satisfaction caused by ludus. In romantic relationships, intimacy can transform the negative effect of ludic love on relationship satisfaction. This transformation leads to the evolution of ludus style into other forms of love.

This study tested a third model and found that storge style had a positive effect on both relationship satisfaction and intimacy. Intimacy was also found to partially mediate the relationship between storge style and relationship satisfaction. Therefore, an increase in storge levels led to an increase in both relationship satisfaction and intimacy. Although Uysal (2016) found that storge did not predict relationship satisfaction, the findings of other studies (Beştav, 2007; Rohmann et al., 2016; Türk & Yıldız, 2017) support this result. Storge style is characterized by the slow development of relationships, shared interests and activities, and stability (Lee, 1974; 1988). While passion may not be a prominent feature of this love style, relationship satisfaction could still be influenced by factors such as similarity and closeness. These factors can aid in individuals' understanding of each other and in resolving conflicts.

The fourth model test concluded that mania style has a direct and negative effect on relationship satisfaction. The analysis indicated that intimacy did not act as a mediator in the relationship between the two variables. This discovery aligns with prior research indicating that a mania style is inversely correlated with relationship satisfaction. (Budak, 2011; Rohmann et al., 2016). However, some studies suggest that mania does not predict relationship satisfaction (Beştav, 2007), or it predicts it positively (Uysal, 2016). Mania involves showing intense attention to the lover and demanding the same level of attention in return. When this expectation is not met, feelings of jealousy and insecurity may arise. Individuals may experience fear of losing their partner and may be reluctant to end the relationship even if it fails to meet their expectations. The presence of these adverse attributes suggests that a manic interpersonal style is anticipated to yield a detrimental effect on the level of satisfaction within relationships. Consequently, it can be inferred that the results of this study are consistent with the foundational theoretical frameworks. Nonetheless, it is imperative to acknowledge that the research results may exhibit nuances contingent upon the specific attributes of the demographic cohorts from which the data were sourced. It is noteworthy that individuals exhibiting manic traits typically experience heightened relationship contentment when paired with partners exemplifying altruistic tendencies.

The last model tested in this study concluded that the agape style did not directly predict relationship satisfaction. However, intimacy had a full mediating effect on predicting relationship satisfaction. As participants' agape levels increase, their relationship satisfaction increases through their levels of intimacy. The literature presents conflicting findings regarding the relationship between agape style and relationship satisfaction. While some studies suggested a positive correlation (Budak, 2011; Rohman et al., 2016; Uysal, 2016; Vedes et al., 2016), others found no such correlation (Beştav, 2007). Agapic lovers prioritize the well-being and happiness of their partners, exhibiting selflessness and generosity without expecting anything in return (Lee, 1974; 1988). These characteristics serve an important function in establishing intimacy with partners and may lead to increased satisfaction in romantic relationships.

This study found that only the pragma style did not directly predict relationship satisfaction or mediate intimacy. This discovery aligns with prior studies (Beştav, 2007; Budak, 2011; Rohman et al., 2016; Taghavi Dinani et al., 2014; Uysal 2016). Pragma is dominated by a pragmatic perspective, where individuals expect partners to meet certain criteria (Lee, 1974; 1988). It may be argued that this feature, which is mostly encountered in regulated relationships, does not meet the characteristics that individuals seek to obtain satisfaction from their relationships in today's conditions. However, if an arranged relationship persists, intimacy can be established, and relationship satisfaction may increase. However, the nature of this type of love does not support the establishment of intimacy in the early stages of a relationship. Therefore, considering the developmental characteristics of the research group, the possibility of not being part of a long-standing arranged relationship with no built intimacy may have played a role in the emergence of this result. In addition, pragma style did not predict relationship satisfaction, which may be an indication that collectivist values and arranged relationships are not idealized among undergraduate students.

Finally, some recommendations could be given to researchers and practitioners for future studies. Firstly, the study could be conducted with a distinction between actors and partners. Secondly, data could be collected from a wider age range, and comparisons could be made considering both relationship duration and relationship status. Thirdly, cross-cultural comparison studies could be conducted to reveal similarities and differences between cultures. Lastly, the existing information unit could be used in counseling and couple therapies before marriage.

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Development of a Quadrilaterals Test for Seventh-Grade Students: A Validity and Reliability Study*

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Abstract

This study is aimed at developing an achievement test on quadrilaterals for seventh-grade students. For this purpose, a test consisting of multiple choice questions was developed by conducting validity and reliability studies. Survey design, one of the quantitative research methods, was used. The sample of the study consisted of 300 seventh-grade students enrolled in a middle school in Melikgazi district of Kayseri, Turkey. Within the scope of validity, item analysis and construct validity analyses were conducted. In addition, exploratory and confirmatory factor analyses were conducted for construct validity. As a result of the reliability analysis, the KR-20 reliability coefficient of the scores obtained from the test was calculated as 0.928. The CFA analysis confirmed the one-factor structure determined by the EFA. The average item difficulty index of the scale was found to be 0.51, and the average item discrimination index was found to be 0.64. As a result, a valid and reliable quadrilateral test was obtained. For future studies, this test, which has high discrimination, can be accepted as a criterion test, and items can be prepared for similar purposes.

Keywords: Quadrilaterals, mathematics education, test development, validity, reliability.

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Yedinci Sınıf Öğrencileri için Dörtgenler Testi Geliştirme: Geçerlik ve Güvenirlik Çalışması*

Makale Türü	Başvuru Tarihi	Kabul Tarihi
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Öz

Bu çalışmada 7. sınıf öğrencileri için dörtgenler konusunda bir başarı testi geliştirilmesi amaçlanmıştır. Bu amaç doğrultusunda geçerlik ve güvenirlik çalışmaları yapılarak çoktan seçmeli sorulardan oluşan bir test geliştirilmiştir. Nicel araştırma yöntemlerinden biri olan anket tasarımı kullanılmıştır. Çalışmanın örneklemini Türkiye'nin Kayseri ili Melikgazi ilçesindeki bir ortaokulda öğrenim gören 300 yedinci sınıf öğrencisi oluşturmuştur. Geçerlik kapsamında madde analizi ve yapı geçerliliği analizleri yapılmıştır. Ayrıca yapı geçerliliği için açımlayıcı faktör analizi ve doğrulayıcı faktör analizi yapılmıştır. Yapılan güvenirlik analizi sonucunda testten elde edilen puanların KR-20 güvenirlik katsayısı 0,928 olarak hesaplanmıştır. DFA analizi, AFA'nın belirlediği tek faktörlü yapıyı doğrulamıştır. Ölçeğin ortalama madde güçlük indeksi 0,51, ortalama madde ayırt edicilik indeksi ise 0,64 olarak bulunmuştur. Sonuç olarak geçerli ve güvenilir bir dörtgenler testi elde edilmiştir. İleride yapılacak çalışmalarda yüksek ayırt ediciliğe sahip bu test bir ölçüt test olarak kabul edilebilir ve benzer amaçlar için maddeler hazırlanabilir.

Anahtar Sözcükler: Dörtgenler, matematik eğitimi, test geliştirme, geçerlik, güvenirlik.

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Introduction

Geometry teaching has been included in the curriculum due to various requirements. These include being able to use entities made up of geometric shapes effectively, understanding how shapes relate to their functions, recognizing space and applying spatial skills, and employing basic geometry knowledge and skills to solve everyday life problems (Aslaner, 2018). In the math curriculum, geometry is taught to help students learn how to think mathematically and logically, to show how things fit into the real world by looking at their spatial properties, and to give students the geometry skills they need in everyday life (González & Herbst, 2006). The development of geometric thinking enhances mathematical thinking.

Geometry develops five important skills in students: visual, verbal (use of terminology), drawing, and logical skills (distinguishing classification patterns, forming and testing hypotheses, and making inferences). Hoffer (1981) defines geometry as the application of knowledge to daily life. Understanding geometry not only prepares students for higher-level thinking but also establishes a foundation for various mathematical subjects such as measurement, arithmetic, and problem-solving (Gravemeijer et al., 2016). The K–12 math curriculum aims to teach students how to: use transformation geometry and symmetry to solve mathematical problems; figure out where things are and how they relate to each other using analytic geometry and other representation systems; and think mathematically about the properties of two-dimensional and three-dimensional geometric shapes and objects and how they relate to each other mathematically (National Council of Teachers of Mathematics [NCTM], 2000). It utilizes visualization, spatial reasoning, and geometric modeling to address the problem.

Geometry involves three cognitive processes that develop in synergy with one another: visualization, structure building, and evidence processing (Duval, 1998). Visualization involves describing an expression, making its hidden parts visible, and describing the object's two- and three-dimensional relationships and gestalt in a way that makes it easier to understand. It includes summarizing or subjectively questioning the problem, as well as constructing structures. This phase involves creating a mathematical model that expresses actions and observed results using tools such as rulers, compasses, or dynamic geometry software. Proof demonstrates the truth of the propositions reached through reasoning processes.

Teaching geometry aims to build theoretical and spatial knowledge together. When students encounter new geometry problems, they must see, understand, predict, and prove the connection between their theoretical knowledge and the representation of these concepts in space (Laborde et al., 2006). It is possible to approach a geometry problem from various perspectives and arrive at different solutions. This diversity and richness should enhance geometry teaching. Flexible instruction should integrate different visualization methods and types of reasoning (Duval, 1998). Vinner (1991) outlined key considerations for defining and organizing mathematical concepts as follows. Students primarily acquire concepts through their definitions. They use definitions to solve problems and mathematically prove theorems when necessary. Descriptions should be concise and contain minimal information.

Quadrilaterals

Quadrilaterals are defined as: If A, B, C, and D are four non-linear planar points, then [AB], [BC], [CD], and [DA], which are made up of four line segments that only meet at their ends, are called a *quadrilateral* (Hızarcı et al., 2009). This is a simple definition of quadrilaterals, including concave and convex quadrilaterals whose sides intersect only at the vertices. Grade level allows for changes in definitions and an increase in properties. For example, while all diagonals of convex polygons intersect at a common point, not all diagonals of concave polygons intersect at a common point (Graumann, 2005). De Villiers (1994) defined a more complex quadrilateral (i.e., crossed quadrilateral) according to which both sides of a quadrilateral can intersect each other at a point other than the corners.

Special quadrilaterals can be classified according to the properties of their angles and sides. A *square*, *rectangle*, *rhombus*, *parallelogram*, *trapezoid*, and *deltoid* are special quadrilaterals, but the *deltoid* is not included in the middle school mathematics curriculum (Ministry of National Education [MoNE], 2018). Special quadrilaterals are defined in two ways. The relationships and coverage of these quadrilaterals determine whether definitions are hierarchical or exclude relationships.

The hierarchical ordering of quadrilaterals can benefit from reasoning, and it is important to focus on certain features (Graumann, 2005). It is important to pay attention to the following features: sides of the same length, parallel sides, opposite angles of the same measure, special angles, angles that add up to the same number, diagonals of the same length, orthogonal (crossing perpendicularly) diagonals, diagonals that average each other, one diagonal that averages the other, and axes of symmetry. We classify these definitions as either inclusive or exclusive (Ulusoy, 2022). In an inclusive definition, the classification of any set of concepts is hierarchically dependent on the definition. The most general special quadrilateral is considered a trapezoid, and the definition is made as a quadrilateral with at least one pair of opposite sides parallel. On the other hand, the exclusionary approach defines the trapezoid as a quadrilateral with only one pair of opposite sides parallel (De Villiers, 1994). The Turkish MoNE (2018) middle school mathematics curriculum accepts the inclusive definition in teaching quadrilaterals. The definitions of quadrilaterals are:

A *trapezoid* is a quadrilateral with at least one pair of parallel sides (MoNE, 2018). The definition of a trapezoid is expressed with a hierarchical and inclusive approach. In the next step, students are expected to establish a relationship between a trapezoid and a parallelogram and conceptualize a trapezoid with two pairs of parallel sides as a parallelogram (Çalık Uzun, 2020). A *parallelogram* has two pairs of parallel sides, or a quadrilateral whose opposite sides are parallel and of equal length. Since the two pairs of sides of a quadrilateral are parallel, their opposite sides must also be equal, so there is no need to state this equality (Çalık Uzun, 2020). The sides of a parallelogram are equal because the opposite sides are parallel; the lengths of diagonals are different, but they center each other. Its opposite angles are equal, and consecutive interior angles are supplementary.

A *rhombus* is a parallelogram with all sides of equal length. In addition to the properties of a parallelogram, it has some special angle-side relationships. All sides of a rhombus are the same length, and its diagonals are orthogonal; that is, they are not parallel to each other. The bisector is the point where the diagonals meet at the corners (Çalık Uzun, 2020). Since the side lengths are equal and the diagonals are bisectors, these diagonals divide the rhombus into four equal triangles (Danişman, 2020). A *rectangle* is a parallelogram with a 90-degree angle. In addition to all the properties of the parallelogram, all its interior angles are 90 degree, and the lengths of both diagonals are equal (Çalık Uzun, 2020). A rectangle is a special case of a parallelogram, and it has same properties as a parallelogram. In addition to parallelogram properties, rectangle diagonals are equal in length and bisect.

A *square* is a special case of a rectangle with all sides of equal length. The lengths of the diagonals are equal; they are bisectors, and each of these angles is 45° . The diagonals bisect each other orthogonally, dividing the square into four equal triangular regions (Danişman, 2020). A square is a special kind of trapezoid, parallelogram, rhombus, or rectangular square (Çalık Uzun, 2020). Zazkis and Leikin (2008) said that a square is a regular quadrilateral with all interior angles and side lengths being the same, a quadrilateral with all sides being the same and one angle being 90 degrees, a rhombus with equal interior angles and diagonal lengths, and a parallelogram with equal length and an orthogonal diagonal. It is defined as a quadrilateral with four axes of symmetry.

Students' Misconceptions and Difficulties in Quadrilaterals

Students may experience problems when they do not consider the relational properties of quadrilaterals and focus only on the shapes of these concepts (Çalık Uzun, 2020). Middle school students had misconceptions about trapezoids and thought that some special quadrilaterals, such as squares, rectangles, and parallelograms, were not trapezoids (Dogan et al., 2012). Seventh-grade students had misconceptions regarding the classification and definition of special quadrilaterals and the determination of the relationships between them (Ay & Başbay, 2017; Özkan & Bal, 2017). Ubuz (2017) found that the formal definitions used to set up hierarchical relationships between special quadrilaterals and students' concept images were not the same. She suggested using shapes that encompass everyone to create the correct concept image.

In this study, we aimed to develop a valid and reliable method for a seventh-grade geometry test based on quadrilaterals. We developed the geometry test to identify students' misconceptions and achievements in quadrilaterals. This test, developed following the mathematics curriculum, can be used by middle school teachers to determine students' misconceptions and achievements in quadrilaterals.

Method

Study Design

We used a survey design, a type of quantitative research method. In a survey design, the qualities, such as interests, skills, opinions, and abilities, of the participants regarding a subject or event are revealed (Fraenkel & Wallen, 2006). This study aimed to develop a reliable and valid achievement test to determine the achievement levels of 7th-grade middle school students on quadrilaterals.

Population and Sample

The accessible population for the study includes 7th-grade students in Melikgazi, Kayseri, during the 2022-2023 academic year. The sample consists of 300 students enrolled in 7th grade at a middle school in Melikgazi, Kayseri. The study utilized cluster sampling. The sample size must be at least five times the number of questions (Büyüköztürk, 2002). This study also adheres to the ten-fold rule. We initially composed the achievement test with 25 questions but later reduced it to 17 through analysis, leading to the establishment of the final version. The final version of the quadrilaterals test is in the Appendix. Orman (2025) administered the Turkish version of the quadrilateral test.

Data Collection Tools

We aimed to develop a quadrilaterals test as a data collection tool. We provided the quadrilaterals test in Orman (2025). We conducted validity and reliability studies while creating the quadrilaterals test. The related section presents the findings.

Data Analysis

We conducted the necessary reliability and validity studies using SPSS 22 during the test development phase. A value of 1 was assigned to students' correct answers and 0 to their blank or wrong answers. To ensure content validity, the purpose and objectives of the study were determined, a question pool was created, a specification table was created, and expert evaluation was conducted. Difficulty and discrimination indexes were examined to ensure the validity of the test. In addition, exploratory and confirmatory factor analyses were conducted for construct validity. Then, the KR-20 reliability coefficient was calculated. Since the study was carried out by following the achievement test development steps, detailed information about the analysis is given in the findings section.

Ethical Procedures

The Human Sciences Ethics Committee of the corresponding Erciyes University approved the research protocol on 25 / 10 / 2022 with the research number 445. The data were obtained from students. For this reason, we informed the participating students and their families about the study's content. We obtained consent forms from the families of each student. The research was based on voluntary participation.

Results

Validity Study for Achievement Test

Validity is the degree to which a test prepared for a purpose serves it (Fraenkel & Wallen, 1996). Within the scope of the validity study, findings related to content and construct validity were included.

Content Validity of Quadrilaterals Test

We examined the Mathematics Curriculum before creating the quadrilaterals test (MoNE, 2018). The curriculum includes quadrilaterals under the subheading of polygons in the Geometry and Measurement Learning Area. Table 1 provides the objectives regarding quadrilaterals in the mathematics curriculum. There are three objectives for quadrilaterals in the curriculum. First, the researcher considered these objectives, conducted a literature review, and created an item pool consisting of 60 items. This item pool was reduced to 25 items by obtaining the opinions of five experts, including a Turkish teacher, three mathematics teachers, and a faculty member working in the department of middle school mathematics teaching. The first item was included in the 2022 7th-grade Scholarship Exam. The third item was included in the 2010 7th-grade SBS Exam. Item 17 was included

in the 2008 7th-grade SBS Exam. The 8th item was included in the 2007 7th-grade Scholarship Exam. Inspired by scholarship exams and expert opinions, the researcher prepared the other items using 7th-grade mathematics textbooks. Table 1 displays the relationship between 25 items and the objectives.

Table 1. *Distribution of objectives (O)*

O	An Explanation of Objectives	Items
1	“Recognizes rectangle, parallelogram, trapezoid, and rhombus; determines the angle properties.” (MoNE, 2018, p. 69) (Seven hours of teaching) a) “Along with the angles formed by the sides, the angles formed by the diagonals in rhombuses, squares, and rectangles are also examined.” (MoNE, 2018, p. 69) b) “Square is considered a special case of rectangle and rhombus. In addition, rectangles and rhombuses are considered special cases of parallelograms. In addition, rectangle, rhombus and parallelogram are considered special cases of the trapezoid.” (MoNE, 2018, p. 69)	3, 6, 7, 9, 10, 11, 12, 13, 14, 15, 16, 18, 19, 20, 21, 23, 24, 25
2	“Creates area relations of rhombus and trapezoid, solves related problems.” (MoNE, 2018, p. 69) (2 hours of teaching)	1, 2, 5, 17
3	“Solves area-related problems.” (MoNE, 2018, p. 69) (3 hours of teaching) a) “Problems that require finding the areas of compound shapes consisting of triangles, rectangles, parallelograms, trapezoids, or rhombuses are included.” (MoNE, 2018, p. 69). b) “Studies aimed at relating the perimeter and area of a rectangle are included. “The perimeters of different rectangles with the same area and the areas of different rectangles with the same perimeter are examined.” (MoNE, 2018, p. 69).	4, 8, 22

Examining Table 1, we found that the first objective had the highest number of items. This is because it is a detailed learning outcome that examines the angle and diagonal properties of quadrilaterals and their relationships with each other. The first version of the quadrilaterals test, consisting of 25 items, was administered to 300 8th-grade students enrolled in the same school with 7th-grade students at the beginning of the 2022-2023 academic year. The reason why the first version of the quadrilaterals test was administered to 8th graders was that 7th graders had recently learned the quadrilaterals.

Item Analysis

We examined item difficulty and discrimination indexes in addition to content validity studies. These indexes are statistical procedures that will also increase the validity of the test. In the quadrilateral test, items can be multiple-choice. In the quadrilateral test, one point was given to those who answered each question correctly, and zero points were given to those who answered incorrectly or left the question blank. In this way, both the item-based and total scores of 300 students were calculated. Students were ranked from highest to lowest according to their scores. Since 27% of 300 were 81, the 81 students with the highest score formed the upper group, and the 81 students with the lowest score formed the lower group. The item analysis method was applied to the lower and upper groups.

The item difficulty index of each question was calculated by dividing the sum of the number of students who answered each question correctly in the upper and lower groups by the sum of the number of students in the upper and lower groups, which is 162. Then, the number of students who answered each question correctly in the upper group was subtracted from the number of students who answered it correctly in the lower group. We determined the item discrimination index for each question by dividing this difference by the total number of students in each group, which is 81. These calculated index values are shown in Table 2.

If the item difficulty index is close to 1, the item is easy; if it is close to 0, the item is difficult (Büyüköztürk, 2011). This value is generally expected to be close to 0.5. However, preparing each item with a difficulty index of 0.5 is not desirable. Instead, items with easy, medium, and difficult difficulty should be included in the test. As a result, the average item difficulty index of the test should be close to 0.5 (Büyüköztürk, 2011; Hasançebi et al., 2020). As seen in Table 2, the item difficulty index of each question varies between 0.19 and 0.69. The average item difficulty index of the test was calculated as 0.47.

Table 2. *Difficulty and Discrimination Indexes of Items in the Achievement Test*

Item	Item difficulty index	Item discrimination index	Item	Item difficulty index	Item discrimination index
1	0.49	0.36	14	0.66	0.63
2	0.65	0.59	15	0.59	0.60
3	0.32	0.44	16	0.51	0.65
4	0.44	0.60	17	0.54	0.79
5	0.48	0.77	18	0.59	0.32
6	0.41	0.63	19	0.62	0.54
7	0.69	0.36	20	0.36	0.33
8	0.49	0.74	21	0.24	0.38
9	0.34	0.21	22	0.49	0.68
10	0.41	0.59	23	0.60	0.57
11	0.41	0.65	24	0.50	0.70
12	0.19	0.05	25	0.53	0.64
13	0.22	0.21			

We use item discrimination as an index to differentiate between individuals who possess the relevant item and those who do not. This index takes a value between +1 and -1. If this value is close to 1, it is interpreted as high discrimination in the upper and lower groups for the relevant item, and if it is close to 0, it is interpreted as low discrimination. A negative value means that the number of correct answers in the lower group is higher than in the upper group (Hasançebi et al., 2020). Büyüköztürk (2011) states that for the item discrimination index range, “If it is less than 0.20, the relevant item is weak and should be removed from the test; in the range of 0.20 – 0.29, the relevant item should be corrected and reviewed; in the range of 0.30 – 0.39, the relevant item is quite good; and if it is 0.40 and above, it is a very good item.”

Examining Table 2 reveals that the item discrimination index values range from 0.05 to 0.77. The average item discrimination index of the test was calculated as 0.52. Items 1, 7, 9, 12, 13, 18, 20, and 21, whose item discrimination index was less than 0.40, were removed from the test after receiving expert opinions. Therefore, we found that each item's item discrimination index exceeded 0.40. After the relevant items were removed from the test, the average item difficulty index of the remaining 17 items was found to be 0.51, and the average item discrimination index was 0.64.

Exploratory Factor Analysis (EFA) for Construct Validity

Construct validity refers to how well the test demonstrates the theoretical framework for measurement (Çepni et al., 2012). We performed an EFA, as shown in Table 3, to address this. To perform factor analysis, it is recommended that Bartlett's test be significant (Pallant, 2016) and the KMO index be greater than the minimum value of 0.6 (Tabachnick & Fidell, 2013). When Table 3 is examined, the KMO value is 0.885. Therefore, since the KMO value is greater than 0.6, EFA can be performed.

Table 3. *KMO Value for the Quadrilaterals Test*

Kaiser-Meyer-Olkin Measure of Sampling Adequacy	.885
Approx. Chi-Square	1041.963
df	136
p	.000

Table 4 displays the total variance after the statistical analysis. Factors with eigenvalues greater than 1 are given in Table 4. Components with eigenvalues of 1 or more are taken into account to decide how many factors to extract (Pallant, 2016). The quadrilaterals test was grouped under one factor. We grouped the quadrilaterals test under a single factor due to the interrelated nature of its objectives. These factors cover 24.245% of the test items. However, the explained variance table alone cannot determine the factor structure in the test.

Table 4. *Total Variance Values for the Quadrilaterals Test*

Factor	Total	% of Variance	Cumulative %
1	4.122	24.245	24.245

A scree plot graph is an important tool for determining the number of factors (Seçer, 2013). Figure 1 shows the Scree Plot graph of the quadrilaterals test. Figure 1 shows that the slope flattens after the second factor. After this point, the contribution of the factors to the variance is considered low (Çokluk et al., 2010). Therefore, the Scree Plot graph shows a single factor.

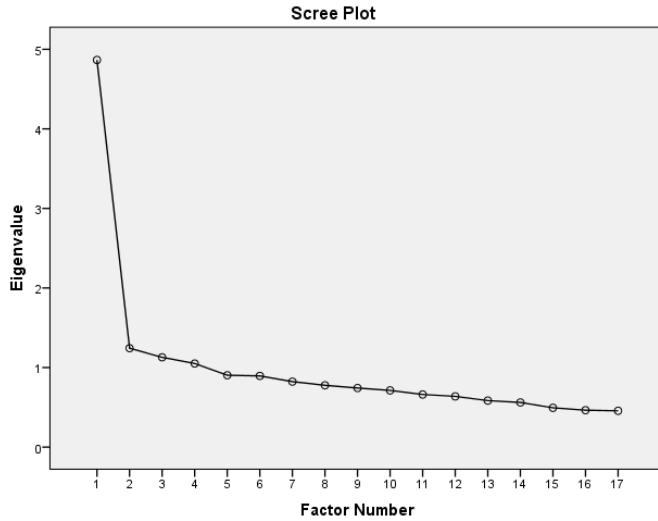


Figure 1. *Scree Plot for the Quadrilaterals Test*

The factor loadings and coefficients of the questions are given in Table 5. Following the test's factor analysis, the researcher examined each factor's questions. The examination revealed that the questions in Factor 1 were associated with the properties of quadrilaterals. The extraction method was principal axis factoring. We extracted one factor through three iterations.

Table 5. *Factor Loadings for the Quadrilaterals Test*

Item	Factor 1
item17	.586
item5	.561
item8	.555
item14	.532
item24	.525
item25	.524
item10	.524
item22	.520
item4	.499
item16	.498
item6	.469
item11	.461
item15	.454
item2	.450
item23	.412
item19	.386
item3	.348

Confirmatory Factor Analysis (CFA)

The CFA for the quadrilateral test developed in this study was conducted with the AMOS program. The CFA yielded a Chi-square with (201.860) degrees of freedom (119), and Hu & Bentler (1999) predicted a result below five. We took this ratio from the selected sample group, and according to Jöreskog & Sörbom (1993), a value below three indicates a perfect fit. The current study determined this result as 1.696, and Table 6 provides evidence of perfect fit in the data. The RMSEA value between 0.00-0.05 used in CFA is considered an acceptable fit, 0.08-0.10 is considered a moderate fit, and values

greater than 0.10 are considered unacceptable (Schermelleh Engel et al., 2003). The RMSEA value of 0.048 obtained from this test indicates that the fit of this test is perfect. The CFA analysis confirmed the one-factor structure determined by EFA. The model is in Figure 2.

Table 6. *Confirmatory Factor Analysis Goodness of Fit Index Table*

Fit Measure	Perfect Fit	Acceptable Fit	Observed Value	Fit Status
χ^2 / sd	$0 \leq \chi^2 / sd \leq 2$	$2 \leq \chi^2 / sd \leq 3$	1.696	Perfect
p value	$0,05 \leq p \leq 1,00$	$0,01 \leq p \leq 0,05$	0,00	Perfect
RMSEA	$0 \leq RMSEA \leq 0,05$	$0,05 \leq RMSEA \leq 0,08$	0.048	Perfect
CFI	$0,95 \leq CFI \leq 1,00$	$0,90 \leq CFI \leq 0,95$	0.911	Acceptable
GFI	$0,95 \leq GFI \leq 1,00$	$0,90 \leq GFI \leq 0,95$	0.925	Acceptable
AGFI	$0,90 \leq AGFI \leq 1,00$	$0,85 \leq AGFI \leq 0,90$	0,903	Perfect

$\chi^2_{MIN}=201,860$; $DF=119$; $CMIN/DF=1,696$; $RMSEA=.048$; $CFI=.911$; $GFI=.925$

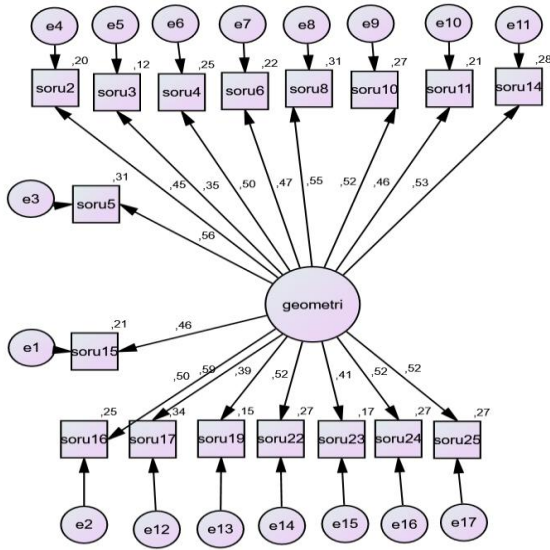


Figure 2. *Path Diagram*

Reliability Study for Achievement Test

The scale must be reliable for use (Pallant, 2016). Reliability is the consistency and stability of measurement results free from random errors (Çepni et al., 2012). For reliability, we use KR-20, KR-21, and Cronbach's alpha calculations. In general, Cronbach's alpha and KR-20 are preferred in tests where a zero value is used for a wrong answer and one value is used for the correct answer. In this study, we calculated the KR-20 value to evaluate the reliability of the students' quadrilateral tests.

We calculated the Kuder-Richardson-20 (KR-20) value to determine the internal consistency coefficient of the quadrilaterals test. The KR-20 value of 25 questions in the pilot quadrilateral test was calculated as 0.915. After removing eight items with a low item discrimination index, the KR-20 value of the remaining 17 items was calculated as 0.928. When the KR-20 value is 0.80 or above, the measurements obtained in the test are reliable (Secolsky & Denison, 2018). The item analysis and KR-20 analysis show that the quadrilateral test has very good discrimination, high reliability, and medium difficulty. Table 7 presents item-total statistics.

Table 7. *Item-total Statistics*

Item	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
item 2	8.01	29.453	.556	.925
item 3	8.35	30.066	.443	.928
item 4	8.23	29.022	.613	.924
item 5	8.19	28.475	.717	.921
item 6	8.25	28.886	.646	.923
item 10	8.26	28.926	.639	.923
item 11	8.25	28.985	.626	.924
item 14	8.01	29.012	.649	.923
item 15	8.08	29.180	.587	.925
item 16	8.15	28.889	.634	.923
item 17	8.12	28.295	.755	.920
item 19	8.05	29.501	.533	.926
item 22	8.18	28.744	.663	.923
item 23	8.06	29.288	.571	.925
item 24	8.17	28.587	.694	.922
item 25	8.14	28.863	.640	.923
item 8	8.17	28.343	.743	.921

Discussion, Conclusion and Recommendations

The study aims to prepare a valid and reliable quadrilaterals test. We conducted the necessary validity and reliability studies for the quadrilaterals test. First of all, the purpose of the study was determined. Next, we determined the content validity objectives and the items that align with these objectives. Experts in mathematics education continuously provided feedback to finalize the test before its administration. During this process, we tried to prepare the objectives, related items, and specification table appropriately. The test development processes in this study are parallel to the studies in the literature (Kılıç & Sağlam, 2009).

When the difficulty and discrimination indexes of the items were calculated, the difficulty indexes and discrimination indexes of questions 1, 7, 9, 12, 13, 18, 20, and 21 were found to be low. At the same time, the removal of these items increased the reliability of the test. We decided to remove these items from the test. Hazır Bıkmaz (2002) stated that some questions in the self-efficacy scale he developed had low discrimination and that the reliability coefficient increased when they were removed from the test. This result is similar to our study.

We performed EFA and CFA in this study to ensure construct validity. As a result of the exploratory factor analysis, it was decided that the test had one factor. A confirmatory factor analysis (CFA) was performed. The fit indices confirmed a good model. We conducted a reliability study for the quadrilateral test. In this context, the KR-20 reliability coefficient was found to be 0.928. In addition, the fact that the effect of each question on the reliability coefficient is greater than 0.60 means that the scores obtained from the test are reliable (Can, 2014). Considering all these evaluations, we developed a valid and reliable quadrilaterals test for the 7th-grade quadrilaterals subject.

This study aimed to create a valid and reliable quadrilaterals test. We determined a total of 17 items for the quadrilaterals test and proceeded with their application and analysis. We can conduct the study with a greater number of items to assess achievement. This approach will increase the likelihood of meeting the determined objectives. Orman and Sevgi (2025) administered the quadrilaterals test to determine the achievement of 7th-grade students' geometry achievement.

Experts assisted in determining the objectives. However, conducting interviews with students during the item determination process is also an option. We conducted the study with a total of 300 7th-grade students. This allows for an increase in the student population. We can provide open-ended questions to reveal students' advanced understanding of the objectives of the study. For future studies, this test with high discrimination can be accepted as a criterion test, and items can be prepared for similar objectives.

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Appendix Quadrilaterals Test

1) Four friends with 36 cm long ropes create the following shapes on the table by using the ropes in their hands without cutting them.

Alp: Square shaped

Banu: Rectangular with a short side of 6 cm

Cem: Rectangular with a short side of 1 cm

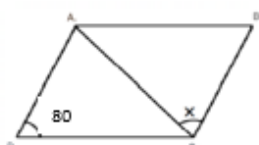
Laurel: Rhombus shaped with a height of 6 cm.

According to this, which one makes the shape on the table?

What is the largest area covered?

A) Alpine B) Banu C) Cem D) Laurel

2)



In the rhombus ABCD in the figure

If $\angle ADC = 80^\circ$ how many degrees is $\angle ACB$?

A) 80 B) 70 C) 60 D) 50

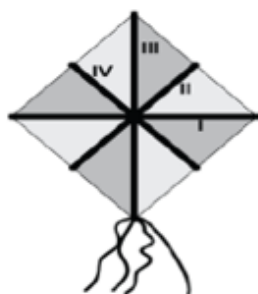
3) In which of the following quadrilaterals are the diagonals always equal in length?

A) Parallelogram and rectangle B) Rectangle and trapezoid
C) Square and rectangle D) Square and parallelogram

4)

The rhombic region-shaped kite on the side was created by combining the kites I, II, III and IV as shown in the figure.

In which of the following are the sides perpendicular to each other?



A) I and III B) II and III C) I and IV D) I and II

5) Which of the following quadrilaterals has equal diagonal lengths and angle bisectors?

A) Square B) Trapezoid
C) Rectangle D) Parallelogram

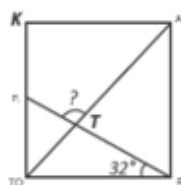
6)

- I. A parallelogram is a special case of a trapezoid.
- II. Square is a special case of rectangle.
- III. Rectangle is a special case of parallelogram.
- IV. A rhombus is a special case of a parallelogram.

How many of the above information are incorrect?

A) 0 B) 1 C) 2 D) 3

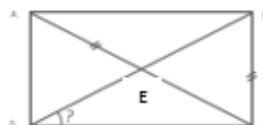
7)



In the above SQUARE square, the PRE angle is 32°
What is the measure of angle PTA in degrees?

A) 64 B) 77 C) 103 D) 116

8)



In the rectangle ABCD above, diagonals [AC] and [BD] intersect at point E and $|AE| = |BC|$.

Accordingly, what is the measure of angle EDC in degrees?

A) 22,5 B) 30 C) 36 D) 45

9) Which of the following quadrilaterals has only one pair of opposite sides parallel?

A) Rectangle B) Parallelogram
C) Trapezoid D) Square

10)



A fountain will be placed at each corner of a rhombic garden as shown in the figure. The distance between the fountains at corners B and D is 8 m. If the area of the garden is 48 m^2 , how many meters is the distance between fountains A and C?

- A) 10 B) 12 C) 14 D) 16

11)



In the figure, ABCD is a trapezoid and ABCE is a parallelogram.

$|DE| = |BC|$ and $\widehat{s(ADE)} = 50^\circ$

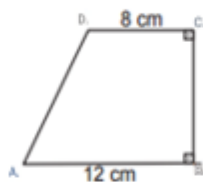
How many degrees is $\widehat{s(ABC)}$?

- A) 100 B) 130 C) 145 D) 160

12) Which of the following properties is **not** a property of a rhombus?

- A) The diagonals are angle bisectors.
B) The diagonals bisect each other.
C) The diagonals intersect at right angles.
D) The diagonal lengths are equal.

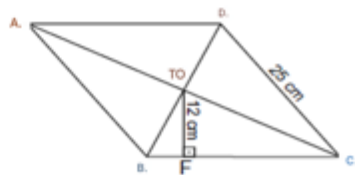
13)



In the right trapezium ABCD in the figure, if $|AB| = 12 \text{ cm}$, $|DC| = 8 \text{ cm}$ and $A(ABCD) = 100 \text{ cm}^2$, how many centimeters is BC?

- A) 12 B) 10
C) 8 D) 6

14)



In the figure ABCD is a rhombus

Point F is on [BC], $|BF| = 12 \text{ cm}$ and $|FC| = 13 \text{ cm}$.

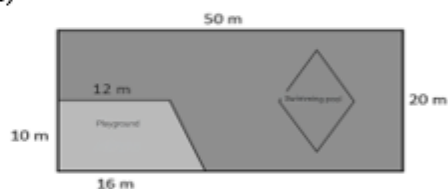
Accordingly, how many square centimeters is $A(ABCD)$?

- A) 150 B) 300 C) 450 D) 600

15) The side lengths of a rectangle with an area of 80 square centimeters are natural numbers in centimeters. According to this, what is the maximum perimeter length of this rectangle in centimeters?

- A) 162 B) 160 C) 80 D) 400

16)

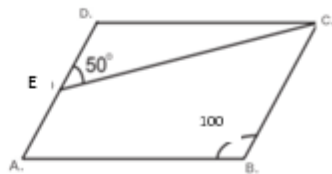


The plan of a rectangular park is given above. The diagonal lengths of the rhombus-shaped pool are 10 m and 16 m. The areas outside the trapezoid-shaped playground and the pool in the park are grassy.

Accordingly, what is the area of the grassy area in the park?

- A) 560 B) 640 C) 700 D) 780

17)



In the figure, ABCD is a parallelogram, $\widehat{m(ABC)} = 100^\circ$ and $\widehat{m(DEC)} = 50^\circ$, how many degrees is $\widehat{m(DCE)}$?

- A) 30 B) 40 C) 50 D) 60

Answer Key: 1-A 2-B 3-C 4-A 5-A 6-A 7-C 8-B 9-C 10-B 11-A 12-D 13-B 14-D 15-A 16-D 17-A

Secondary School Students' Opinions on Teaching the Structure of the Atom with Augmented Reality Application

Article Type	Received Date	Accepted Date
Research	3.01.2025	09.03.2025

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Abstract

This study is aimed at developing an achievement test on quadrilaterals for seventh-grade students. The concept of the atom can be visualized in different ways in the mind due to its structure, which the naked eye cannot see. Augmented reality (AR) is one of the applications that can be used to teach such concepts. This study aimed to investigate students' views on the use of AR applications in teaching. Phenomenological design, one of the qualitative research designs, was used in the study. The study group consisted of 26 -graders in a public secondary school. AR application was organized to teach the structure of the atom. Within the scope of the study, an interview form consisting of four open-ended questions prepared by the researchers and submitted to expert opinion for content validity was used as a data collection tool. When the students' answers to the questions were examined, it was determined that they had positive opinions that AR application could be used in other courses and different subjects, that this application was more instructive because it concretized the subject, that it caused a better understanding of the subject it was used in, and that it increased participation in the lesson due to the possibilities of providing three-dimensional images. Suggestions were made based on the results.

Keywords: Augmented reality, atomic structure, secondary school students, student views.

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Arttırılmış Gerçeklik Uygulaması ile İlgili Atomun Yapısının Öğretimine İlişkin Ortaokul Öğrencilerinin Görüşleri

Makale Türü	Başvuru Tarihi	Kabul Tarihi
Araştırma	3.01.2025	9.03.2025

Fatih Gürbüz*

Ayberk Bostan Sarıoğlu**

Öz

Atom kavramı çıplak gözle görülemeyen yapısı nedeni ile zihinlerde farklı şekillerde canlandırılabilir. Arttırılmış gerçeklik (AR) uygulaması ise bu tür kavramların öğretiminde kullanılabilir. Bu çalışmada AR uygulamasının öğretimde kullanılmasına ilişkin öğrenci görüşlerinin araştırılması amaçlanmıştır. Araştırmada nitel araştırma desenlerinden fenomenoloji deseni kullanılmıştır. Çalışma grubunu bir devlet ortaokulunda öğrenim gören 26 yedinci sınıf öğrencisi oluşturmaktadır. Atomun yapısının öğretimi için AR uygulaması düzenlenmiştir. Araştırma kapsamında, veri toplama aracı olarak araştırmacılar tarafından hazırlanan ve kapsam geçerliği için uzman görüşüne sunulan dört açık uçlu sorudan oluşan görüşme formu kullanılmıştır. Öğrencilerin sorulara verdikleri cevapları incelendiğinde; AR uygulamasının diğer derslerde ve farklı konularda da kullanılabileceği, bu uygulamanın konuyu somutlaştırdığından dolayı daha öğretici olduğu, kullanıldığı konunun daha iyi kavranabilmesine sebep olduğu ve üç boyutlu görüntü sağlama olanaklarından dolayı derse katılımı da artırdığı yönünde olumlu görüşlere sahip oldukları belirlenmiştir. Ortaya çıkan sonuçlardan hareketle önerilerde bulunulmuştur.

Anahtar Sözcükler: Arttırılmış gerçeklik, atomun yapısı, ortaokul öğrencileri, öğrenci görüşleri.

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Introduction

In proportion to the rapid developments in science, there are also rapid technological developments. Developing technology is used in the field of education as in every field. The use of technology has become an indispensable part of distance education. In the world, there have recently been cases where teaching cannot continue in classrooms and can only be carried out technologically (Bostan Sarioğlu, Şen, & Altaş, 2021). Countries with infrastructure in the use of technology in education have organized their educational environments in this process, and the importance of using technology in education has once again emerged. The effects of integrating technology into the teaching process on teaching have been the subject of many studies and it has been stated that the use of various technology applications in education positively affects teaching (Agustina, Siregar, Husain, Asfahani, & Pahmi, 2023; Deng, & Yu, 2023; Fitria, 2023; Grassini, 2023; Lee, 2024; Raja, & Nagasubramani, 2018; Rangel-de Lazaro, & Duarte, 2023; Strzelecki, 2023; Wijayanto, Thamrin, Haetami, Mustoip, & Oktawati, 2023; Yu, 2023; Zhu, Sun, Luo, Li, & Wang, 2023). One of the smart technologies accepted as medium-term in integrating these technologies into learning and teaching environments is augmented reality (AR) application (Spector & Denton, 2016). As a result of the increasing use of technology, the use of AR applications in education has also increased.

Koumpourous (2024), in his research compiling augmented reality studies, stated that the studies on this subject doubled between 2016 and 2020. Hidayat and Wardat (2024) mentioned the commonly used types of augmented reality in their study, compiling the studies using AR applications in Science, Technology, Engineering and Mathematics education. AR application is an important technology that enhances learning experiences (Garzón, Pavón, & Baldiris, 2019). Using AR application in science education increases students' interest in the course (Ab Aziz, Ab Aziz, Avijit, Yusof, & Noor, 2012; Sumadio, & Rambli, 2010). It has been determined that teaching using AR applications in science lessons has positive and significant effects on students' academic achievement and various variables supporting science teaching (Anıl, & Batdi, 2023). From the perspective of students, interacting with materials produced with AR applications creates a fun environment for learning activities (İzgi Onbaşlı, 2018). With the decrease in the costs of AR technologies, the accessibility and usability of these technologies have increased, and their potential in teaching environments has increased (Somyürek, 2014). In particular, the increasing use of smartphones has increased the interest in AR applications (Kljun, Geroimenko, & Čopič Pucihar, 2020). Although the use of AR applications in education has advantages, technical problems and limitations arising from the equipment used in teaching are the most common problems (Koumpourous, 2024). In addition, the fact that students find using AR applications difficult is one of the other problems encountered (Akçayır & Akçayır, 2017).

When the literature is examined, it is understood that the features such as visualizing the subject and increasing comprehensibility, allowing students to experience events that are not possible in the real world, and concretizing abstract content are effective in the importance of augmented reality for science courses (Arvanitis et al., 2009; Klopfer, & Sheldon, 2010; Klopfer, & Squire, 2008). AR technologies also enable students to experience science experiments that may be risky to physically observe in the real world (Wu, Lee, Chang, & Liang, 2013). Students have various difficulties in learning abstract concepts in science courses. For example, there is a relationship between the representation of the structure of the atom in science books and students' misconceptions about the atom (Hejnová, & Kralik, 2019). In science education, human anatomy (Kurniawana, Suharjitoa, & Witjaksono, 2018), cell (Coşkun, & Özkaya, 2023; Özeren, & Top, 2023; Tarnig, Lin, & Ou, 2021), atom (Cai, Wang, & Chiang, 2014; Ewais, & Troyer, 2019), periodic table (Alrige, Bitar, Al-Suraihi, Bawazeer, & Al-Hazmi, 2021; Olim, & Nisi, 2020) and the use of AR technology in teaching abstract concepts such as elements (Chen, & Liu, 2020) are effective in students' more accurate structuring of concepts.

This study aims to investigate students' views on using AR applications in teaching the subject of atoms at the secondary school level. It is important to understand the concepts in teaching, such as the atom, which students cannot observe and experiment with in daily life, and for these reasons, they have difficulty in understanding. It is stated in the studies that the atomic model that students form in their minds and the real atomic model are not compatible with each other (Harrison & Teragust, 1996; Kaya, 2023). The reason for this is the students' lack of knowledge and experience about the atomic model (Cokelez & Yalçın, 2012). In this context, there is a need for instructional content that will facilitate

students' understanding of the concept of the atom by concretizing it. Based on this situation, this study aimed to obtain students' opinions about the use of augmented reality applications in teaching the concept of atoms. Students' feedback on AR applications will facilitate understanding the strengths and weaknesses of using this application and shed light on future teaching applications. The research question of this study is as follows.

What are the students' opinions about using AR applications on the particulate structure of matter? The sub-questions determined based on the research question are given below.

- 1) What are the students' opinions about the contribution of the use of AR applications in courses to course success?
- 2) What are the students' opinions about the difficulties experienced while using the AR application?
- 3) What are the students' views on which subjects would be more effective if AR applications were used in science courses?
- 4) What are the students' opinions about the usage areas of AR applications in different courses?

Method

Research Design

Phenomenology design, one of the qualitative research designs, was used in this study. The study was conducted in the 2024-2025 academic year. Phenomenology is a qualitative research method that enables individuals to express their understandings, feelings, perspectives, and perceptions about a concept and is used to describe how they experience this concept (Rose, Beeby, & Parker, 1995).

Study Group

The research group consisted of 26 students studying in the 7th grade of a public secondary school in a metropolitan center in the western region of Turkey. The school is a school with a medium achievement level in the city center. Convenient sampling method was used in the selection of the study group. The convenient sampling method is the method of identifying easily accessible individuals related to the problem (Büyüköztürk, Kılıç-Çakmak, Akgün, Karadeniz, & Demirel, 2010). Of the students participating in the study, 14 (53.8%) were female and 12 (46.2%) were male. The students' academic achievement in the science course's written exam was at a moderate level and the number of male and female students was close to each other.

Research Instruments and Procedures

Within the scope of the research, 'Augmented Reality Opinion ' (AROF) was prepared by the researchers as a data collection tool to obtain the students' opinions about the use of AR applications in teaching the atom subject. The form consists of five open-ended questions in the first stage, and the opinions of two science education experts and two science teachers were taken to ensure content validity. As a result of expert opinions, one question was removed from the form in line with the opinion that it was ineffective in determining student ideas about augmented reality. The final version of the form included four open-ended questions. In the form, the following questions were asked: "What are your opinions about the contribution of AR application to course success, the difficulties experienced while using AR application, the subjects in which AR application would be more effective if it is used in science courses, and the usage areas of AR application in different courses?".

At the 7th grade level, the instruction in which AR application about the structure of the atom was used lasted four lesson hours. Inquiry-based learning approach was taken as a basis for teaching. Detailed information about teaching the structure of the atom is given below.

Inquiry Step

To direct the students to question, "Are there basic parts of the atom as there are basic parts of the cell?" and "What kind of structure do atoms have?" were asked. Then, the teacher tried to make the students observe that when he held a plastic comb to small pieces of paper, it did not attract the papers. Still, after rubbing the comb on his hair, the comb attracted the small pieces of paper and tried to intuit that some charges in the atom can move from one substance to another substance because they move very fast and that the atom consists of particles.

Step of Revealing Existing Knowledge

In this step, the teacher asked some questions for the students to recall the information they learned in the 6th grade. For example, "What kind of movements do particles make?" was asked.

Forecasting

In this step, students made predictions about the concept of an atom.

Planning and Implementation Step

In this section, the students were divided into 6 groups of 4. Students were made to watch videos about the concept of atoms. Then, the students were asked to open the AR application with the help of their smartphones, zoom in, examine the three-dimensional images of atoms of different elements, and compare them with the images in the video.



Photo 1. *Application phase*



Photo 2. *Application phase*

Commenting and Presenting Results Step

After watching the videos and examining the three-dimensional images of the element cards, the students realized that protons and neutrons are in the atom's nucleus. At the same time, electrons move very fast in the layers. They realized that protons are positively charged, neutrons are uncharged, and electrons are negatively charged. By comparing their predictions and observations, the students in the groups who made wrong predictions reached the correct conclusion by discussing among themselves.

Evaluation Step

At the end of the application, AROP was distributed to the students, and their opinions about augmented reality were taken into account.

Data Analysis

This study used the descriptive analysis method to analyze the qualitative data obtained from the open-ended questions in AROP. The answers given by each student to the AROP were analyzed separately by the researchers. Separate codes were created for the students' different answers. A science educator field expert re-examined the categories formed in each question to ensure reliability, and categories independent of the other researcher were formed. Then, the analyses of the two researchers were compared. The percentage of agreement between the two researchers was calculated as 92.4%. Inter-coder reliability above 70% indicates that the analysis results can be considered reliable (Miles, & Huberman, 1994), and it can be said that the data analysis in this study is reliable. The analyses continued on the answers, but the researchers could not reach a consensus until a consensus was reached between the two researchers. In the study, the participants' real names were kept confidential, and the participants were given codes as S1, S2, ... S26 were given codes and used in direct quotations.

Ethical Procedures

The students included in this study volunteered to participate, and parental permissions were obtained. The student identities were kept confidential in the data obtained. Ethics committee approval was approved by the Balıkesir University Science and Engineering Sciences Ethics Committee in the meeting dated 16.12.2024 and numbered 2024/10.

Results

The first sub-problem of the research is "What are the students' opinions about the contribution of the use of AR application in courses to course success?". The findings related to this research problem are presented in Table 1.

Table 1. *Student views on the contributions of the AR application to course success*

Codes	Frequency
More memorable information	3
Better comprehension of the subject	5
Being more instructive by concretizing the subject	5
Learning the subject better because it is fun	4
More rational as it provides a three-dimensional image	2
Increased participation in the course	7

When the codes in Table 1 were analyzed, it was determined that the students' opinions about the contributions of AR application to the success of the course were as follows: increasing participation in the lesson ($f=7$), being more instructive by concretizing the subject ($f=5$), comprehending the subject better ($f=5$), learning the subject better because it is fun ($f=4$), more memorable information ($f=3$) and being more permanent because it provides three-dimensional images ($f=2$).

Some examples of student views are given below:

S7: Since we could see the three-dimensional version of the subject, we could analyze it better and understand the subject better.

S12: Augmented reality cards increase participation in the lesson because they make the lessons more fun.

S17: It affects our success positively. Because what is done and explained in the lesson is temporary. Augmented reality is more realistic and more permanent.

The second sub-research problem of the study is "What are the students' opinions about the difficulties experienced while using the AR application?". The findings related to the research question are presented in Table 2.

Table 2. *Student opinions about the difficulties experienced during the use of the AR application*

Codes	Frequency
No, I had no difficulty	12
The application does not open immediately	8
Some element cards are not read by the phone	1
Small phone screen	2
Internet problem	3

When the codes in Table 2 were analyzed, it was seen that twelve students stated that they had no difficulty, eight students stated that the application did not open immediately, three students stated that they had internet connection problems, two students stated that the phone screen was small, and one student stated that the application that we downloaded to their phones did not read some element cards.

Some examples of student views are given below:

S4: When the application is installed, it does not open immediately. It is necessary to enter the application and open it again.

S14: I did not. But the screen where we saw atoms was small. It would have been better to see it on the smart board.

S15: Some had internet problems. In some, it was not loaded.

The third sub-problem of the research is "What are the students' views on which subjects would be more effective if AR application is used in the science course?". The findings related to the research question are presented in Table 3.

Table 3. *Opinions on the subjects in which AR applications can be more effective if they are used in science courses*

Codes	Frequency
Basic parts of the cell	10
Space technology and celestial bodies	6
Phases of meiosis	4
Phases of mitosis	4
Mass and weight	2

When the codes in Table 3 were analyzed, it was determined that ten students stated that the AR applications could be more effective if it was used in the science course in which subjects; ten students stated that it could be applied in the subjects of basic parts of the cell, six students in the subjects of space technology and celestial bodies, four students in the subjects of stages of meiosis, four students in the subjects of stages of mitosis, and two students in the subjects of mass and weight.

Some examples of student views are given below:

S5: We could have used this application for animal and plant cells. When we read the cards on the phone, all of their keywords could have come out.

S7: We can observe meiosis and mitosis more carefully and have no difficulty understanding the subject.

S14: We can use it in the subject of space. Thus, it will be more fun and memorable. For example, augmented reality allows us to do experiments that we cannot do at school.

The fourth sub-problem of the research is "What are the students' opinions about the usage areas of AR application in different courses?". The findings related to the research question are presented in Table 4.

Table 4. Student opinions about the usage areas of AR applications in different courses

Codes	Frequency
Social Studies	11
Maths	7
Music	3
Technology-Design	4
English	1

When the codes in Table 4 are analyzed, it is seen that 11 students stated that AR application could be used in social studies, seven students in mathematics, three students in music, four students in technologydesign, and one student in English courses.

Some examples of student views are given below:

S17: I would like to do it in the social studies course. Because it allows us to feel the old structures, objects, etc. more closely and behave as if we were there.

S2: It would be very nice and fun in subjects such as geometry and shapes in maths lessons. S5: Yes, I would like to, for example, play an instrument in music.

Discussion, Conclusion and Recommendations

In this study, students were made to experience this technology with AR application on the structure of atom, and their opinions about AR application were investigated. Based on the results obtained in the research, it can be said that this technology has a positive effect on students because of the use of augmented reality in science lessons. Students stated that AR application would increase participation in the lesson by helping to comprehend the subject better, being more instructive because it concretizes the subject, and providing three-dimensional images. In addition, the students who stated that they generally had a positive opinion about the applications stated that they wanted to use these and similar applications in other courses and subjects. This situation can be explained by the positive effect of augmented reality applications on students' understanding. According to this result, it can be said that augmented reality applications are effective in understanding and concretizing concepts. When the literature is analyzed, results similar to those of this study are found. For example, Garzón and Acevedo (2019), in their research in which they compiled the studies on AR applications, stated that AR applications effectively increase students' achievement. In addition, Di Serio, Ibanez, and Kloos (2013) concluded in their study that using AR applications in lessons positively affects students' attitudes and motivation. A study by Rizov and Rizov (2015) revealed that students who used augmented reality applications as a learning tool in higher education courses increased their interest in the course and understood and internalized the learning content more easily.

When the ' opinions were analyzed, the students who stated they had no difficulty using the AR application were encountered most frequently. The fact that the application did not open immediately and the internet were the most common problems encountered in the AR application. Since AR

applications are applications of technology, the problems experienced will affect the opinions about this application. Similarly, Koumpouros (2024), in his study compiling the results of the AR application, mentions that he encountered technical problems most frequently.

In their opinions, the students stated that AR applications would be most appropriate in teaching the cell subject, a concept we cannot see with our eyes. In addition, students stated that teaching the organelles of the cell and cell divisions with AR applications teaching the organelles of the cell and cell divisions with AR application would be better. This situation can be explained by the fact that the use of AR applications in learning micro-level concepts such as atom and cell and macro-level concepts such as universe and space, which students cannot see with their eyes, provides a chance to observe the concept concretely and affects better understanding. Coşkun and Özkaya (2023), Özeren and Top (2023), Tang, Lin, and Ou (2021) stated in their studies that using AR application in teaching the cell subject was effective in helping students learn the subject better. Students also think it would be appropriate to use AR applications for space technologies and celestial bodies, which, unlike the concept of the atom, is not a very suitable subject for experimentation in science lessons and is taught through various activities. Chen, Chen, and Wang (2022) concluded that astronomy teaching using AR applications had a positive effect on students' academic achievement and motivation. Fleck and Simon (2013) stated that using AR applications in astronomy teaching was effective in onusing AR applications in astronomy teaching andin students' motivation. Supporting this result, Beltozar-Clemente, Sierra-Liñan, Zapata-Paulini, and Cabanillas-Carbonell (2022) found that the AR application significantly affected the astronomy learning of 4th and 6th-grade students in their study.

Another study result is that the students think in social studies and mathematics courses. Students also stated that AR applications could be used in courses such as music and English. Students assume that using these applications to teach abstract concepts in these courses will positively affect their learning.

This study's biggest problem was bringing students' smartphones to the classroom environment. Smartphones were used only for AR applications in the science lesson and were controlled by the teacher during the lesson to prevent them from being used for different purposes. In this study, while obtaining the consent form from the parents, the students were asked to bring their smartphones to the classroom. However, not every student may have a smartphone, and smartphones are prohibited in some schools. Technology-supported devices must be present in the classroom to use the AR application. Therefore, it is important to establish technologies to support such applications in the classroom environment.

Based on the results of this study, the following suggestions were made by the researchers who will research this subject:

In future research, firstly, studies can be conducted to investigate the effects of using augmented reality applications in teaching micro and macro-level science subjects. At the same time, long-term experimental studies can be conducted to investigate the effects of augmented reality applications on students' cognitive and affective factors. Just as in the science course, it can be suggested that AR applications be used in subjects of other courses that contain abstract concepts and are difficult for students to understand.

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Examining the Relationship between Students' Attitudes toward Physical Education and their Belonging to School*

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Abstract

This research aims to explore how the attitudes of secondary and high school students toward physical education correlate with their sense of belonging to both their school and their local community. This research sample comprised 1,102 students, with 490 being female and 612 being male. It was determined that the data obtained showed a normal distribution. Thus, it was decided to conduct simple linear regression, ANOVA and Tukey analyses. A moderate correlation was detected between the attitude toward physical education and the sense of belonging to the school ($p < 0.05$, $r = 0.425$). In the simple linear regression analysis, it was concluded that the attitude toward physical education explained the sense of belonging to the school by 18% ($p < 0.05$, $R = 18.1$). A statistically significant difference was found between the attitude toward physical education and sports lessons and the place of residence ($p < 0.05$). In conclusion, physical education and sports course explained school belonging by 18% and that physical education and sports course attitudes differed according to the regions of residence in favor of the Georgia/Batumi ($x:3.98$) region ($p < 0.05$).

Keywords: Attitude, belonging, physical education and sports lesson, sport management.

* The paper was produced from the PhD thesis completed at Marmara University Institute of Sport Science prepared by the first author under the supervision of the second author.

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Öğrencilerin Beden Eğitime Yönelik Tutumları ile Okula Aidiyetleri Arasındaki İlişkinin İncelenmesi*

Makale Türü	Başvuru Tarihi	Kabul Tarihi
Araştırma	11.02.2024	18.03.2025

Emre Caner Yapıcı**

Veysel Küçük***

Öz

Araştırmanın amacı, ortaokul ve lise öğrencilerinin beden eğitimi ve spor derslerine yönelik tutumları, okula aidiyet duyguları ve yaşadıkları bölge arasındaki ilişkinin incelenmesidir. Araştırmanın örneklem grubunu, 490'ı kız, 612'si erkek öğrenci olmak üzere toplam 1102 öğrenci oluşturmuştur. Elde edilen verilerin normal dağılım gösterdiği belirlenmiştir. Buna göre basit doğrusal regresyon, ANOVA ve Tukey analizlerinin yapılmasına karar verilmiştir. Ulaşılan bulgular neticesinde; beden eğitimi ve spor derslerine yönelik tutum ile okula aidiyet duygusu ilişkisinin orta seviyede olduğu belirlenmiştir ($p<0,05$, $r=0,425$). Yapılan basit doğrusal regresyon analizinde beden eğitimi ve spor derslerine yönelik tutumun okula aidiyet duygusunu %18 oranında açıkladığı sonucuna ulaşılmıştır ($p<0,05$, $R=18,1$). Beden eğitimi ve spor dersine yönelik tutum ile yaşanan yer ilişkisi istatistiksel olarak anlamlı bulunmuştur ($p<0,05$). Sonuç olarak, beden eğitimi ve spor dersinin okula aidiyeti %18 oranında açıkladığı, beden eğitimi ve spor dersi tutumlarının yaşanan bölgelere göre Gürcistan/Batum ($x:3.98$) bölgesi lehine farklılaştığı belirlenmiştir ($p<0.05$).

Anahtar Sözcükler: Tutum, ait olma, beden eğitimi ve spor dersi, spor yönetimi.

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Introduction

This research aims to describe the relationship between the attitudes of secondary school and high school students from our Turkish schools abroad, Georgia/Batumi and Artvin province in Türkiye, toward physical education and sports lessons and their sense of belonging to the school, on the cultural axis, and to reveal how geographical-cultural characteristics affect attitude and school belonging. It is considered critical to remove the purpose of this research, which is an examination of the relationship between secondary and high school students' attitudes toward physical education and sports lessons, their sense of belonging to the school and the region they live in.

It is value for the development and civilization of societies that the human race formed, keeping up with the new world order and for all kinds of health conditions. Joining in physical education and sport activities is crucial. Because these two specific fields have many positive psychological, social, and mental effects on individuals. The most important value that physical education and sport, which are seen as a divisible and important section of education, add to individuals is the development of positive attitudes toward sports thus bringing sports to an important part of their lives (Balyan, Balyan & Kiremitçi, 2012).

Attitude is a significant concept that determines the direction of individual's behaviors. Attitude is a notation that forms a person's feelings, thoughts, and behaviors about the psychological object in a regular way (Kağıtçıbaşı, 2005). Beliefs arise from our perspectives on people and things. They intricately shape our behaviors in numerous ways, influencing the activities we engage in, the goals we set, and the decisions we choose to abandon (Linda-Rikard & Banville, 2006).

Educational activities are predominantly conducted in schools. At the same time, the aim to be achieved by educational activity is to provide pupils to acquire terminal behaviors in their lives and to build attitudes in pupils toward the continuity of these behaviors (Alpaslan, 2008).

At this point, physical education and sports lesson stands out as a lesson that aims to make sports a habit in pupil's lives. Physical and sports lessons, with both specific and general achievements within general education activities, help each pupil reach the highest level of movement capacity by realizing the education of pupils through physical activities (Çöndü, 2004).

The main aim of the physical education and sport program in schools is to foster pupils' proficiency in physical activities, promote a healthy lifestyle, impart essential concepts and tactics, develop self-regulation abilities, enhance social interaction, and hone critical thinking skills, all of which are fundamental for their lifelong utilization and readiness for higher education (MEB, 2018).

Physical education is a significant educational process aiming to enhance human performance and promote the development of individuals through physical activities. It is considered crucial material for a thorough and balanced program. Simultaneously, it can be a factor that contributes significantly to an individual's development in all special of life, including physical, emotional, cognitive, and psychosocial dimensions (Chakraborty, Nandy & Adhikari, 2012).

Physical education and sports lessons are expected with interest and enthusiasm. Game and activity lessons as a tool also affect pupils' sense of belonging toward school. In the literature, there are various studies examining both attitudes toward physical education and sports courses and the relationship between physical education and sports courses and a second dependent variable, such as school belonging, academic achievement, and nutritional habits (Alpkaya & Çoknaz, 2018; Dereceli, 2020; Duman, Karagün & Selvi, 2020; Göksel & Çağdaş, 2016; Günbay & İhsan, 2020; Özsarı & Çelik, 2021; Sertkahya & Üren, 2021; Subramaniam & Silverman, 2007; Tannehill & Zakrajsek, 1993; Türkmen & Varol, 2017; Yetiş, Aytaç & Çalğan, 2022; Yıldızhan & Çağlayan, 2019).

In the studies, unlike the studies mentioned above, the relationship between physical education and sports lessons and the sense of belonging to school is evaluated in terms of different sample groups. While pupil's sense of belonging to the school is considered important for education and teaching efficiency and continuity, it is necessary to perform studies and practices that will ensure belonging to the school. To contribute, this study is expected to present the ability of physical education and sports lessons to affect and improve the sense of belonging to the school. Although sense of belonging to the

school can be linked to positive emotions, such as happiness and satisfaction, an emotion of exclusion is often associated with negative emotions, such as jealousy, loneliness, and anxiety (Osterman, 2000).

The sense of belonging to the school is regarded as a risk factor for pupils' success or failure in educational programs within school settings. The sense of belonging to the school is deemed highly essential for the educational process and school outcomes (Ma, 2003). Sense of belonging develops through the supportive relationships between teachers and administrators and pupils, and this interaction and communication nurtures pupils' happiness at school, confidence in their performance at school, and their psychological wellness (Booker, 2006). Goodenow and Grady (1993) define the sense of belonging to the school as the experience of pupils feeling personally accepted, respected, included, and supported in the social environment of the school. School is a dynamic living space encompassing various social, physical, and emotional situations, which can directly or indirectly influence the sense of belonging to the school.

Additionally, in many other studies, a direct correlation has been revealed between the sense of belonging to the school and aspects, such as school attendance, readiness for school, fulfilling assigned tasks and homework, and active participation in social and exercise activities (Finn, 1989; Goodenow & Grady, 1993; Voelkl, 1995).

Physical education and sport teaching are one of the most valuable fields where pupils' happiness at school and commitment can be provided by building supportive relationships with pupils. With this study, obtaining and presenting outputs on how physical education and sports lessons affect pupils' belonging of the school can address the gap in the literature, that has under-researched.

Method

This section encompasses research design, sample selection, tools for data collection, methodology for data collection, and data analysis.

Research Design

The paper is descriptive research conducted using the survey model to reveal the existing situation. In descriptive research, the current situation is determined, discussed together with the literature, and a generalization is reached (Karasar, 2007). In this context, this paper purposes to examine how pupils' attitudes toward exercise and activity lessons affect their emotion of loyalty to the school. For this aim, answers to the following problem statements will be sought.

- 1) Is there a relationship between pupils' attitudes toward exercise and sports lesson and their belonging to the school?
- 2) Is there a difference between the place where pupils live and their attitudes toward physical education and sport lesson.

Research Sample

In determining the sample numbers, the table of minimum acceptable sample sizes for different populations was taken as a basis. According to this, the sample size required in the population range of 15000-20000 at a 95% confidence interval is 376 (Gürbüz & Şahin, 2018). In this research, 1102 pupils, 490 boys and 612 girls, were selected by random sampling method, from the Turkish school in Georgia/Batumi, one of the Turkish schools abroad, and secondary and high schools in the center and districts of Artvin in the 2022-2023 academic year, constituted the sample of this study. All in all, 763 of the pupils were secondary school pupils and 339 of them were high school pupils. The sample group was selected from the provinces of Georgia/Batumi and Artvin, which are considered to be geographically close but culturally distinct from each other. According to this, 187 pupils from Georgia/Batumi, 391 pupils from Artvin/Kemalpaşa, 263 pupils from Artvin/Hopa, and 261 pupils from Artvin/Provinces of Artvin took part in this study.

Data Collection Tools

Two scales were used to obtain the information. These scales were selected as the most appropriate and current scientific criteria by examining the literature. Quantitative research ways were used to

collect data, and scales were preferred for measurement. The researcher collected data from the specified sample groups, expressing the application principles of the scale. In cases where the researcher was absent, the teachers and school administrators who applied the scales were provided with a brief explanation of the application principles. Thus, efforts were made to ensure that the reliability and validity of the scale were as high as possible. Since this study was conducted on Turkish students living abroad, a test-retest reliability analysis was performed to assess the reliability of the scales within this sample group. The two administrations of the test were conducted with an interval of six weeks. According to Cohen (2007), test-retest reliability is a method used to evaluate the consistency of a measurement over time (Table 1).

Table 1. *Results of test-retest reliability analyses for the loyalty scale*

N:188	First Application	Second Application
1) Sense of Belonging to the school first application	---	
2) Sense of Belonging to the school second application	,725**	---
Average	3,38	3,36
Standard Deviation (SD)	,63	,65

**significant at $p < 0.05$ level

To ensure reliability in the study, test-retest reliability analysis was applied to the data. The correlation between the first and second applications was detected as .725 and this value indicated that the data were a complete and consistent measurement tool (Table 1).

To determine the reliability of the collected data, a test-retest reliability analysis was conducted as a second analysis. The test is applied to the same group twice with a certain interval. The relationship/correlation between the first and second application scores is calculated. The correlation coefficient is a value between -1.00 and +1.00. The coefficient should approach +1.00 for reliability.

Table 2. *Test-retest reliability analysis of attitude scale*

N:188	First Application	Second Application
1) Attitude toward Phys Ed. And Sports Lessons First Application	---	
2) Attitude Toward Phys Ed. And Sports Lessons Second Application	,715**	---
Average	3,79	3,82
Standard Deviation (SD)	,73	,72

**significant at $p < 0.05$ level

Physical Education and Sports Attitude Scale

The scale selected for use in this study was developed by Güllü and Güçlü (2009) and consists of 35 items, including 24 positive items and 11 negative items (3, 17, 19, 20, 24, 25, 26, 29, 30, 34, 35). The scale is graded on a 5-point Likert scale as definitely no, yes, Undecided, yes, and definitely yes. The lowest score can be gotten from the scale is 36, and the highest score is 175. A Cronbach's alpha reliability analysis was carried out to measure the internal consistency of the scale and the result was 0.94. Also, the test-retest method was carried out as a second reliability analysis, and the Pearson moment correlation coefficient was 0.80 (Schober, Boer & Schwarte, 2018).

The Sense of Belonging to the School Scale

Another scale used in collecting the data was the sense of belonging to the school developed by Goodenow, 1993 and adapted into Turkish by Sari, 2011. The scale has two dimensions: belonging to School and Rejection. The rejection dimension consists of 18 items, 3,6,9,12,16 of which are negative, and 13 of which are positive items. The validity and reliability of the scale for primary school pupils was conducted by Sari, 2011. Again, Sari, 2013 conducted a study on high school pupils for secondary

school pupils, and the scale was 2-dimensional. The 5-point Likert scale is graded as definitely no, no, undecided, yes, and definitely yes. The Cronbach's alpha reliability coefficient of the scale was 0.84. High scores gotten from the scale indicate that the emotion of loyalty to the school is strong (Table 3).

Table 3. *Statistical analysis of cronbach's alpha reliability of the scales*

Scales	Number of Items	Cronbach Alfa
Attitude Scale	35	0,93
Belonging	18	0,86

Procedure

Firstly, permissions for the use of the scale were obtained from the academicians who developed the physical education and sports attitude scale and the sense of belonging to school scales. Then, the Marmara University Health Sciences Institute Ethics Committee in Türkiye gave ethical approval to this study (15.03.2023-22). Then, the research's objective was elucidated to the parents of appropriately selected pupils and informed consent was obtained from the families who voluntarily yes to participate in this research, so that the pupils could participate in this study. Finally, the scale form created for the pupils was applied by the researchers in their schools. The data was collected between April 15 and June 10, 2023, and the process took approximately 15-20 minutes for each pupil. As a consequence, the paper findings were limited to the participation of secondary school and high school pupils who continued education in Artvin /Türkiye and Batum/Georgia between 15 April - 10 June 2023.

Data Analysis

Jamovi version 2.3 statistical program was used to analyze the data acquired from this research. To decide which hypothesis test to analyze the data with, Kolmogrow Simirnova, skewness and kurtosis values, graphs, and curves were utilized to determine the direction of data distributions, and it was concluded that the data showed a normal distribution. In this context, to describe demographic information, a descriptive analysis technique was applied to data. It was decided to conduct a Pearson correlation analysis to examine the relationship between normally distributed continuous variables and simple linear regression to determine the variances explained by the relationship between continuous variables. In this context, it was checked whether the variations were provided.

The assumptions, including the normal distribution and continuous variability of the data, linearity, absence of multilinearity, a Durbin-Watson coefficient between -3.29 and 3.29, and the presence of correlations between variables, were observed to be met. Therefore, it was determined that simple linear regression could be performed.

The Durbin-Watson statistic is interpreted as whether there is a correlation between the error terms. An error term value of 1.706 between 1-3 means that regression analysis can be performed (Field, 2009). Furthermore, the variables were analyzed in terms of assumptions, such as continuous variables, normal distribution, absence of multilinearity (excessive similarity), linear relationship, outliers (cooks distance) being within scientific limits. It was concluded that there are variables suitable for regression analysis.

It was decided to apply the ANOVA hypothesis test in this analysis, in which more than two groups were examined to determine the attitude toward physical education and sports lessons according to the region of residence and to determine the direction of this difference with Tukey test if there is a difference between the groups.

Results

Some descriptive information about this study is presented in Table 4.

Table 4. Descriptive information about the participants

Gender		N	%
	Male	612	55,5
	Female	490	44,5
	Total	1102	100
School Type		N	%
	Secondary School	763	69,2
	High School	339	30,8
	Total	1102	100
Where You Live		N	%
	Georgia/Batumi	187	17,0
	Artvin/Kemalpaşa	391	35,5
	Artvin/Hopa	263	23,9
	Artvin/Other provinces	261	23,7

When we examine the descriptive statistics of the participants, 44.5% (490) of the join were male and 55.5% (612) were female, making 1102 participants in all. The school types of the pupils included in this study consisted of 69.2% (763) secondary school pupils and 30.8% (339) high school pupils. The findings showed that 17% (187) of the participants lived in Georgia/Batumi, 35.5% (391) in Artvin/Kemalpaşa, 23.9% (263) in Artvin/Hopa and 23.7% (261) in other provinces of Artvin.

Skewness- kurtosis values and graphs were used to determine the distribution of the data. Skewness and kurtosis values of the data are given in Table.5.

Table 5. Statistical analysis of distribution data of scales

Scales and Subdimensions	N	Average(x)	Sd	Median	Skewness	Kurtosis
Attitude Scale	1102	3,88	,63	3,97	-,577	-,178
Belonging Scale	1102	3,57	,65	3,61	-,343	,049
Belonging of the School Subdimension	1102	3,59	,67	3,69	-,385	,285
Rejection Subdimension	1102	2,45	,84	2,40	,415	-,324

Based on the obtained data, the average score of students' responses to the scales was 3.88, the average score for the sense of belonging scale was 3.57, the average score for the school belonging subdimension was 3.59, and the average score for the rejection subdimension was 2.45. Analyzing the obtained data, it was determined that the skewness and kurtosis values were within the normal distribution range. In this study, a correlation analysis was conducted to determine the relationship between the two variables, and the obtained data are presented in Table 6.

Table 6. Correlation analysis between attitudes toward physical education and sport and the sense of belonging to the school

N:1102	1	2
1)Attitude Toward Phys Ed. and Sports Lessons	---	
2)Sense of Belonging to the School	,425**	---
Average	3,88	3,57
Standard Deviation	,63	,65

**significant at $p < 0.05$ level

Based on the obtained data, a significant and positive relationship was found between attitudes toward physical education and sports courses and the sense of school belonging ($p < 0.05$; $r = 0.425$). These values are used to evaluate the correlation coefficient: $0 < r < 0.3$ is weak, $0.3 < r < 0.7$ is moderate, and $0.7 < r < 1$ is strong (Norusi, 2008).

Table 7 presents the results of a linear regression analysis examining the relationship between attitudes toward physical education lessons and a sense of belonging to the school. The model

demonstrates a correlation coefficient (R) of 0.425, with an R² value of 0.181, indicating that the model accounts for 18% of the total variance in the dependent variable. The adjusted R² value of 0.180 further suggests the model's generalizability. The estimated standard error is 0.59, and the Durbin-Watson statistic is 1.706, suggesting no significant autocorrelation.

Table 7. Analysis of Attitude and loyalty Scales Linear Regression Analysis

	R	R ²	Adjusted R ²	Estimated Standard Error	Durbin-Watson	p
Model						
	,425	,181	,180	,59	1.706	0,00

Adjusted R² indicates the generalizability of the model. In other words, the model explained 18% of the total variance.

Model	Total Squares	df.	Mean squares	F	p
Regression	85.269	1	85.269	242,606	0,00
Residual	386.616	1100	,351		
Total	471.885	1101			

Model	B	Std. Error	β
Constant	1,875	,111	
Phys Ed. Lessons ATT	,439	,028	,425

Model: Sense of Belonging to the School=1,875+(Phys Ed. Lessons Attitude*0,43)

The ANOVA results showed that the regression model was statistically significant ($F = 242.606$, $p < 0.001$), confirming that the independent variable significantly predicted the dependent variable. The regression coefficients revealed that the constant value was 1.875 ($p < 0.05$), while the attitude toward physical education lessons had a standardized regression coefficient (β) of 0.425 and an unstandardized coefficient (B) of 0.439, with a standard error of 0.028.

The regression equation derived from these findings is expressed as: Sense of Belonging to the School = 1.875 + (Phys Ed. Lessons Attitude $\times$ 0.439) This equation suggests that for each unit increase in attitude toward physical education lessons, the sense of belonging to the school increases by 0.439 units. The descriptive statistics of the responses to the scale items applied in this research are given in Table 9 and the items considered important are presented.

The answers given to the items of the attitude scale toward physical education and sports lessons used in the research are presented in the Table. The answers given to the items of the attitude scale toward physical education and sports lessons used in the research are presented in the Table. For instance, the average of the responses to the item "I look forward to Phys. Ed. Lessons" was 4.06, The average of the average of the responses to the item "I enjoy participating in Phys. Ed. Lessons" was 4.19, the average of the responses to the item "Weekly Phys. Ed. lessons should have a higher number of hours" was 4.05, the average of the responses to the item "Phys. Ed. Lessons should be removed from the school programs" was 1.53. The average of the responses to the item "Phys. Ed. lesson activities encourage pupils to break school rules." was 1.65. In Table 11, physical education and sports lessons attitudes of the participants according to the region they live in were analyzed and the differentiation between them is presented.

Table 8. Descriptive statistics of attitude toward exercise and activity lessons scale items

Items of Scale	Definitely no		No		Undecided		yes		Definitely yes		X
	N	%	N	%	N	%	N	%	N	%	
1)I look forward to Phys. Ed. Lessons.	62	5,6	67	6,1	133	12,1	310	28,2	524	47,6	4,06
3) I find Phys. Ed. Lesson an unnecessary subject.	649	58,9	274	24,9	88	8,0	34	3,1	50	4,5	1,69
7) Thanks to Phys. Ed. Lessons, I realize how sports are beneficial for health.	28	2,5	28	6,9	151	13,7	434	39,4	405	36,8	4,02
15) I enjoy participating in Phys. Ed. lessons	44	4,0	58	5,3	110	10,0	316	28,7	569	51,7	4,19
18) Weekly Phys. Ed. lessons should have a higher number of hours.	65	5,9	94	8,5	149	13,5	204	18,5	582	52,9	4,05
21) I think that Phys. Ed. Activities contribute to physical development.		3,2	64	5,8	134	12,2	453	41,1	410	37,2	4,04
23)Thanks to Phys. Ed. Lessons, I get to know other sports branches better.	43	3,9	64	5,8	153	13,9	420	38,1	415	37,7	4,00
25)Phys. Ed. Lessons should be removed from the school programs.	773	70,2	178	16,2	71	6,4	33	3,0	41	3,7	1,53
35)Phys. Ed lesson activities encourage pupils to break school rules.	660	59,9	259	23,5	76	6,9	36	3,3	44	4,0	1,65

When Table 9 was examined, it is determined that pupils' attitudes toward physical education and sports lessons had a significant difference according to the region they lived in ($F=2,901$; $P<0,05$). Tukey test was conducted to determine in which regions pupils' attitude toward physical education and sport differed and according to results of this tests, the attitudes of the pupils living in Batumi toward physical education and sports lessons ($x=3,98$); Artvin/Kemalpaşa ($x=3-82$), Artvin/Hopa ($x=3,89$) and Artvin/Other provinces ($X=3,90$) were higher.

Table 9. Physical education and sports attitude scale Anova and Tukey test results

Where You Live	N	X	ss	Source of the KT Variance	df.	KO	F	p	Diff.
Georgia/Batumi	187	3,98	,646	Between G.	3	1,163			
Artvin/Kemalpaşa	390	3,82	,605	Inside G.	439,693	,401	2,901	,03	1-2
Artvin/Hopa	263	3,89	,655	Total	443,181				
Artvin/Other provinces	261	3,90	,640						
Total	1102	3,88	,634						

Discussion, Conclusion and Recommendations

In the paper conducted by Yıldızhan and Çağlayan, 2019 on middle school pupils, pupils' social intelligence level and their attitudes toward physical education and sports lessons were examined and a high positive relationship was found between social intelligence levels and attitudes physical education and sports lessons. In the carried out study, the relationship between middle and high school pupils' attitudes toward physical education and sports lessons and their sense of belonging to the school was examined through 1101 pupils, and a moderate relationship was found in the study in which the relationship between the two variables was examined ($r=0.425$).

In the study conducted by Özşarı and Öztürk Çelik, 2021 on middle school pupils, the relationship between attitude toward physical education and sports lessons and social skills was examined. A weak positive relationship was determined between attitudes toward physical education and sports lessons and social skills ($r=0,2$). In this study, the level of the relationship between two different variables revealed a contrary result. Also, in the study conducted by Gökhan et al., 2022 examining the relationship between middle school pupils' attitudes toward physical education and sports lessons and their attitudes toward school, there was no significant relationship between middle school pupils' attitudes toward physical education and sports lessons and their attitudes toward school ($p=.920$ $r=,005$). As a result, this study revealed a contrary result. In the study titled Investigation of the Attitudes of Obese Peers Toward physical education and sports lessons carried out by Alpkaya and Çoknaz, 2018 on high school pupils, there was no significant relationship between the attitude toward physical education and sports lessons and the attitude toward obese peers ($p>0.05$). revealed a finding contrary to the study conducted in this study.

In the literature, to our knowledge, no study directly examines the relationship between physical education and sports attitude and the sense of belonging to the school. The studies examining the relationship between physical education and sports attitude and a second variable in the literature are presented in the discussion. In the conducted study, the relationship between physical education and sport lesson attitude of middle and high school pupils and their belonging to the school was examined and a moderate positive correlation was found between them ($r=0.425$). Moreover, collected data were analyzed by simple linear regression technique and a statistically significant result was found ($p<0.05$). In addition, it was determined that attitude toward physical education and sports lessons had a variance of 18% in the formation of a sense of belonging to the school ($R^2=18.1$).

The results of this study suggest that students' attitudes toward physical education and sport lessons are moderately associated with their sense of belonging to school. This finding suggests that students who have a positive perception of physical education and sports may feel more integrated into the school environment. Several potential explanations can be proposed for this relationship. First, participation in physical education and sports activities may enhance students' social interactions, fostering a sense of community and connectedness within the school. Physical education lessons often involve teamwork, collaboration, and peer engagement, which may contribute to students developing stronger social bonds and, consequently, a greater sense of belonging. Second, physical activity has been linked to psychological well-being, self-esteem, and motivation, which could indirectly influence students' attachment to their school. Students who enjoy physical education and sports may perceive the school environment more positively, leading to increased emotional and social attachment. However, the divergence between the findings of this study and previous literature suggests that the relationship between attitudes toward physical education and a sense of belonging may be influenced by contextual factors, such as school culture, educational policies, socioeconomic background, or students' personal experiences. The inconsistencies in previous studies also highlight the possibility that different psychological or social constructs may moderate or mediate this relationship.

From a research perspective, further studies should investigate the role of mediating variables, such as peer relationships, school climate, and extracurricular participation in sports. Additionally, longitudinal studies could provide deeper insights into the causal relationship between attitudes toward physical education and a sense of belonging.

In conclusion, while this study contributes to the literature by demonstrating a significant association between attitudes toward physical education and school belonging, further research is

necessary to explore the underlying mechanisms and external factors that may shape this relationship. A significant difference was determined between the region of residence and pupils' attitudes toward physical education and sports lessons ($p < 0,05$). Attitudes toward physical education and sports lessons were ranked as Batum 3.98, Kemalpaşa 3.82, Hopa 3.89, and Provinces 3.90.

Previous studies have highlighted the impact of cultural, environmental, and socioeconomic factors on students' participation in and attitudes toward physical education. According to Bailey (2006), cultural context plays a crucial role in shaping students' engagement in sports and physical activities, as societal norms and values influence the perceived importance of physical education. Similarly, Kirk (2010) emphasizes that regional disparities in access to sports facilities, teacher quality, and extracurricular opportunities contribute to variations in students' attitudes toward physical education. In a study conducted by Karaca, Aydın, and Çalışkan (2016), students from urban areas demonstrated more positive attitudes toward physical education than their rural counterparts, mainly due to differences in school infrastructure and sports opportunities. This aligns with the present study's findings, which show a variation in attitudes across different regions, potentially due to differences in access to sports facilities, community support for sports, and cultural perspectives on physical activity. The differences in attitudes observed in this study could be attributed to multiple cultural and structural factors:

School and Community Resources: Schools in different regions may have varying levels of investment in sports education, leading to differences in student attitudes. Access to sports equipment, quality of instruction, and extracurricular opportunities could shape students' engagement with physical education.

Cultural Perceptions of Physical Activity: In some regions, physical activity and sports may be highly valued and integrated into daily life, whereas in others, academic achievement may be prioritized over physical education, leading to differing student attitudes.

Socioeconomic Factors: Economic disparities between regions could impact students' exposure to and participation in sports activities, thereby influencing their attitudes toward physical education.

Social Integration and Peer Influence: Students in areas where sports and physical activities are strongly supported by their peers and the local community may develop more positive attitudes toward physical education.

In addition, the mean of the answers given by the participants to the scale items for physical education and sports lessons was 3.88 and the average of the sense of belonging to the school was 3.57. The result obtained revealed that the pupils had high physical education and sport course attitudes and belonging to school. In a paper carried out by Tannehill and Zakrajsek (1993), in which the attitudes of middle school and college pupils toward physical education and sports lessons were examined, 211 of 366 participants reported that physical education and sports lessons were important. In the study conducted by Mohammed et al. on college pupils in 2011, it was revealed that the participants had a positive attitude toward physical education and sport classes and that they knew the benefits of participating in physical education and sport lessons, but they did not participate sufficiently. In the work performed by Birtwistle and Brodie in 1991 on 291 middle school and 316 primary school pupils, it was determined that female pupils had a more positive attitude toward physical education and sports lessons than male pupils and that socioeconomic conditions did not affect the attitude.

In the physical education and sports attitude study carried out by Subramaniam and Silverman on 995 middle school pupils in 2007, it was determined that the pupils' attitudes toward physical education and sports lessons were positive. In studies carried out in the literature, it has been determined that the attitude toward physical education and sports lessons is positive, with a score above the average, which supports this study. The high level of positive attitudes toward physical education and sports suggests that students perceive these lessons as important in terms of physical activity and in terms of social interaction, enjoyment, and motivation. Similarly, studies in the literature indicate that students generally exhibit positive attitudes toward physical education classes and that these lessons provide physical, psychological, and social benefits (Subramaniam & Silverman, 2007; Tannehill & Zakrajsek, 1993).

In conclusion, the high mean scores obtained in this study suggest that students have developed a positive attitude toward physical education and sports lessons and feel a strong sense of belonging to their school. These findings align with the literature, emphasizing the positive impact of physical education and the school environment on students. When the studies on the sense of belonging to the school in the literature were examined, some similar results were reached, specific to the subject and sample studied. In his study on secondary school pupils, Carson (2004) found the average score of pupils' sense of belonging to the school to be 3.22. This result shows that pupils have a good sense of belonging to the school. In the study, the mean score of sense of belonging to the school was 3.57. This result is supported by the literature.

The findings suggest that students generally have a positive attitude toward physical education lessons, as reflected in the high mean scores for items, such as "I enjoy participating in Phys. Ed. Lessons" (4.19) and "I look forward to Phys. Ed. Lessons" (4.06). The item "Weekly Phys. Ed. lessons should have a higher number of hours" (4.05) suggests that students desire more time dedicated to these lessons, reinforcing the importance they place on physical activity within the school curriculum.

Conversely, the low mean scores for items, such as "Phys. Ed. Lessons should be removed from the school programs" (1.53) and "Phys. Ed. lesson activities encourage pupils to break school rules" (1.65) indicated that students do not perceive physical education as an unnecessary subject or as a disruptive element in school discipline. These results are consistent with previous studies, such as those by Tannehill and Zakrajsek (1993) and Subramaniam and Silverman (2007), which have also demonstrated that students recognize the benefits of physical education and generally hold positive attitudes toward it. Providing the highest and lowest mean scores of the responses to the attitude scale items in this study highlights key trends in students' attitudes toward physical education lessons. This allows for a clearer understanding of which aspects of physical education are most valued and which are met with resistance or negative perceptions.

Overall, the present findings may steer the following recommendations. Regional and cultural differences should be considered in the conduct of physical education and sports lessons. Depending on the regional factors, the necessary facilities, tools, and equipment should be planned according to physical education needs and sports lessons. The Ministry of National Education, the Ministry of Sports, and sports federations should cooperate intensively with schools and physical education teachers to maintain a positive attitude toward physical education and sports lessons. Primary school pupils, who are in the concrete operations stage between the ages of 7 and 11, should be introduced to physical education and sports lessons and teachers at that stage. The physical education and sports curriculum should be fully considered.

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The School Adjustment Process of Preschool Children Displaced by Earthquake: A Phenomenological Study

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Abstract

This study explores the school adjustment experiences of children displaced by an earthquake, focusing on their perceptions of peer relationships, teacher interactions, and the broader educational environment. The study was conducted using a phenomenological research design. A study group of 10 children aged between 60 and 72 months was formed on February 6, 2023, after the earthquakes with magnitudes of 7.7 and 7.6 centered in Kahramanmaraş. Participants were selected using criterion sampling, a type of purposeful sampling that ensures the inclusion of individuals meeting the predetermined criteria. Data were collected using qualitative techniques, including structured observations, semi-structured interviews, and analysis of children's drawings. The findings indicated that earthquake-related trauma had a significant negative impact on school adjustment. Factors such as peer interactions, the structure and content of the school curriculum, and its implementation played a crucial role in adjustment. Furthermore, teacher attitudes and behaviors influence children's peer relationships, emotional well-being, and classroom experiences. The results, analyzed from psychological and developmental perspectives, provide recommendations for future research and interventions supporting disaster-affected children in educational settings.

Keywords: School adjustment, earthquake, pre-school education, phenomenological approach.

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Deprem Nedeniyle Göç Eden Okul Öncesi Çocukların Okul Uyum Süreci: Fenomenolojik Bir Çalışma

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Öz

Bu çalışma, deprem sonrası göç etmek zorunda kalan çocukların akran ilişkileri, öğretmen etkileşimleri ve genel eğitim ortamına ilişkin algılarını inceleyerek okula uyum deneyimlerini derinlemesine analiz etmektedir. Çalışma, fenomenolojik bir araştırma deseni kullanılarak gerçekleştirilmiştir. 6 Şubat 2023 tarihinde Kahramanmaraş merkezli meydana gelen 7.7 ve 7.6 büyüklüğündeki depremler sonrasında farklı bir şehre göç eden ve yaşları 60 ila 72 ay arasında değişen 10 çocuktan oluşan bir çalışma grubu oluşturulmuştur. Katılımcılar, belirlenen ölçütleri karşılayan bireylerin seçilmesini sağlayan amaçlı örnekleme yöntemi olan ölçüt örnekleme ile belirlenmiştir. Veriler, yapılandırılmış gözlemler, yarı yapılandırılmış görüşmeler ve çocuk çizimlerinin analizi gibi nitel teknikler kullanılarak toplanmıştır. Bulgular, depremden kaynaklanan travmanın okul uyum süreçleri üzerinde önemli ölçüde olumsuz bir etkisi olduğunu göstermiştir. Akran etkileşimleri, okul müfredatının yapısı ve içeriği ile uygulanışı uyum sürecinde kritik bir rol oynamıştır. Ayrıca, öğretmen tutum ve davranışlarının çocukların akran ilişkileri, duygusal iyi oluşları ve sınıf içi deneyimleri üzerinde etkili olduğu bulunmuştur. Psikolojik ve gelişimsel açılarından analiz edilen sonuçlar, afetlerden etkilenen çocukları desteklemeye yönelik müdahaleler ve gelecekteki araştırmalar için öneriler sunmaktadır.

Anahtar Sözcükler: Okula uyum, deprem, okul öncesi eğitim, fenomenolojik yaklaşım.

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Introduction

Earthquakes are natural disasters that significantly impact not only physical structures but also individuals' psychological and social well-being, profoundly affecting societal structures. Due to their developmental vulnerability, children are particularly susceptible to the adverse effects of natural disasters. Research indicates that children exposed to natural disasters at an early age may experience anxiety, depression, post-traumatic stress disorder, behavioral issues, and cognitive impairments, as well as difficulties in social adaptation (Hansel et al., 2013; Yavuz & Dikmen, 2015). The traumatic effects of disasters on children can further hinder their ability to adapt to new social environments (Maclean et al., 2016).

Research indicates that one of the most significant effects of natural disasters on children is the adjustment problems caused by the changes in their social environment due to migration (Leblebici, 2004; Ekici & Tuncel, 2015; Kaştan, 2015). Beyond physical adaptation to a new setting, children must also navigate social and cultural adjustments. This transition may result in loneliness, social exclusion, and difficulties in establishing peer relationships (Kaştan, 2015). Hansel et al. (2013) found that children who migrated following Hurricane Katrina exhibited persistent post-traumatic stress symptoms, particularly those who did not return to the disaster-affected region. These findings underscore the long-term psychosocial impact of post-disaster migration on children's school adjustment processes.

Schools are not only educational institutions but also environments where children engage in social interactions, develop a sense of belonging, and assume social roles (UNICEF, 2016). Entering a new school setting requires children to navigate unfamiliar social relationships and cultural dynamics, and successful management of this process is essential for their overall development. Odinko (2016) describes school adjustment as the beginning of a lifelong process of adjustment. School adjustment encompasses children's participation in social-emotional, behavioral, and academic processes (Canbulat, 2017). Research indicates that school adjustment is closely linked to social competence, and children with strong adaptation skills tend to achieve higher academic success (Bayraktar et al., 2012; Chan, 2012; Herndon et al., 2013; Ladd & Price, 1987; Seven, 2011). Furthermore, early childhood school adjustment significantly influences primary school success and overall academic performance (Cook et al., 2017). Thus, a child's ability to adapt to a new school and social environment is crucial for their future adjustment to new situations.

The school adjustment process is a complex phenomenon that significantly influences children's socio-emotional development and overall well-being (Odinko, 2016). While transitioning to a new school may be a natural process for some children, it can be particularly challenging for those who have experienced trauma. The adjustment process is even more demanding for children who migrated due to an earthquake, as they must cope with separation from familiar environments and establish new social connections. Key factors influencing school adjustment include teacher support, peer relationships, and the quality of the educational environment (Başaran et al., 2014; Uysal et al., 2016). The relationships children establish with their teachers and peers, participation in classroom activities, and the physical environment all shape their perceptions of school and directly impact their adjustment process (Uysal et al., 2016). Child-centered educational approaches that encourage active participation in activities help reduce stress levels and foster positive attitudes toward school (Frost et al., 2012; Özdemir & Kalaycı, 2013; Koçyiğit, 2014; Kaya & Akgün, 2016).

Research highlights that children who have experienced migration and trauma benefit from supportive school environments, leading to improved social and academic outcomes (Drange & Telle, 2010; Frost et al., 2012; Sibley & Kalina, 2017). Teachers' responsiveness and supportiveness are crucial in helping children affected by trauma adjust emotionally and socially (Pianta & Steinberg, 1997). UNESCO's (2011) report emphasizes that quality education provided in schools serves both protective and rehabilitative functions for migrant children. Additionally, peer support strengthens social bonds, whereas negative experiences such as bullying and exclusion hinder school adjustment (Rubin et al., 2006; Kılcan et al., 2017).

This study aims to explore the school experiences of children aged 60-72 months who migrated due to the earthquakes that struck Kahramanmaraş, Turkey, on February 6, 2023, with magnitudes of 7.7 and 7.6. The study investigates children's perceptions of their new school environment, peer

relationships, teachers, and educational programs. By specifically analyzing children's perceptions of peer relationships, teachers, and the school program in their new schools, we aim to provide a more comprehensive evaluation of their school experiences. In the preschool years, which are a critical period for development, it is important to minimize the long-term effects of traumatic experiences caused by disasters to prevent them from leaving lasting marks in their future lives. In this context, addressing the experiences of children trying to adapt to new educational environments after a disaster through qualitative research methods will contribute to the development of practices and policies for preschool education following a disaster. It is expected that the research findings will contribute to the structuring of inclusive and supportive educational environments by raising teachers' awareness of this issue. In line with this purpose, the following research questions will be addressed:

- How do children perceive their peer relationships in their new school environment following post-earthquake migration?
- What are their perceptions of their teachers?
- How do they perceive the educational environment?

Method

Research Model

In this study, which aims to examine the school experiences and adaptation processes of preschool children who migrated from their cities after the 7.6 and 7.7 magnitude earthquakes that occurred on February 6, 2023, centered in Kahramanmaraş, Turkey, a qualitative research approach has been adopted. The research was conducted with a phenomenological research design aimed at deeply understanding the participants' experiences. The goal of the phenomenological technique is to directly gather people's experiences, ideas, feelings, and perceptions about a phenomenon. This design provides an appropriate framework for understanding the participants' school experiences and the challenges they face (Creswell, 2015).

Study Group

The study sample consisted of 10 children aged 60-72 months who had to migrate due to the earthquake. The participating children migrated from their city to the province of Antalya about two months after the earthquake and started at their new schools. During the period of the research, the participating children have been attending these schools for approximately three months. Participants were selected through criterion sampling, a form of purposive sampling ensuring the inclusion of individuals who met specific selection criteria (Creswell & Poth, 2018). This sampling method aimed to enhance internal validity and provide an in-depth understanding of participant experiences. The inclusion criteria were (1) being between 60-72 months old and (2) having been displaced following the February 6, 2023, earthquake. These criteria have been established to form a group consisting of individuals with direct experience. The method aims to enhance internal validity and deeply understand participant experiences.

Data Collection Tools and Process

The research was conducted in schools where children aged 60-72 months who migrated to Antalya after the earthquake between July 15 and September 15, 2023, were studying. Before data collection, the researcher explained the scope of the study to school administrators and teachers, obtained permission, and provided a written consent form to the children's families. The consent form detailed the purpose of the research, the process, the principles of voluntariness, participants' rights, and privacy protection. It was explicitly stated that the children's identities would be anonymized through code names (e.g., Gizem, Aslı, Didem, Fatih, Mert, Rüzgar, Yağmur, Nisa, Damla, Demir). The schools where the 10 approved children were educated were visited eight times in total, with visits occurring twice a week. To comprehensively understand the children's school experiences, multiple qualitative data collection methods were employed, including observations, semi-structured individual interviews, and the draw-and-tell technique, which allowed children to express their emotions and experiences visually.

Observation

Observations in the school environment were conducted using a semi-structured observation form aimed at understanding children's peer relationships, teacher interactions, and adaptation to the school program. The observation form consists of 10 items and evaluates three main dimensions: peer relationships (communication, cooperation, social participation, exclusion), teacher-child interaction (warmth, social supportiveness, individualized attention), and adaptation to the school program (participation in activities, emotional state, perception of the physical environment). The content validity of the form was ensured with the contributions of field expert academics and supported by the researcher's participation in classroom activities. One of the researchers conducted participant observations over a month, two days a week, during free play time, group activities, story time, mealtime, and individual work hours; by participating in class activities, they maintained the naturalness of the observation process with the children. Each session lasted an average of 50-60 minutes. Observations were supported by interviews with the classroom teacher, and the observation notes were recorded in the computer system on the same day. The content validity of the observation form was ensured by obtaining expert opinions. The researcher's active participation in class activities and interaction with children supported the internal validity by increasing the naturalness of the observations. Additionally, the researcher's active participation in class activities and interaction with the children supported internal validity by enhancing the naturalness of the observations.

Interviews

A semi-structured interview form consisting of 10 questions has been prepared to understand children's perceptions of their school experiences. The interview questions were created based on a review of the relevant literature and expert opinions, and a pilot application was conducted with five children to test their comprehensibility and validity. During the pilot application process, it was observed that the children had difficulty understanding some questions, and accordingly, two questions were simplified. The one-on-one semi-structured interview technique has been used as a data collection method that reflects the participants' emotions, thoughts, opinions, and experiences in the most detailed and comprehensive way (Moerer-Urdahl & Creswell, 2004; Kuş Saillard, 2010). Each interview lasted approximately 40-45 minutes, audio recordings were made, and the entire process was conducted with the participants' consent. Based on the data obtained from the preliminary application, necessary adjustments were made, and the interview form was finalized, after which interviews were conducted with all the children in the study group.

Draw and Explain Technique

To support the observation and interview methods, the "draw and explain technique" has been used. Children were asked to draw with the instruction, "Draw a day at school," and these drawings were used in the analysis of emotional states. This technique is based on having individuals draw a picture on a given topic and then narrate the picture they have drawn (Driessnack, 2006). One of the most enjoyable and simple ways for children to express their feelings, thoughts, and dreams is through drawing (Skybo et al., 2007; Yavuzer, 2016). In the use of this technique, it has been noted that the limited vocabulary of preschool children and their ability to express their inner world more comfortably through drawings are significant factors (Montserrat et al., 2010).

Data Analysis

The qualitative data obtained within the scope of the research were analyzed using the content analysis method. The audio recordings obtained from the interviews were transcribed into text format on a computer and analyzed. For coding and categorization, the NVIVO 11 qualitative data analysis program was used; participant responses were examined in detail to create main themes and sub-themes. Interview and observation data were evaluated alongside the drawings made by the children, revealing their perceptions of school experiences. In the data analysis, the children's statements were reported using code names determined in accordance with the principle of confidentiality. In the analysis process, the data were evaluated in three stages: The first stage, open coding, involves examining the data line by line, dividing it into meaningful sections, and creating initial conceptual codes (Strauss & Corbin, 1990). At this stage, expressions reflecting the children's experiences were identified and used as initial

codes guiding the themes. The second stage, axial coding, is the process of relating and grouping the concepts identified during the open coding process under broader categories (Corbin & Strauss, 2008). At this stage, connections were established between the codes identified for peer relationships, teacher interactions, and the educational environment, and sub-themes were created. The final stage, selective coding, involves identifying the main themes in accordance with the primary purpose of the research and analyzing the relationships between these themes to create a holistic structure (Charmaz, 2006). In this process, the strongest themes related to children's adjustment to school have been identified and interpreted.

Various methods have been applied to enhance the validity and reliability of the research: Using data triangulation, interviews, observations, and children's drawings were evaluated together for cross-validation. This method has increased the reliability of the results by enabling the multidimensional analysis of the obtained data (Patton, 1990). For inter-coder reliability, the data were independently coded by two experienced qualitative researchers, and the consistency of the coding processes was calculated (Kappa value: 0.875) (Landis & Koch, 1977). The coding process was reviewed by an academic expert in the field, and necessary adjustments were made. These methods have strengthened the scientific consistency of the findings by ensuring the validity and reliability of the research.

Ethics Committee Approval

Ethics committee approval was obtained from Akdeniz University Social and Human Sciences Scientific Research and Publication Ethics Committee with decision number 326 on 10.07.2024.

Findings

The research data were examined under three main themes: 'Peer Relationships,' 'Teacher Relationships,' and 'Educational Environment,' to understand the experiences of children who were affected by the earthquake and started at a new school. To enhance the validity and reliability of the findings, the data triangulation method was employed; interviews, observations, and children's drawings were subjected to a cross-validation process for evaluation. The simultaneous analysis of three different data sources has provided a multidimensional perspective on children's school experiences and has strengthened the comprehensiveness and accuracy of the findings.

Findings on Peer Relationship Experiences

The findings related to the first research question, "What are the emotions and thoughts of participant children regarding peer relationships in the new school?" were examined under two categories: positive peer experiences and negative peer experiences. According to the results, three children (Gizem, Yağmur, Demir) reported positive peer experiences, while seven children (Ashi, Didem, Fatih, Mert, Rüzgar, Nisa, Damla) shared negative peer experiences.

Positive Peer Experiences

The positive peer experiences identified from the findings included "being invited to play, playing together, engaging in conversations, sharing toys, offering help, and adhering to social rules such as expressing gratitude, apologizing, and being polite." During interviews, a child named Demir expressed that he had positive experiences in his new school compared to his schoolmates in the earthquake-affected area. Similarly, a child named Yağmur shared affection for their peers at the new school while also mentioning missing their old friends.

Some participant statements highlighting positive peer experiences are as follows:

Gizem: "I have so much fun with my friends at school. My friend treats me very kindly and shares their toys with me."

Demir: "At this school, my friends are very kind to me. Once, during a game, someone bumped into me and made me fall, but they apologized. No one did that at my old school." After this statement, the researcher asked C10, "Do you miss your friends at the old school?" to which Demir responded, "Yes, I miss some of my friends very much, but I also like my friends at this school."

Observations revealed that children who spoke about positive peer experiences, such as Gizem, Yağmur, and Demir, were cheerful and energetic when interacting with their peers. These children appeared well-accepted by their classmates and actively participated in group play. During free play periods, they communicated effortlessly and played comfortably with their peers.

The findings from the analysis of drawings also supported these observations. For instance, Gizem drew a scene showing themselves playing happily with a friend. The vibrant colours and central placement of figures in the drawing conveyed a sense of trust and belonging, aligning with their statement: "My friends are very kind to me." Similarly, Yağmur and Demir created drawings reflecting enjoyable moments with their peers. Yağmur's drawing depicted playing with balloons in a joyful environment. In interviews, Yağmur stated, "I love my friends very much." The use of bright colours and expansive spatial arrangements in the drawing suggested positive emotions.

Negative Peer Experiences

The findings revealed that some children experienced negative peer interactions. These experiences were categorized under themes such as "exclusion from play, verbal harassment, lack of material sharing, and physical violence". Seven children expressed these types of experiences, reporting difficulties in gaining acceptance in their new social environment, struggling to make friends, and feeling excluded, which often led to feelings of sadness or anger. During the interviews, children named Aslı, Didem, Fatih, and Rüzgar expressed that they experienced "exclusion." Aslı mentioned being left out of classmates' games and feeling lonely. Didem stated that while their classmates played tag, they were excluded because they preferred playing with dolls. Similarly, Fatih shared that they did not want to attend school because they had not made any friends.

Physical violence emerged as a significant issue in the experiences of Damla, who explained that a classmate frequently hit them, causing both anger and sadness. Rüzgar recounted that classmates mocked them and used hurtful words, leading to feelings of distress. Nisa and Mert expressed dissatisfaction with the lack of material sharing in class. Nisa noted that their peers forcibly took their toys, causing anger, while Mert described peers' unwillingness to share as rude behavior.

Some participant statements highlighting negative peer experiences include:

Aslı: "My friends don't want to play with me. They always leave me alone."

Damla: "There's a kid in the class who keeps hitting me. I don't like them at all."

The researcher observed that students coded as Aslı and Fatih, who reported difficulties in peer communication, often exhibited shy behavior. These children were frequently excluded by their peers during free play activities.

The analysis of the children's drawings further supported these negative experiences. For instance, Aslı's drawing depicted themselves alone in the classroom while their peers played elsewhere. This visual representation aligned with the statement: "My friends don't play with me." The use of sad facial expressions and the isolated positioning of figures highlighted the sense of exclusion. Additionally, the dark tones in the drawing reflected the child's emotional state. Similarly, Didem's drawing portrayed themselves away from the school and their peers, emphasizing feelings of loneliness. The small size of the figures and the limited use of colours suggested a sense of detachment and exclusion. Fatih also depicted themselves as distanced from the school and classmates, illustrating their loneliness. Rüzgar, while drawing a peer mocking them with a happy facial expression, depicted themselves as sad, reflecting their emotional reaction to the teasing. Nisa illustrated a peer forcibly taking their toys, conveying their stress and frustration through the tense expressions in the drawing. Damla drew a scene of conflict with peers, stating, "They don't play with me," underscoring their sense of exclusion. The heavy use of lines and chaotic composition in the drawing reflected emotional tension and conflict. Negative peer experiences emerged as a critical factor significantly impacting the children's social adaptation. These findings emphasize the need for teachers to carefully observe interactions among children and intervene in situations involving exclusion or bullying.

Findings on Experiences with Teacher Relationships

The second subproblem of the study focused on the question, "What are the feelings and thoughts of participant children regarding their teachers in their new schools?" The participant children's experiences with their teachers were analyzed under two categories: positive and negative. Initially, the children were asked, "What do you think about your teacher at school? Why?" followed by the question, "How do you feel when you are with your teacher?" These findings, combined with observations and drawing analyses, provide significant insights into the influence of teacher-student relationships on children's school adjustment.

Positive Teacher Experiences

Findings from interviews, observations, and drawings reveal that seven children (Gizem, Didem, Rüzgar, Yağmur, Nisa, Damla, Demir) reported positive experiences with their teachers. Positive teacher experiences were characterized by "the teacher being cheerful and tolerant, engaging in physical affection (e.g., hugging or kissing), and teaching new knowledge." These experiences contributed to the children feeling happy and valued.

Some participant statements highlighting positive teacher experiences include:

Didem: "My teacher treats me very well. She's always smiling. She doesn't give punishments."

Gizem "My teacher knows everything. She teaches me new things. That's why I like her."

According to the findings from interviews with the children, Didem, Yağmur, and Demir, stated that their teachers were always smiling and praised their teachers' warm and supportive attitudes. Especially Yağmur said, "My teacher always smiles and loves us." "Even when we do something wrong, she doesn't get angry: she just talks to us." Using this expression, she emphasized her teacher's cheerful and tolerant approach. Rüzgar and Nisa indicated their teacher's positive behavior by expressing that their teacher loves them and hugs them. For example, Rüzgar said, "My teacher says she loves me; she hugs me." "I love my teacher too," he said. Gizem and Damla, on the other hand, expressed that they liked their teachers because they taught them new information. In line with these findings, it is observed that the warm and supportive approaches of teachers play an important role in helping children adapt to their new school environment.

The researcher observed that children who spoke about positive teacher experiences actively participated in classroom activities, trusted their teachers, and willingly followed instructions. Furthermore, it was noted that these children were highly motivated, had strong communication with their teachers, and established a trusting relationship with them. Teachers displayed a patient, compassionate, and child-centered approach toward the children. The researcher's observations indicated that children who discussed positive teacher experiences participated more easily in class activities under their teacher's guidance and felt safe. The way teacher figures were emphasized in the children's drawings reflects the nature of the teacher-child relationship. In the children's drawings, teacher figures were often depicted in bright colours and in central positions. For example, Rüzgar depicted their teacher next to a large heart, which they stated represented their teacher. The vibrant colours in the drawing and the large heart figure symbolize the special bond the child has with their teacher. This drawing reflects the love and trust the child feels for their teacher. Similarly, in the drawings of Didem, the teacher is depicted larger and, in the center, compared to other human figures, and the teacher figure is highlighted in bright colours, expressing trust and attachment to the teacher. Yağmur and Nisa did not include a teacher figure in their drawings, yet in the interviews, they clearly expressed their love for their teacher. These findings suggest that teachers' warm, supportive, and encouraging approaches positively affect children's adaptation to their new school environment.

Negative Teacher Experiences

Three of the participating children (Aslı, Fatih, Mert), mentioned negative experiences with their teachers. These experiences were generally associated with behaviors such as "raising their voice to reprimand, anger, and punishment for mistakes." The children indicated that these negative behaviors led to feelings of fear and anxiety. Aslı and Fatih expressed discomfort with their teachers' loud reprimands and anger. Mert described the situation where the teacher excluded misbehaving children

from games and activities as something that caused worry and even fear. Some participant statements about negative teacher experiences are as follows:

Aslı: "My teacher gets mad a little too much. She always reprimands loudly. Sometimes I am scared."

Mert: "My teacher doesn't let my friends play as a punishment. I am afraid she won't let me play either."

The researcher observed that children who expressed negative teacher experiences were generally more passive during classroom activities and hesitated to communicate with their teachers. It was determined that these teachers exhibited a more authoritarian attitude in classroom management and resorted to verbal punishment. In the children's drawings, the absence of teacher figures or their depiction in a distant position are details that indicate the negative experiences the children expressed. For example, Fatih drew the teacher figure far from themselves, reflecting emotional distance and lack of communication. This situation suggests that the teacher-student relationship is perceived as distant and negative. Aslı and Mert were observed not to include their teacher in their drawings. These negative experiences suggest that teachers' failure to display a supportive attitude or insufficient intervention in negative situations within the classroom led to the children feeling emotionally isolated. When the findings from teacher experiences are examined holistically, it becomes evident that teachers' supportive and tolerant attitudes facilitate children's school adjustment processes, whereas authoritarian and punitive approaches can make this process more difficult.

Findings Related to the Educational Environment

The third sub-problem of the research, "What are the feelings and thoughts of the participating children regarding the educational environment in their new schools?" is addressed under the categories of positive and negative experiences. The participants were asked, "What do you enjoy doing the most at school? Why?" and then "What do you dislike doing the most at school?" Four (Gizem, Rüzgar, Yağmur, Demir) spoke about positive experiences, while six children (Aslı, Didem, Fatih, Mert, Nisa, Damla) expressed negative experiences.

Positive Educational Environment Experiences

The positive perceptions of the participants regarding the educational environment were associated with game-based fun activities and the physical conditions of the school. The children stated that they enjoyed the game-based activities in the school program, which made them happy. Gizem expressed great enjoyment in the costume parties held at the school and emphasized that such events were not available in their previous school. Yağmur who stated that they loved playing most in the block corner, was observed re-enacting an earthquake during play with blocks, expressing the experiences they had during an earthquake. Rüzgar stated that the large garden of the school and the materials it offered made them very happy, especially enjoying activities in the garden with sand, shovels, and toy trucks. Demir mentioned that they played fun games at school. Some statements by participants who spoke about positive educational environment experiences are as follows:

Gizem: "We had a costume party at my school. I had so much fun. We didn't have such nice events at my old school."

Rüzgar: "My school is very big, very beautiful. There are very nice toys. The garden is huge. There is even sand, shovels, and trucks in the garden."

Upon examining the observations of the children who spoke about positive school environment experiences, it was determined that these children had positive relationships with their peers and teachers, were willing to participate in group activities, and their teachers exhibited more child-centered approaches in preparing and delivering activities. Clues to these positive experiences were also found in the children's drawings. The children's drawings frequently featured play corners in the classroom and garden activities. The scenes of playing with blocks in the drawings of the child coded as Yağmur were particularly noticeable. Demir expressed that the fun games in their new school made them very happy and mentioned that they were bored with the intense line-drawing activities in their old school. The dynamic movements of the children playing and the use of bright colours in Demir's drawings

reflect the child's positive emotional perceptions. Although Rüzgar expressed problems in peer relationships in both the interview and drawings, they showed overall happiness with school by highlighting their teacher with a different colour and drawing a large heart symbol.

Negative Educational Environment Experiences

Negative experiences related to the educational environment were addressed under the headings of limited outdoor space usage, the intensity of desk-based activities, and fears about extracurricular trips. Two children, although they stated that they enjoyed playing outside the most, mentioned that they did not go out to the garden very often. Damla expressed that staying in class created fear for them, reflecting the trauma they experienced during the earthquake in their words. Fatih, in their interview, stated that their teacher "always wanted them to stay in the classroom," associating the teacher's attitude with the restrictive nature of the program. Aslı mentioned that they were bored with constantly doing letter and line exercises and that such activities caused their hands to hurt. Mert expressed that they were afraid to participate in extracurricular trips, and this situation disturbed them. Some statements by participants who spoke about negative educational environment experiences are as follows:

Fatih: "You know, our house was destroyed. That's why I don't want to stay in class. I'm really scared that there will be another earthquake. But we stay in class more."

Damla: "My school in Hatay was destroyed. I think this school will be destroyed too. I don't want to be inside the school. It's nicer to play in the garden, but we always spend time in class."

Observations support these statements; it was determined that the children spent most of their time in the classroom and that the garden was rarely used. The researcher observed that structured and teacher-centered activities predominated in these classes and that the children generally spent their time inside the classroom. Children who spoke about negative educational environment experiences expressed that these experiences made them feel unhappy. The children's statements in the interviews are consistent with their drawings. In Mert's drawing, the child depicted themselves inside the classroom, which they considered a safe environment, supporting their concerns about the trips. Damla, expressing that staying in the classroom created fear, depicted the school building as "collapsing." This drawing reflects the child's trauma from the earthquake.

The findings indicate that the educational environment plays a significant role in children's emotional and social adjustment. Game-based activities and enriched physical environments were found to enhance children's positive feelings toward school, while the monotony in outdoor activities and space usage led to a decrease in children's enthusiasm for school. These findings emphasize the importance for educators to create a more sensitive educational environment, particularly for children who have experienced trauma.

Discussion, Conclusion, and Recommendations

This research examined the school adjustment processes of preschool children who migrated to their new schools due to the earthquake. As a result of semi-structured interviews, observations, and picture analysis, the themes of "peer relationships, teacher relationships, and educational environment" have emerged. These themes highlight the critical role of children's social relationships and school experiences in the adjustment process. The results of the research indicate that positive perceptions of peer relationships, teacher relationships, and the school program facilitate the adaptation processes of preschool children to school (Başaran et al., 2014; Kaya & Akgün, 2016; Kılcan et al., 2017; Özdemir & Kalaycı, 2013; Uysal et al., 2016).

Negative peer experiences, such as exclusion, verbal, and physical violence, and the non-sharing of classroom materials lead to social isolation and emotional distress. Peer rejection, shown to hinder social skill development and emotional well-being (Nakamichi et al., 2021), is more evident in children who have experienced traumatic events like earthquakes (Laurence et al., 2011). Conversely, positive peer relationships promote social acceptance and adjustment. Behaviors such as cooperation and assistance contribute to children feeling valued, aligning with research that social bonds with peers aid school adjustment (Johnson et al., 2000). On the other hand, it has been observed that positive experiences such as being accepted by peers, being included in games, and engaging in social behaviors

like helping, apologizing, and thanking others are effective in children's social acceptance and school adjustment. One of the most important factors affecting preschool children's adaptation processes to school is peer relationships (Rubin et al., 1998). Studies in the literature also emphasize that cooperation and helping positively affect young children's peer relationships (Ladd & Sechler, 2012) and that children who are accepted and liked by their peers can adapt to school more easily (Johnson et al., 2000). Problems experienced in peer relationships can cause changes in children's social competence, self-perception, and emotional well-being in the short term, while in the long term, they can lead to issues such as dropping out of school, committing crimes, loneliness, and depression, as noted in the literature (McDougall et al., 2001; Nakamichi et al., 2019; Shin et al., 2016; Wentzel, 2017). Gülay and Erten (2011) found significant negative relationships in their study regarding the importance of peer acceptance during the preschool period in the school adjustment process and how this acceptance affects variables such as a child's love for school, cooperative participation, and self-management. These findings highlight the necessity of developing children's skills in managing peer relationships. Research shows that children may be exposed to social exclusion during the adjustment process to their new schools due to migration, and this situation negatively affects the child's mental and emotional well-being (Kirmayer et al., 2011). Based on this information, it can be said that the social bonds and positive experiences that children form with their peers at school facilitate their adaptation process to school when they have to adapt to new schools in extraordinary situations.

According to the research findings, teacher-child relationships also significantly influence school adjustment. It has been observed that loving and supportive teacher attitudes facilitate the adaptation process to school by increasing children's sense of security. Physical contact, a friendly approach, and positive verbal expressions have facilitated the establishment of strong bonds with children. This finding is supported by research indicating that positive teacher-child interactions facilitate children's emotional well-being and school adjustment processes and that effective classroom management positively affects children's perception of school (Aykaç, 2012; Howes et al., 2008). Conversely, authoritarian and teacher-centered approaches have negatively affected children's motivation and adaptation to school. Alisic et al. (2012) also found in their research that non-supportive approaches negatively affected children's school motivation and social adaptation. This finding has revealed that children who go through traumatic processes need more sensitive and supportive teacher attitudes and that the individual needs of these children must be taken into account. The educational environment influences children's school perceptions and adjustment processes. Play-based activities and rich materials help children develop positive feelings toward school, consistent with research supporting child-centered approaches for adjustment (Kaya & Akgün, 2016). However, monotonous desk activities and discomfort in enclosed spaces are associated with post-traumatic stress effects. Due to the earthquake and the destruction of their homes, children who do not want to be in enclosed spaces and prefer to spend more time in the garden have also reported spending more time in the classroom as a negative experience. These findings highlight that the psychological impact of the earthquake on children affects their adaptation process to school and emphasizes their need for active participation and energy-releasing games. A child's reluctance to participate in outdoor excursions indicates the effects of the stress and anxiety caused by the earthquake. This situation indicates that the child is showing signs of post-traumatic stress and tends to avoid new environments and uncertainty. This finding helps us understand how children can react differently after traumatic events like earthquakes and how these reactions can reflect in their school lives. This situation highlights the need for educators and school administrators to adopt a sensitive approach to children's needs and develop strategies that support their adjustment processes, indicating that a personalized educational environment should be embraced. UNESCO (2011) also emphasized in its report the protective and restorative role of such educational approaches. In conclusion, instead of activities where the child is in a passive role, incorporating play-based, actively participatory activities and organizing physical conditions and materials by considering the individual needs of the children are effective in the children's adaptation process.

Although this study highlights key factors influencing school adjustment, it does not address variables such as children's personality traits, parental attitudes, or socioeconomic status. The limited number of participants also restricts the generalizability of the findings. Despite these limitations, the research has significant implications. The findings reveal that peer relationships, teacher-child relationships, and perceptions of the educational environment are decisive in children's school

adjustment processes. Negative peer experiences, particularly exclusion and violence, adversely affect social adaptation, while positive relationships foster social acceptance and value. These results stress the need for programs supporting social skill development. Teacher-child relationships directly influence emotional well-being and motivation. Loving, cheerful, and child-centered teacher approaches have increased children's attachment to school and mitigated the negative effects of traumatic experiences. In contrast, the authoritarian and teacher-centered approach has reduced some children's participation in school activities and increased their anxiety levels. Teachers must adopt empathetic approaches for children who have experienced trauma. The educational environment also plays a pivotal role. Play-based activities, diverse materials, and outdoor spaces encourage positive feelings toward school, whereas monotonous activities and enclosed spaces diminish interest. For children affected by the earthquake, play-centered and child-centered activities significantly ease school adjustment. Reorganizing educational programs to meet traumatized children's needs and ensuring safe, supportive, and inclusive school environments are vital. Teachers adopting empathy-based strategies and implementing individualized approaches can strengthen children's emotional and social adjustment. Based on the research findings, the impact of children's personality traits, family structures, and environmental factors on school adjustment processes can be examined. Mixed research methods can be useful for a more comprehensive understanding of these processes.

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Investigation of Preservice Teachers' Perceptions of Online Privacy Through Metaphors

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Abstract

In this study, preservice teachers' perceptions of online privacy were determined through metaphors. The study participants consisted of 111 preservice teachers studying in different departments at the faculty of education of a state university. In the study, conducted in a phenomenological design, the data collected through the questionnaire were analyzed by content analysis method. As a result of the analysis, 75 different metaphors created by preservice teachers about online privacy were grouped under 11 categories. The metaphors created were classified under the theme of media, information, and person, and the analysis revealed that most metaphors were in the theme of media privacy. In the distribution of metaphors created for media privacy, the analysis revealed that the private space category contained the most metaphors. The analysis revealed that the valuable category came to the fore in the information and personal categories in the person themes. It was determined that preservice teachers perceived online privacy as an area where personal information is available and a private environment that needs to be protected.

Keywords: Online privacy, preservice teacher, metaphor, media privacy.

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Öğretmen Adaylarının Çevrim İçi Mahremiyete Yönelik Algılarının Metaforlar Aracılığıyla İncelenmesi

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Ayşe Aktaş *
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Öz

Bu çalışmada, öğretmen adaylarının çevrim içi mahremiyet algıları metaforlar aracılığıyla belirlenmeye çalışılmıştır. Çalışmanın katılımcılarını, bir devlet üniversitesinin eğitim fakültesinde farklı bölümlerde öğrenim gören 111 öğretmen adayı oluşturmaktadır. Olgu bilim deseninde yürütülen çalışmada, anket yoluyla toplanan veriler içerik analizi yöntemiyle incelenmiştir. Analizler sonucunda öğretmen adaylarının çevrim içi mahremiyete yönelik oluşturdukları 75 farklı metafor 11 kategori altında toplanmıştır. Oluşturulan metaforlar ortam, bilgi ve kişi mahremiyeti temasında sınıflandırılmış, en fazla metaforun ortam mahremiyeti temasında yer aldığı tespit edilmiştir. Ortam mahremiyetine yönelik oluşturulan metaforların dağılımında özel alan kategorisinin en fazla metaforu içerdiği saptanmıştır. Bilgi temasında değerli kategorisinin, kişi temasında ise kişisel kategorisinin ön plana çıktığı tespit edilmiştir. Öğretmen adaylarının, çevrim içi mahremiyeti sadece kişisel bilgilerin bulunduğu bir alan olarak değil, aynı zamanda korunması gereken mahrem bir ortam olarak algıladıkları belirlenmiştir.

Anahtar Sözcükler: Çevrim içi mahremiyet, öğretmen adayı, metafor, ortam mahremiyeti.

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Introduction

People's daily engagement in digital activities such as online chatting, video, and photo sharing, and e-commerce has led to the need to share their personal data (Morse & Birnhack, 2022). These activities largely reflect users' real lives through online behaviors, and this process raises sensitive issues such as privacy (Eroğlu, 2018). In addition, the fact that developing artificial intelligence-supported technologies has advanced and popularized these activities has also facilitated the collection of personal data, which has increased the importance of acting consciously about privacy and confidentiality (Yengin & Bayrak, 2024). Privacy involves different normative decisions regarding the legitimate use of private information in interaction processes on the Internet (Pańkowska, 2019). Online privacy is related to the level of privacy and security of personal information shared consciously or unconsciously on the Internet (Aslanyürek, 2016). A privacy-aware user is expected to reflect the importance of protecting personal data and the extent to which they know the consequences of disclosing personal data (Cavoukian & Chibba, 2018). Unconscious sharing of personal information in online environments may cause serious privacy issues in the future.

Users unaware of potential dangers, such as sharing personal information in online environments, may need more knowledge about online privacy. Not having enough knowledge can create uncertainty and anxiety about how individuals should protect themselves in online environments. Taking measures to protect online privacy in digital environments requires a cognitive effort, which is confusing or challenging for many users (Walker, 2016). Gerber et al. (2018) state that users do not make a significant effort to protect their personal data even though they consider privacy a significant issue. Although users think that they attach great importance to protecting their privacy and personal data while performing their digital activities on the Internet when their online history is examined, it is generally seen that they exhibit the opposite behavior, and this phenomenon is called the privacy paradox (Barnes, 2006; Pötzsch, 2009). The privacy paradox can be considered as a criterion in creating privacy awareness. In this direction, users' understanding and recognition of the privacy paradox can also facilitate the protection of privacy.

To protect their online privacy, users should not only rely on technical knowledge but also be able to generate solutions as informed users (Pötzsch, 2009). Education is vital in shaping users' awareness of protecting their privacy online by increasing their ability to acquire and use digital information (Yuanyuan et al., 2023). Teachers, as designers of educational environments, are one of the stakeholders in this process. The widespread use of educational technologies in the design of educational environments increases the role of online platforms in learning environments (Haleem et al., 2022). A preservice teacher with online privacy awareness can evaluate the security of online environments and provide more effective guidance to learners in online behaviors. Thus, they can raise awareness at the cognitive and behavioral level to raise privacy awareness in online environments. In addition, preservice teachers, who will be the guides of future generations, will also assume the responsibility of managing sensitive information, including the personal data of the institutions they will work in and their students. It is important to determine the perceptions of preservice teachers, who have a social responsibility for online privacy, towards this concept. It is thought that this situation will provide insights about being and raising individuals who are conscious of privacy in online environments.

There are quantitative (Soumelidou & Tsohou, 2021; Korkmaz et al., 2021; Avcı & Kayıran, 2023) and qualitative (Bostancı, 2019; Öz & Kılıç, 2020) studies on online privacy in the relevant literature. However, no study can provide an in-depth understanding through metaphors focusing on the concept of online privacy. Individuals, when explaining a concept, often refer to a concept from a different field of knowledge and strive to make sense of the information and express it effectively by connecting it to their own experiences and knowledge (Clarken, 1997). Yılmaz and Güven (2015) stated that metaphors can be used to have detailed information about people's perception of a subject. In this study, metaphors were utilized to determine preservice teachers' perceptions of online privacy in depth.

Aim

This study aimed to determine the perceptions of preservice teachers studying at a faculty of education regarding online privacy. To this end, answers to the following questions were sought.

- 1) Through which metaphors do preservice teachers explain their perceptions of online privacy?
- 2) Under which conceptual categories are the metaphors created by preservice teachers about online privacy grouped?

Method

Research Design

Phenomenology, one of the qualitative research methods, was used in the study's design. Phenomenology focuses on phenomena that are recognized but do not have an in-depth and detailed understanding (Yıldırım & Şimşek, 2016). Surveys or scales used to obtain data from large masses are limited in revealing feelings and thoughts (Wilson & Elliot, 2016). Therefore, metaphors can communicate complex concepts more simply and effectively (Leavy et al., 2007). For this reason, metaphors were used in this study to gain an in-depth understanding of preservice teachers' perceptions of online privacy, and a phenomenological design was chosen.

Study Group

In phenomenological research, data sources are individuals or groups who experience the phenomenon that the research focuses on and who can express or reflect this phenomenon (Yıldırım & Şimşek, 2016). The convenience sampling method, one of the non-random sampling methods, was used to determine the study group. In this method, participants are selected from the closest individuals until the appropriate sample is reached or the current participants are reached (Cohen et al., 2007). The preservice teachers who constitute the study group of this research are studying at a state university in Türkiye where the researchers are also working. The pre-service teachers who formed the study group were selected due to their potential roles in shaping future generations. The study was conducted with 111 preservice teachers studying at the faculty of education. Demographic information of the study group is presented in Table 1.

Table 1. Demographic information of the study group

Variables	Groups	n	%
Gender	Female	90	81.1
	Male	21	18.9
	Guidance and Psychological Counseling	31	27.9
	Classroom Teacher Education	23	20.7
Department	Social Studies Teacher Education	15	13.5
	Elementary Mathematics Teacher Education	14	12.6
	Turkish Language Education	11	9.9
	Art Teacher Education	9	8.1
	Science Teacher Education	8	7.2
Grade	Grade 1	27	24.3
	Grade 2	28	25.2
	Grade 3	22	19.8
	Grade 4	34	30.6

According to Table 1, 90 of the preservice teachers who participated in the study were female, and 21 were male. The highest number of participants was from the Department of Guidance and Psychological Counseling (27.9%), and the lowest was from the Department of Science Education (7.2%). The highest number of participants was from 4th grade (30.6%), and the lowest was from 3rd grade (19.8%).

Research Instruments and Procedures

The study data were collected through a questionnaire developed by researchers. To ensure the content validity of the form created by the researchers, the opinions of two experts who have experience in online privacy and are competent in qualitative research methods were obtained. According to the opinions received, the content validity of the form items was ensured, examined in terms of spelling and grammar, some items were rewritten more understandably, and then a pilot study was conducted

with ten preservice teachers. After the pilot study, the definition of the metaphor was added to the questionnaire in line with the expert opinions, the sample metaphor sentence was changed, and the data collection tool was finalized. The data were collected online through Google Forms prepared by researchers in a two-month period between December 2023 and January 2024. The preservice teachers were first asked to answer questions to determine their technology use, and then they were asked to complete the sentence “Online privacy is like, because” to create a metaphor about online privacy.

Data Analysis

The research data were analyzed using content analysis technique. Accordingly, each participant was numbered P1- P111. The metaphors created by the participants were reviewed, and the survey data of 24 participants who did not create a metaphor or did not provide a justification even though a metaphor was created were excluded from the study. Categories were created after analyzing the metaphors and determining the commonalities between the codes. To ensure the validity and reliability of the study, as stated by Yıldırım and Şimşek (2016), the categories and themes revealed as a result of the analysis were tabulated, and direct quotations supported the raw data. Moreover, the framework created for online privacy in the data analysis was in line with the dimensions of privacy in the literature (Rosenberg, 1992; Holvast, 1993). The researchers repeated the data analysis at different times, and after confirming the results between them, they received opinions from two field experts for coding. Categories and themes were finalized in line with the expert opinions. The inter-coder agreement was examined using Miles and Huberman's (1994) formula. As a result of the comparison, it was calculated as $(106/106+5) \times 100 = 95.5\%$.

Ethical Procedures

This study was evaluated by Recep Tayyip Erdoğan University Social and Human Sciences Ethics Committee, and ethics committee approval was granted with the decision numbered 2023/341 at the meeting dated 22.11.2023. The data were obtained with the prerequisite that the participants confirmed their voluntary participation in the study.

Results

In this section, preservice teachers' metaphors about online privacy are organized within the framework of the determined conceptual category and theme and are presented in tables. The relevant tables were elaborated by including quotations as well as explanations.

Metaphors for Online Privacy Concept

The metaphors that preservice teachers created about online privacy and the codes of the participants who created these metaphors are presented in Table 2.

When Table 2 is investigated, it is seen that 111 preservice teachers created 74 different metaphors for online privacy. It was determined that the most frequently used metaphors by the participants were home (12), curtain (6), family (5), diary (5) and secret (5). In addition, privacy in our daily lives, shield, closed box, a locked chest, locked chest, box, pomegranate, private, and our body was determined as repeated twice, while the remaining metaphors were not repeated.

Table 2. *Metaphors for online privacy*

Row	Metaphor	Participant	Row	Metaphor	Participant
1	home (12)	P5, P12, P25, P54, P67, P70, P71, P73, P77, P80, P85, P107	38	Islam	P51
2	curtain (6)	P3, P16, P31, P40, P55, P100	39	a closed box	P28
3	family (5)	P6, P21, P22, P24, P82	40	black box	P101
4	diary (5)	P50, P64, P65, P69, P104	41	safe box	P15
5	secret (5)	P7, P72, P75, P99, P111	42	your own home	P86
6	privacy in our daily lives (2)	P13, P45	43	our own room	P68
7	shield (2)	P60, P62	44	clothes	P58
8	closed box (2)	P14, P26	45	locked safe	P38
9	a locked chest (2)	P41, P42	46	Identity	P9
10	locked chest (2)	P46, P76	47	one's own room	P74
11	box (2)	P44, P36	48	one's private space	P2
12	pomegranate (2)	P34, P66	49	personal space	P106
13	private (2)	P17, P63	50	personal privacy	P23
14	our body (2)	P39, P79	51	neighbor	P87
15	sunflower	P20	52	sand grain	P95
16	brain	P83	53	sacred	P27
17	a box full of knowledge	P35	54	jewelry	P56
18	glass lantern	P52	55	ownership	P91
19	mosque	P109	56	honor	P47
20	walnut	P102	57	room door	P33
21	wallet	P37	58	private life	P92
22	flower	P105	59	freedom	P11
23	our child	P103	60	pandora's box	P32
24	sea	P19	61	money	P98
25	a pebble by the sea	P4	62	police	P93
26	a boat in the sea	P89	63	our principles	P90
27	between four walls	P108	64	profile	P61
28	my emotions	P18	65	scene	P110
29	house key	P88	66	hidden box	P1
30	privacy in the home	P78	67	chest	P84
31	house interior	P53	68	flood	P94
32	etiquette rules	P10	69	love	P48
33	rose	P81	70	zero	P30
34	security	P57	71	transparent	P8
35	pearl	P29	72	salt	P96
36	human	P49	73	tulle curtain	P43
37	the differences between human beings at home and outside	P59	74	bedroom	P97
				Total	111

Themes of Metaphors for the Concept of Online Privacy

The metaphors created by the preservice teachers regarding online privacy were categorized under three main themes: media privacy, information privacy, and personal privacy. These themes encompassed 11 distinct categories: valuable, hidden, scope, personal, control, protective, private space, special knowledge, sharing, precaution, and danger (Table 3).

Table 3. *Themes of metaphors for online privacy*

Theme	Category	Metaphor	f	%
Media privacy	private space (16)	home (7), family (3), between four walls, privacy in the home, a closed box, closed box, your own home, our own room	60	54.05
	scope (9)	pomegranate (2), a box full of knowledge, privacy in our daily lives, Islam, sand grain, private life, scene, zero		
	precaution (7)	curtain (5), a locked chest (2)		
	valuable (6)	mosque, flower, home, privacy in our daily lives, freedom, chest		
	control (6)	home, shield, locked chest, room door, private, Pandora's box		
	hidden (4)	diary (2), a pebble by the sea, pearl		
	personal (4)	home, human, the differences between human beings at home and outside, neighbor		
	danger (4)	a boat in the sea, rose, salt, tulle curtain		
	protective (2)	walnut, curtain		
	sharing (2)	family, one's private space		
Information privacy	valuable (8)	secret (2), family, wallet, our child, identity, our principles, jewelry	32	28.8
	special knowledge (6)	security, home, closed box, safe box, private, secret		
	hidden (5)	glass lantern, black box, secret, brain, box		
	danger (5)	wallet, house key, house interior, flood, transparent		
	control (2)	one's own room, money		
	protective (2)	diary, security		
	sharing (2)	personal privacy, home		
	scope (1)	hidden box		
Personal privacy	personal (1)	box	19	17.12
	personal (6)	diary, locked safe, sacred, profile, love, our body		
	private space (4)	locked chest, personal space, ownership, bedroom		
	hidden (3)	my emotions, diary, our body		
	protective (3)	shield, clothes, police		
	valuable (2)	etiquette rules, honor		
	control (1)	sunflower		
Total			111	100

As shown in Table 3, the majority of metaphors were grouped under the theme of media privacy ($n = 60$), followed by information privacy ($n = 32$), and personal privacy ($n = 19$). There are ten different categories in the theme of media privacy, which refers to privacy in digital and technological environments. The information privacy theme, which refers to controlling personal data collection, storage, processing, and distribution, consists of nine categories. There are six categories in the theme of personal privacy, which refers to inappropriate/unjustified interventions into the individual's physical existence.

Metaphors emphasizing the perception of personal space/space were grouped under the "private space" category. The private space category contains the highest number of metaphors (20). There are 16 metaphors in the theme of media privacy and four in the theme of personal privacy. In this category,

it was determined that home (7) and family (3) metaphors were repeated, while the other ten metaphors were not repeated. In this direction, for the “home” metaphor in the theme of privacy of the environment, P71 stated it “What happens inside is only our business” while P21 stated it “What happens in the family should stay in the family” and likened it to “family”. From a similar point of view, P76, who was on the theme of personal privacy, likened online privacy to a “locked chest” and stated, “It is private to the person, and only the person should have the key.”

16 metaphors containing expressions about being valuable regarding quality and quantity were collected in the “valuable” category. There are eight metaphors in the information privacy theme and six in the media privacy theme. In this category, it was determined that the secret (2) metaphor was repeated, while the other 14 metaphors were not. In this context, for the “secret” metaphor in the information privacy theme, P99 stated, “It should be carefully protected.” while P56 compared it to “jewelry” and stated, “It should always be protected.” For the “chest” metaphor in the theme of media privacy, P84 used the expression “Special and valuable things are hidden.”

Expression emphasizing the hiding of online privacy was evaluated in the “hidden” category. There are five metaphors in the theme of information privacy, four in the theme of media privacy, and three in the theme of person privacy. It was determined that the metaphors in this category, except for the “diary” metaphor, did not repeat. However, for the “black box” metaphor in the theme of information privacy, P101 stated, “The information inside is very confidential.” P50 likened it to a “diary” and stated, “The most private memories and moments of a person are hidden there.” P18 explained the metaphor of “my emotions” in the theme of personal privacy saying “I do not want anyone to see it.”

Expressions referring to personal situations other than media and information were analyzed in the “personal” category. There are six metaphors in the personal privacy theme, four in the media privacy category, and one in the information privacy category. The metaphors in this category do not repeat. In this context, P39 expressed the metaphor of “our body” in the theme of personal privacy stating “It is special to us.”, while P85 expressed the metaphor of “home” in the category of media privacy stating “What happens in it concerns us, it is special.” From the same point of view, P36 explained the “box” metaphor in the theme of information privacy saying “What is inside is only for human beings.”

Ten metaphors with expressions about what is included in the concept of online privacy were collected in the “scope” category. There are nine metaphors in the theme of media privacy and one metaphor in the theme of information privacy. Within this category, except for two participants who likened online privacy to “pomegranate”, the other eight metaphors were not repeated. In this context, P66 used the expression “Although it looks like a whole from the outside, there are dozens of details inside it.” for the “pomegranate” metaphor in the theme of media privacy. At the same time, P35 expressed his opinion by using the expression “You can find everything in it.” for the metaphor of “a box full of knowledge”. With a similar approach, for the metaphor of a “hidden box” in the theme of information privacy, P1 stated, “It contains all the information.”

The nine metaphors containing expressions about the decision being in the person were analyzed in the “control” category. There are six metaphors in the theme of environment privacy, two in the theme of information privacy, and one in the theme of person privacy. It was determined that the metaphors in this category did not repeat. In this direction, P46 for the “locked chest” metaphor in the theme of media privacy states, “Only the key in the owner can open it.” P98, for the “money” metaphor in the theme of information privacy, stated, “When you lose it, it travels from hand to hand, and you do not know who it reaches.” Similarly, for the metaphor of “sunflower” in the theme of personal privacy, P20 stated, “Sunflower blooms only facing the sun. In other words, we make references only to the person we want to be, the person we want to show.”

The expressions referring to the negative consequences of the concept of online privacy were evaluated under the category of “danger”. There are five metaphors in the information theme and four in the environment theme. It was observed that the metaphors in this category did not repeat. In this context, P88 explained the metaphor of “house key” in the information privacy theme saying “If it falls into the hands of the wrong people, you lose your existence.”, while P89 explained the metaphor of “a boat in the sea” in the environment theme saying “It does not make you feel safe enough.”

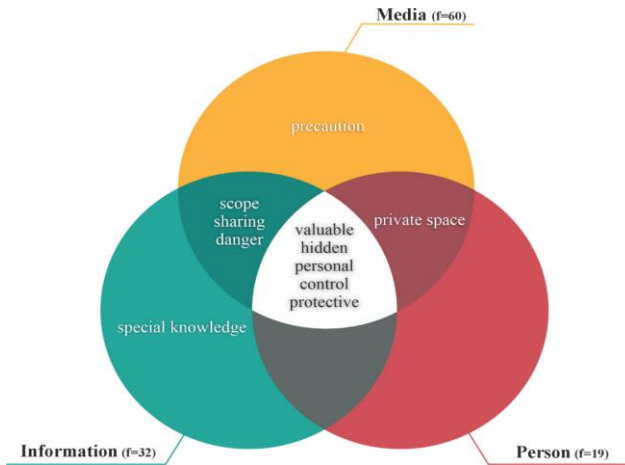
Metaphors that include expressions and concrete measures for what can be done for protection were grouped under the category of “precaution”. In the media privacy theme, there are seven metaphors, including a curtain (5) and a locked chest (2). In this direction, P40 expressed the “curtain” metaphor saying “It keeps us away from disturbing things from outside.” P42 expressed the “a locked chest” metaphor saying “Only the one who has the key should open it because it contains private things.”

The metaphors containing situation expressions that serve the purpose of protection were analyzed in the “protective” category. There were three metaphors for personal privacy and two for information and media privacy. It was determined that these metaphors did not repeat. In line with this information, P62 explained the “shield” metaphor in the theme of personal privacy stating “It protects the person.” while P104 explained the “diary” metaphor in the theme of information privacy stating “It keeps our private information.” Similarly, P100 explained the “curtain” metaphor in the theme of media privacy stating “When that curtain is lifted, the inside of our homes, which is our private space, is seen as it is from the outside.”

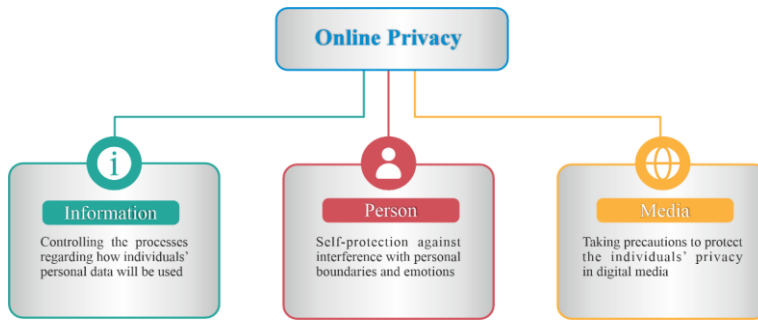
There are six metaphors in the “special knowledge” category in which expressions about the existence of personal information are analyzed. It was determined that these metaphors in the theme of information privacy did not repeat. In this context, P7 stated the following about the “secret” metaphor: “It contains most private information of the person.” Meanwhile, P15 stated the following about the “safe box” metaphor: “Its password is only for the individual.”

Metaphors containing expressions emphasizing sharing or not sharing were evaluated in the “sharing” category. There are two metaphors, each of which is a theme of environment and information privacy. In this direction, P2 explained the metaphor of “one's private space” in the theme of media privacy saying “Private information is shared.” while P23 explained the metaphor of “personal privacy” saying “One should not share one's confidential information.”

This study handled online privacy under three headings, and themes were formed (Figure 1).



As illustrated in Figure 1, a classification structure similar to the concept of privacy has emerged. The definitions of the dimensions of online privacy (information, person, and media privacy) put forward within the scope of the study were made as shown in Figure 2.



Discussion, Conclusion and Recommendations

This study examined preservice teachers' perceptions of online privacy through metaphors. Among the 74 metaphors created for online privacy, it was determined that the metaphors of home, curtain, family, diary, and secret were repeated (Table 2), and the participants adopted online privacy as an environment that needs to be protected, a protective shield and an important element that needs to be

kept. This result shows that preservice teachers not only perceive online privacy as a place where personal information is located but also have the awareness that it is a private area that needs to be protected, like home. It also reveals that the participants perceive that online privacy acts as a protective shield against external threats and that personal information should be kept safely in this environment. Similarly, Öztürk et al. (2022) and Türten (2018) stated that university students and graduate students had privacy concerns and awareness, respectively. In their study, Korucu and Gürkez (2019) found that preservice teachers' online privacy concerns did not differ according to various variables. This shows that university students ignore their privacy in digital media. There may be different situations in which various factors such as social environment, socioeconomic status, technology use, purpose of using the Internet, and use of artificial intelligence applications may affect preservice teachers' approaches to privacy. In this context, the reasons for this difference can be examined with studies focusing on in which cases these factors are prioritized, and privacy is ignored.

According to the findings of the study, the metaphors created by preservice teachers were distributed into 11 categories (Table 3). Among these categories, the "private space" category, which characterizes individual privacy (Rath & Kumar, 2021), was found to contain most metaphors. The metaphors distributed under 11 categories were grouped under three themes: information, person, and media (Figure 1). This result is consistent with Rosenberg's (1992) and Holvast's (1993) definition of privacy in terms of three sub-dimensions (territorial, personal, and informational privacy). The concept of territorial privacy is expressed as media privacy in this study. Privacy, which generally refers to a physical region (Akgül & Toprak, 2019), refers to the virtual environment in this study in the context of online privacy. It was determined that media privacy was the theme with the most categories in the study. This result shows that preservice teachers care about media privacy. In their study with university students, Akgül and Toprak (2019) concluded that students did not hesitate to disclose their personal spaces even if they were careful in their privacy behaviors. Kütükoğlu (2021) and Aslanyürek (2016) stated that although people know the concept of privacy, they continue to engage in behaviors that damage their privacy in online environments. This shows that there is an inconsistency between knowledge and behavior. It can be stated that this result supports the paradox of privacy. It was determined that most of the metaphors created by the preservice teachers were related to the theme of media privacy and covered most of the metaphors in the theme of information and personal privacy (Figure 1). This may be because preservice teachers prioritize the privacy dynamics of the online environment more, although they have the perception of person and information privacy. These findings show the complexity of online privacy and the diversity of reasons underlying conflicting behaviors. Therefore, there may be sociological, psychological, or cultural reasons behind conflicting behavior. Rath and Kumar (2021) stated that privacy-related research has a cultural dimension. In this direction, comparative results can be obtained by conducting interdisciplinary studies within the scope of the subject, ensuring that the concept is addressed in a broad perspective. Obtaining comparative results

may help better understand the privacy dynamics of the online environment and determine which variables affect the perception of online privacy.

According to the study results, it was concluded that another theme with the most categories after the media privacy category was the information privacy theme. It was determined that the "valuable" category came to the fore under the related theme. This result shows that preservice teachers value information privacy. Indeed, the privacy of valuable resources should be protected (Rath & Kumar, 2021). However, research shows that students are not only willing to share their personal data but also have concerns about information privacy (Rath & Kumar, 2021; Yavalar, 2021). It can be said that the metaphors in the category of "danger" in the theme of information privacy support this statement. However, the data that people accept as personal data may be different from each other (Yavalar, 2021). Differences in the perception of personal data may affect people's attitudes toward security and privacy. Increasing individuals' awareness of personal data security can create a more secure and responsible digital culture. Although information privacy is an increasingly public issue (Solove & Schwartz, 2020), it cannot directly impact users' information-sharing behaviors (Mitchell & El-Gayar, 2020). Similarly, the fact that preservice teachers created two metaphors for the category of sharing can be interpreted as the fact that their perceptions about sharing information in the online environment are not sufficiently developed and deepened. In this context, courses such as Media Literacy, where the concept of online privacy is discussed in undergraduate education programs, and Information Technologies can be increased, and various activities focusing on this issue can be integrated into different courses within the education programs.

The third and final theme reached in the study is personal privacy. The theme of personal privacy contains the least number of categories in this study. This finding shows that preservice teachers associate the concept of online privacy less with personal privacy compared to media and information privacy. Individuals' efforts to protect their personal boundaries and themselves against emotional interference constitute the essence of personal privacy. However, personal privacy in the online environment may be perceived differently due to the virtual nature of the environment. Therefore, the fact that preservice teachers created fewer metaphors about personal privacy can be associated with the natural comfort of being in the virtual environment. Similarly, Canbolat (2022) found that the participants exhibited an indifferent attitude toward personal privacy perception. When the metaphors created for personal privacy were examined, it was determined that the preservice teachers associated personal privacy with the physical domain with the metaphor "our body" and the emotional domain with the metaphor "my emotions". The reason for this situation may be that although the physical integrity of preservice teachers is generally not threatened in virtual environments, they have the potential to face negative situations such as cyberbullying emotionally. Akgül (2020) stated that in environments with no face-to-face communication, the sense of empathy towards the communicator disappears, and online environments facilitate using power against others. From another perspective, it was found that university students' online privacy concerns were related to their emotional intelligence (Yabancı et al., 2018). Another study found that university students did not give enough importance to the phenomenon of privacy while focusing on factors such as personal pleasure, happiness, and curiosity, which are elements of psychological satisfaction (Kozan, 2021). This situation shows that emotional factors such as curiosity and happiness can affect individuals' approaches to privacy. In this context, the reasons for this difference can be examined with studies focusing on cases where emotional factors are prioritized, and personal privacy is ignored.

One of the significant responsibilities of preservice teachers is to correctly manage personal data in the institutions where they will be assigned. The findings obtained from this research indicate that preservice teachers are aware of the necessity to protect personal data and ensure security in online environments. Their creation of a greater number of metaphors regarding the online environment points to both an awareness of the importance of privacy in virtual settings and their potential to create secure digital environments. It was also determined that preservice teachers' perceptions of media and information privacy were higher than their perceptions of personal privacy, likely due to the virtual nature of the environment. In this context, training activities can be organized to raise awareness among preservice teachers that the emotional impacts on individuals' privacy in virtual environments may lead to important consequences. Through drama training, preservice teachers can be made aware of the

emotional effects of online privacy on individuals. In addition, digital stories, animations, and similar digital content could be prepared to inform preservice teachers about this issue. In doing so, preservice teachers' overall awareness of online privacy can be increased, thereby contributing to the development of individuals who are emotionally more resilient.

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Life Science Lessons Supported by Virtual Exhibitions: A Mixed-Method Research Study

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Abstract

A virtual exhibition can be defined as an exhibition in which digital content is presented interactively and accessibly over the internet, with content enriched by visuals, texts, videos, and other multimedia tools. Such exhibitions can be created using platforms such as Art Steps, Spatial, or Emaze, with interactive content developed using these applications in the learning and teaching process. In particular, virtual exhibitions can potentially enhance the interactivity and enjoyment of Life Sciences courses. The primary objective of this research is to ascertain the impact of virtual exhibitions on students' attitudes toward the Life Science course and their levels of enjoyment. Additionally, the study seeks to explore students' perceptions of these applications. A mixed-methods research approach was adopted in the study. The study group consists of 15 students from the third grade of a public school. The data collection instruments employed included the "Life Science Lesson Attitude Scale," the "Life Science Lesson Fun Level Scale," interview forms, and student and researcher diaries. Quantitative data was analyzed using a dependent groups t-test, while qualitative data underwent content analysis. The research findings revealed that the integration of virtual exhibitions in the Life Science course positively impacted students' attitudes towards the course and their levels of enjoyment. The qualitative data analysis indicated that students found the Life Science lessons delivered via virtual exhibitions more interactive and enjoyable.

Keywords: Virtual exhibition, Life Science Course, digital learning tools, student attitude.

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Sanal Sergilerle Desteklenen Hayat Bilgisi Dersi: Karma Yöntem Araştırması

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Öz

Sanal sergi, belirli bir tema veya konu etrafında hazırlanan dijital içeriklerin internet üzerinden etkileşimli ve erişilebilir bir formatta sunulduğu, görseller, metinler, videolar ve diğer multimedya araçlarıyla zenginleştirilmiş bir sergi türüdür. Artsteps, Spatial veya Emaze gibi platformlar, bu tür sergilerin hazırlanmasında kullanılan uygulamalardır. Öğrenme öğretme sürecinde bu uygulamalardan yararlanarak etkileşimli içerikler hazırlanabilmektedir. Özellikle Hayat Bilgisi derslerinde sanal sergiler kullanılarak ders içerikleri daha etkileşimli ve eğlenceli bir hale getirilebilir. Bu bağlamda araştırmanın temel amacı, Hayat Bilgisi dersini sanal sergi ile desteklemenin öğrencilerin derse yönelik tutumunu ve eğlence düzeyini nasıl etkilediğini belirlemektir. Yine bu uygulamalarla ilgili öğrenci görüşlerinin belirlenmesi hedeflenmektedir. Araştırmada karma araştırma yöntemi kullanılmıştır. Araştırmanın çalışma grubu bir devlet okulunun 3. sınıfında öğrenim gören 15 öğrenciden oluşmaktadır. Araştırmanın veri toplama araçlarını, “Hayat Bilgisi Dersi Tutum Ölçeği”, “Hayat Bilgisi Dersi Eğlenme Düzeyi Ölçeği” görüşme formu, öğrenci ve araştırmacı günlükleri oluşturmaktadır. Nicel verilerin analizinde bağımlı gruplar için t-testi, nitel verilerin analizinde ise içerik analizi kullanılmıştır. Araştırma sonucunda, Hayat Bilgisi dersinde kullanılan sanal sergilerin, öğrencilerin derse yönelik tutumlarını ve eğlence düzeylerini olumlu yönde etkilediği belirlenmiştir. Nitel verilerden elde edilenlere göre, öğrencilerin sanal sergilerle desteklenen Hayat Bilgisi dersini daha etkileşimli ve keyifli buldukları sonucuna ulaşılmıştır.

Anahtar Sözcükler: Sanal sergi, Hayat Bilgisi Dersi, dijital öğrenme araçları, öğrenci tutumu.

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Introduction

The rapid development and widespread adoption of technology have led to a significant increase in the use of digital tools in education, resulting in the proliferation of interactive applications such as augmented reality, holograms, online meetings, and virtual museums. Technologically, Web 1.0 was a structure that provided only static content, where users were passive consumers. During this period, educational materials were primarily delivered through digital books and basic websites, with limited interaction. However, the advent of Web 2.0 marked a paradigm shift, ushering in a new era of user empowerment. This evolution empowered individuals to consume content and create, share, and interact with it. Within the educational sector, the adoption of blogs, wikis, online forums, and Web 2.0-based learning management systems became pervasive, fostering active engagement among students and educators. Conversely, Web 3.0 has begun to offer more personalized and secure experiences by integrating advanced technologies such as artificial intelligence and blockchain (Berners-Lee, Hendler, & Lassila, 2001). At this stage, intelligent teaching systems, personalized learning pathways, and big data analytics have made educational processes more efficient. While the interactive content and user participation facilitated by Web 2.0 have rendered education more dynamic, the intelligent systems proffered by Web 3.0 have rendered learning processes more efficient and individualized (Bayrak Uluğ & Ertürk, 2022).

The World Wide Web has provided new opportunities for museum information to be presented online, thus enabling museums to go beyond their physical walls (Schweibenz, 2019). Virtual museums, one of the web tools, are referred to by various terms such as electronic, digital, online, meta, web, hypermedia, and cyberspace, depending on their design. Virtual museums serve as a digital exhibition method and exhibition design process that aims to bring artworks together with audiences through various digital platforms (Schweibenz, 1998; Tekin, 2022). These technology-based gallery and museum applications facilitate the exhibition of artworks on digital platforms and enable them to reach wider audiences (Wands, 2021).

During the global pandemic period (2020) caused by the severe acute respiratory syndrome (SARS-CoV-2) virus known as the coronavirus pandemic, the adoption of virtual museum applications has increased significantly as physical museums closed their doors to visitors, and these applications have been widely adopted in various fields, including education (Kahraman, 2021). Virtual museums have successfully reached wider audiences by offering various content such as drawings, artworks, photographs, animations, graphics, sound recordings, video recordings, newspaper articles, and interviews through the Internet and multimedia technologies (Patterson, 1997). Furthermore, integrating multimedia elements such as video, audio, and 360-degree viewable virtual environments has effectively transformed virtual museums into engaging teaching tools (Patterson, 1997). The emergence of advanced augmented reality (AR) and virtual reality (VR) visualizations has led to the emergence of more fun and interactive learning environments, allowing viewers not only to observe artworks but also to interact with them, thus enhancing the learning process more effectively (Bayrak Uluğ & Ertürk, 2022).

Virtual exhibitions have become integral to museum activities and integrated into mainstream culture (Tekin, 2022). These virtual exhibitions are realistic three-dimensional representations of artwork collections that appeal to individual and multiple users. Visitors can navigate the exhibitions, observe the exhibits, and learn about and, in some cases, interact with items in various media formats. Virtual exhibition applications facilitate the digital presentation of works of art, removing the constraints of time and space (Bonis et al., 2013). The digital dissemination of cultural artifacts, including paintings, sculptures, architectural structures, manuscripts, mosaics, and digital artworks, has the potential to extend the reach of artistic heritage to a wider audience and thus increase cultural accessibility. The availability of software that offers pre-designed templates allows for the customization of exhibition organization, enabling users to create exhibitions that align with their unique vision and goals (Almurbati, 2021).

Online exhibitions have precipitated a paradigm shift in conventional exhibition environments, rendering them digital through various formats. Technological advancements can be attributed to this transformation (Yanar, Karadeniz & Tekkök Karaöz, 2021). Web-based applications such as Artsteps

VR, All Art, Emaze, and Spatial have emerged as instrumental tools in creating virtual museums and interactive learning environments within educational settings. These digital platforms have been shown to enhance students' engagement with art and cultural heritage, providing them with opportunities to experience beyond the confines of the traditional classroom setting. These applications boast user-friendly and straightforward interfaces, rendering them accessible to both teachers and students alike. This accessibility positions them as a noteworthy substitute for conventional art exhibitions and educational digital content (Aydoğan, 2021). Virtual exhibitions are poised to play a pivotal role in enriching educational materials, providing interactive learning environments, and cultivating students' creative thinking skills. Moreover, students who actively engage in exhibition organization, content creation, and digital platform sharing develop their digital literacy skills, acquiring knowledge in art and technology. Consequently, virtual exhibitions contribute to inclusivity in education, making learning accessible to a broader audience (Tarlakazan, 2021).

With technological advancements in the 21st century, knowledge has evolved into a dynamic element shaped by the learner's responsibility and active participation in learning. Effective teaching and learning processes are closely related to the learner's willingness to learn, attitudes, motivation, and other affective characteristics. In this context, it is essential to support individuals not only cognitively but also affectively and socially to foster holistic development (Uluçınar Gündoğan & Akar, 2020). Considering that children in primary school are in their play stage, incorporating engaging and interactive materials into the teaching process enhances learning motivation and provides a more effective teaching-learning experience. Consequently, the design of instructional materials that align with the interests and needs of children is imperative in enhancing the quality of the learning process (Ersoy & Gürgen, 2021; Işık & Tural, 2018).

The revised Life Sciences Curriculum of 2018 (MONE) has been developed to enhance individuals' digital competence. This is to be achieved by fostering skills in accessing, evaluating, storing, producing, and sharing information and promoting effective communication and collaboration through the Internet. The updated program emphasizes the necessity of acquiring fundamental knowledge and skills with technological support, highlighting the role of digital tools in education. In this regard, developing online educational exhibitions is a pivotal strategy for enhancing primary school students' engagement in learning (Prabowo, Sitthiworachart & Hong, 2023). The integration of virtual exhibition activities into Life Sciences lessons has been demonstrated to enhance students' interest in the subject whilst also supporting the development of historical, cultural, and aesthetic competencies (Uluçınar Gündoğan & Akar, 2020; Ütkür Güllühan & Bekiroğlu, 2023).

A review of the literature reveals that studies on virtual museums are predominant, with a particular emphasis on Social Studies courses (Aladağ, Akkaya & Şensöz, 2014; Çalışkan, Önal & Yazıcı, 2016; Çınar, Utkugün & Gazel, 2021; Peker, 2014; Turgut, 2015; Ustaoglu, 2012; Yıldırım & Tahiroğlu, 2012). Most of these studies are based on teachers' and students' perspectives and aim to evaluate the role and impact of virtual museums in education. Additionally, research on virtual museums has been conducted in mathematics (Arık Karamık & Özyıldırım Gümüş, 2022; Aydoğdu, Aydoğdu & Aktaş, 2021), English (Gılıç, 2020), history (Kaya & Okumuş, 2018; Zabun, 2020), art education (Dinger, 2021), and visual arts (Canlı, 2016; Ermiş, 2010). However, within the context of Life Sciences courses, studies on virtual museums are limited and primarily focus on examining elementary school students' perceptions and awareness (Çelik & Ütkür Güllühan, 2022). Studies based on virtual exhibitions, on the other hand, are pretty limited and are primarily conducted as part of Social Studies course activities (Çekiş & Kurtde Fidan, 2024; Kayaalp, Namlı, & Meral, 2024).

The life sciences course, which enhances students' social, cultural, and environmental awareness while developing essential life skills, can provide a more effective learning environment if visual and interactive materials are supported. In this context, integrating virtual exhibition activities into the course can contribute to developing students' digital skills, collaborative skills, and active participation in the learning process. Accordingly, this study aims to determine the impact of virtual exhibition applications on students' attitudes toward the Life Sciences course and their level of enjoyment while also exploring their opinions on the matter. In this context, the following research questions will be addressed:

1. Is there a statistically significant difference between the pre-test and post-test scores regarding the student's level of enjoyment of the Life Sciences course supported by virtual exhibitions?
2. Is there a statistically significant difference between the pre-test and post-test scores regarding students' attitudes towards the life sciences course supported by virtual exhibitions?
3. What are the students' opinions on virtual exhibition applications in the Life Sciences course?

Method

Research Design

The present study employed a mixed-methods approach to ascertain the impact of virtual exhibition-supported Life Sciences lessons on students' attitudes towards the course, level of enjoyment, and opinions. The amalgamation of quantitative and qualitative data collection techniques is fundamental to the aforementioned approach (Creswell & Plano Clark, 2011). An embedded mixed design was selected for the study. This model aims to collect realistic and comprehensive data while interpreting changes occurring throughout the process (Johnson & Onwuegbuzie, 2004). Two quantitative scales and two qualitative data collection methods (journals and interviews) were utilized to ensure a more comprehensive analysis. In this context, the quantitative phase employed a one-group pre-test post-test weak experimental design (Fraenkel, Wallen & Hyun, 2012). The designated educational program was implemented during the experimental process, and data were collected from the participants. For the qualitative phase, a case study design was adopted, in which researcher and student journals were kept throughout the process, and structured interviews were conducted after the experiment (Yıldırım & Şimşek, 2016; Miles & Huberman, 1994).

Study Group

The group under scrutiny in this study consists of 15 students enrolled in the third grade of a primary school operating under the jurisdiction of the National Education Directorate of Afyonkarahisar province in the 2022-2023 academic year. It was ascertained that 15 students, eight of whom were female and seven of whom were male, were enrolled in the class. Convenience sampling was used to select the study group, as one of the researchers taught at this grade level. The researchers aimed to conduct the study more quickly and practically by selecting the closest case. In addition, the fact that this method is less costly than other sampling methods was also a reason for preferring it (Yıldırım & Şimşek, 2016). In order to protect the confidentiality of participants, it was explained that students could use pseudonyms of their choice instead of their names.

Data Collection Tools

In the present study, quantitative data were collected through scales (attitude and enjoyment level scale). In contrast, qualitative data were obtained through an interview form and qualitative documents (researcher and student journals). Detailed information on data collection tools is provided below.

Quantitative Data Collection Tools

The Life Studies Course Enjoyment Level Scale was developed by Uluçınar et al. (2020). The scale is structured as a three-point Likert type, rated as Always (1), Sometimes (2), and Never (3), with no reverse-scored items. Within the scope of construct validity, exploratory and confirmatory factor analyses revealed that the scale effectively measures the intended structure. The scale consists of two sub-dimensions: "Enjoyment Level Based on Course Content" and "Enjoyment Level Based on Course Delivery," comprising ten items. The scale ranges from a minimum of ten to a maximum of 30, with a total score indicating the extent to which respondents agree with the statements presented. The scale demonstrated adequate internal consistency, with a Cronbach's Alpha coefficient of .780, and satisfactory sub-dimension internal consistency, with coefficients of .765 and .596, respectively. The present study found a slightly lower internal consistency coefficient of .734 for the scale as a whole.

Oker and Tay (2020) developed the Life Studies Course Attitude Scale. The scale follows a three-point Likert type, rated as Disagree (1), Partially Agree (2), and Agree (3). The scale demonstrated an overall explanatory capability of 46.30% of the total variance, with each factor exhibiting an Eigenvalue of at least 2, each factor accounting for a minimum of 14% of the total variance, and each factor represented by a minimum of five items. The internal consistency coefficient for the first sub-dimension

was .740, the second sub-dimension .729, and the third sub-dimension .663. The present study calculated Cronbach's Alpha internal consistency coefficient as .894.

Qualitative Data Collection Tools

The qualitative data collection tools used in the study were determined as a semi-structured interview form and qualitative documents (student and teacher journals). While developing these tools, the research objective was considered, the relevant literature was reviewed, and expert opinions were obtained. Based on the experts' suggestions, the interview questions were simplified and made more comprehensible. Additionally, pilot studies were conducted to ensure the validity of the tools. Detailed information about the data collection tools is provided below.

Student Interview Form for the Course Supported by the Virtual Exhibition: The form is comprised of six semi-structured inquiries, the interview questions of which are as follows:

- What are your thoughts and feelings on Life Studies lessons conducted with virtual exhibitions?
- What activities were carried out in Life Studies lessons that included virtual exhibitions?
- How did you find the Life Studies lessons conducted with virtual exhibitions? Please explain.
- Would you like Life Studies lessons to be conducted with virtual exhibitions? Why or why not?
- What aspects of Life Studies lessons conducted with virtual exhibitions did you like the most?
- What aspects of Life Studies lessons conducted with virtual exhibitions did you dislike?

Student and Researcher Journals: Throughout the implementation process, data will be collected through journals in which students reflect their feelings and thoughts about the application process. Documents such as journals can be valuable sources of information in qualitative research (Bogdan & Biklen, 2007; Creswell, 2012). The journals were prepared by researchers in a semi-structured format and consisted of three items:

- Today, we conducted the Life Studies course using a virtual exhibition.
- The parts I enjoyed the most while working with virtual exhibitions in the Life Studies course were.
- The parts I enjoyed the least while working with virtual exhibitions in the Life Studies course were.
- Additionally, the research journal includes observations related to the research process.

Data Collection

The commencement of the data collection process was preceded by the approval of the Afyon Kocatepe University Scientific Research and Publication Ethics Committee on 12 April 2023, with the reference number 2023/130. Thereafter, the pertinent information was disseminated to students' parents, and their consent was obtained through a voluntary consent form by confidentiality principles.

Quantitative data were collected in the classroom using the Life Studies Attitude Scale and the Life Studies Enjoyment Level Scale. These scales were administered as pre-tests and post-tests and were completed by students within 40 minutes. Qualitative data were collected throughout the implementation process, with student journals used to gather data and student interviews conducted at the end. The entire implementation, including pre-tests and post-tests, lasted 11 weeks.

Implementation Process

Pre-application process: A pilot study was conducted before the experimental process began. In this process, the application was introduced to the students, who were guided to improve their diary-keeping skills. On 2 March 2023, the following pre-implementation steps were followed based on the learning objective 'Identifies traffic signs and signals' within the Safe Life Unit of the 2018 Life Sciences Curriculum:

- The virtual exhibition was explained to the students, and a sample exhibition was shown.
- How to write a diary was explained to help the students learn how to do it.

After the first exercise, it was observed that some students were unwilling or unable to write. To overcome this, the students were divided into small groups and shared diaries to inspire and engage each other.

Table 1. *Research implementation process*

Week	Date	Learning Objective	Process
1 st Week	13.04.2023	Conducting the pre-test applications of the research.	
2 nd Week	14.04.2023	LS.3.5.1. Recognizes the administrative units and administrators in their immediate surroundings.	The lesson will be taught using the virtual exhibition created with the spatial application.
3 rd Week	28.04.2023 29.04.2023	LS.3.5.2. Explains the form of government in our country.	Teaching the lesson using the virtual exhibition created with the Emaze application.
4 th Week	04.05.2023 05.05.2023	LS.3.5.3. Introduces the characteristics of historical, natural, and touristic places in their immediate surroundings.	Exploring Türkiye's historical, natural, and touristic sites through virtual museums via the Ministry of Culture and Tourism's website. Creating a virtual exhibition with students using images of natural, touristic, and historical places in the immediate surroundings.
5 th Week	11.05.2023 12.05.2023	LS.3.5.4. Establishes a connection between the development of their country and fulfilling their duties and responsibilities.	Teaching the lesson using the virtual exhibition created with the Emaze application.
6 th Week	17.05.2023 18.05.2023	LS.3.5.5. Protects common areas and shared resources.	Creating a virtual exhibition using videos featuring students' discussions on the topic.
7 th Week	24.05.2023 25.05.2023	LS.3.5.6. Investigates the contributions of national unity and solidarity to social life.	Teaching the lesson using the virtual exhibition created with the Emaze application.
8 th Week	26.05.2023 30.05.2023	LS.3.5.7. Participates in social responsibility projects addressing the issues of people from different cultures living in our country.	Teaching the lesson using the virtual exhibition created with the Emaze application. Developing and implementing a social responsibility project with the students.
9 th Week	01.06.2023 02.06.2023	LS.3.5.8. Investigates the personality traits of Atatürk.	The lesson will be taught through a virtual exhibition prepared with images and videos of Atatürk.
10 th Week	05.06.2023 06.06.2023	LS.3.5.9. Investigates individuals who have contributed to our country through their work.	The lesson will be taught through a virtual exhibition created with videos in which students role-play individuals who have contributed to our country.
11 th Week	12.06.2023	Conducting the post-test applications of the research Conducting face-to-face individual interviews	

Keeping researcher and student diaries

The photos of the virtual exhibition applications conducted during the implementation process are presented in Figure 1:



Figure 1. A virtual exhibition created with the spatial application for the learning objective recognizes the administrative units and administrators in their immediate surroundings.

Data Analysis

The normal distribution of the "Life Studies Course Enjoyment Level" and "Life Studies Course Attitude Scale," including their sub-dimensions, in the quantitative aspect of the research, was determined using the "Skewness" and "Kurtosis" values. The normality distribution values for the two scales are presented in Table 2.

Table 2. Distribution values of the scales

Scales/ Values	N	$\bar{X}$	SS	Skewness	Kurtosis	Variance
Life Studies Course Attitude Scale	15	2.71	.389	-1.337	.612	.152
Life Studies Course Enjoyment Level	15	18.33	2.00	1.426	-1.318	4.023

The skewness and kurtosis values of the data falling between -1.5 and +1.5 indicate that the distribution is normal (Tabachnick & Fidell, 2013). Similarly, according to Bursal, normal distribution is considered when the normality values are between -1.96 and +1.96 (Bursal, 2017). In order to ascertain whether there is a significant difference between the pre-test and post-test scores of students in the Life Studies Course Enjoyment Level and Life Studies Course Attitude Scale, where normality was achieved, a dependent samples t-test was employed. The dependent samples t-test is a statistical method used to determine whether there is a significant difference between two measurements obtained from the same subjects at different times or under different conditions (Büyüköztürk, 2021).

The qualitative data of the research were evaluated using content analysis, with the face-to-face interviews with the students first transferred to Word and the diaries reviewed and prepared for analysis. The data were then read and examined, with the reviews being evaluated using researcher triangulation. In order to ensure the reliability of the research, three researchers independently coded the data. In the fourth step, sub-themes and themes were identified based on the codes obtained and the research questions. The fifth step involved decisions regarding the presentation of themes and the interpretation of findings, with direct quotations supporting interpretations (Creswell, 2014; Yıldırım & Şimşek, 2016). To maintain confidentiality, pseudonyms were used in direct quotations from participants' opinions and diaries.

Ethical Procedures

The ethical board report for this study was approved by Afyon Kocatepe University on April 12, 2023, with the number 2023/130.

Results

In this research, the analysis of quantitative and qualitative data was presented in a systematic sequence. Initially, the quantitative data were analyzed, followed by the evaluation of the qualitative data.

Quantitative Findings

The study sought to determine if there was a statistically significant difference between the pre-test and post-test scores on the Life Science Course Enjoyment Level Scale for students, using the t-test for dependent groups. The findings are displayed in Table 3.

Table 3. *T-test analysis results for pre-test and post-test scores on the life science course enjoyment level scale*

Scale	N	$\bar{X}$	SS	T	P
Life Studies Course Enjoyment Level Scale Pre-Test	15	1.70	.205		
Life Studies Course Enjoyment Level Scale Post-Test	15	1.96	.082	4.918	.000*

When Table 3 is examined, a statistically significant difference in favor of the post-test is observed between the pre-test mean score ($X = 1.70$) and the post-test mean score ($X = 1.96$) of the Life Studies Course Enjoyment Level Scale ($t = 4.918$; $p < 0.05$). Accordingly, it can be stated that students' enjoyment levels increased as the Life Studies course was taught using virtual exhibitions.

The results of the Life Science Course Attitude Scale, using the t-test for dependent groups between pre-test and post-test scores, are shown in Table 4.

Table 4. *T-Test analysis results for pre-test and post-test scores on the life science course attitude scale*

Scale	N	$\bar{X}$	SS	t	P
Life Studies Course Attitude Scale Pre-Test	15	2.50	.445		
Life Studies Course Attitude Scale Post-Test	15	2.92	.148	1.67	.007*

When Table 4 is examined, a statistically significant difference in favor of the post-test is observed between the pre-test mean score ($X = 2.50$) and the post-test mean score ($X = 2.92$) of the Life Studies Course Attitude Scale ($t = 1.67$; $p < 0.05$). Accordingly, it can be stated that students' attitudes toward the course improved as the Life Studies course was taught using virtual exhibitions.

Qualitative Findings

In this research section, the qualitative findings obtained regarding the Life Sciences course supported by virtual exhibitions are presented under the main themes of experiences, learning processes, content, contributions, and appreciated features. These four main themes and their sub-themes are given in Table 5. The themes that emerged from the analysis are in Figure 2 below:

Table 5. *Themes and sub-themes*

Theme	Sub-Theme
Experiences	Emotions
	Thoughts
Learning Processes and Content	Learning Methods
	Learned Topics
Contributions	Contributions to Learning
	Emotional and Social Effects
Appreciated Features	Virtual Environment
	Visual and Auditory Elements

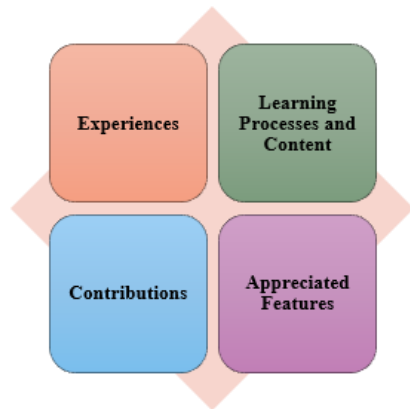


Figure 2. Themes derived from qualitative data

As shown in Table 5, qualitative data are categorized under four main themes: experiences, learning processes and content, contributions, and appreciated features. The sub-themes and codes related to these themes are presented below in sequence with figures. The sub-themes and codes related to the experiences theme in the Life Sciences course supported by virtual exhibitions are shown in Figure 3.

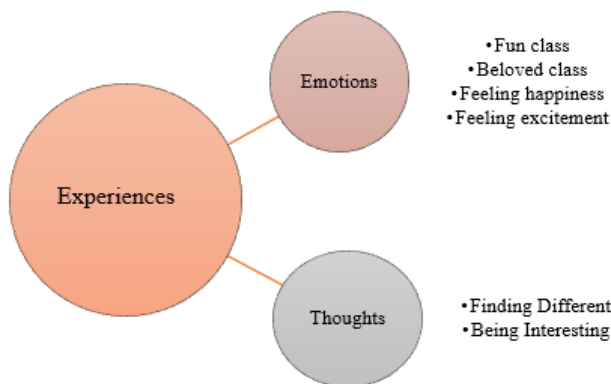


Figure 3. Sub-themes and codes of the experiences theme

Based on the evaluations of primary school students' interviews and diary reflections, the experiences related to the Life Sciences course supported by virtual exhibitions are categorized into two sub-themes: emotions and thoughts.

In the emotions sub-theme, it was found that students found the lesson enjoyable and liked it. Ahmet expressed his thoughts on finding the lesson fun by saying, *it was delightful. Seeing myself, there was fun*. Similarly, Şükran stated, *I enjoy it. We used just to read, but now I learn Life Sciences while having fun*. Nalan indicated that the application made her like the Life Sciences course more by saying, *...It made me like the Life Sciences course*. Orhan also expressed his feelings: *I liked the Life Sciences course*.

Additionally, it was observed that students felt happiness and excitement during the lesson. Şükran expressed her happiness and excitement about participating in the virtual exhibition by saying, *I feel happy when participating in virtual exhibitions in the Life Sciences course*. Didem also shared her emotions by saying, *Teacher, how can I put it? Sometimes I get excited. It feels different*.

In the thoughts sub-theme, the concept of finding the lesson differently emerged. Didem explained her opinion: *Because it was something we had never studied before. We had not covered such things much before. These applications were quite different and beautiful*. Another student, Gülsüm, wrote in her diary, *"Learning our subject through virtual exhibitions seemed very interesting to me*.

Figure 4 presents the sub-themes and codes related to the learning processes and content theme.

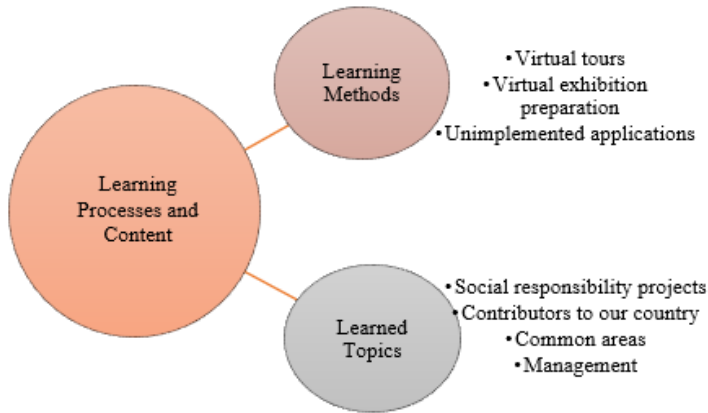


Figure 4. Sub-themes and codes related to the learning processes and content theme

The sub-themes and codes of the content and learning processes theme are examined under two sub-themes: teaching methods and learned topics.

Regarding lesson processing, virtual tours were organized to explore Türkiye, and the students mentioned previously untried applications. Gülsüm spoke about the application, *we prepared virtual exhibitions with our teacher*, and Ahmet said, *we traveled around Türkiye and saw every place*. Didem described the experience, *we did things we never did ourselves*.

Regarding topics under the theme of 'social responsibility projects, Gülsüm remembered projects, *we did something called clean toilet by Opet. We learned our social responsibilities*. Regarding 'contributors to our country, Şükran said, *we learned about those who contributed to our country*. Under the same code, Gülsüm noted in her diary, *we covered those who contributed to our country in the lesson with a virtual exhibition. Some of them were Nene Hatun, Mehmet Akif Ersoy, Mehmet Ali Kağıtçı, Vecihi Hürkuş, Nuri Demirağ, Engin Arık, Jale İnan, and Naim Süleymanoğlu*. On 'administrative units and their managers', Nalan remembered, *Governors manage provinces*. Didem noted in her diary, *we learned about administrative units. We learned that districts are managed by district governors, neighborhoods by neighborhood leaders, municipalities by mayors, and provinces by governors*." she explained it with these words.

Figure 5 presents the sub-themes and codes related to the theme of the contribution.

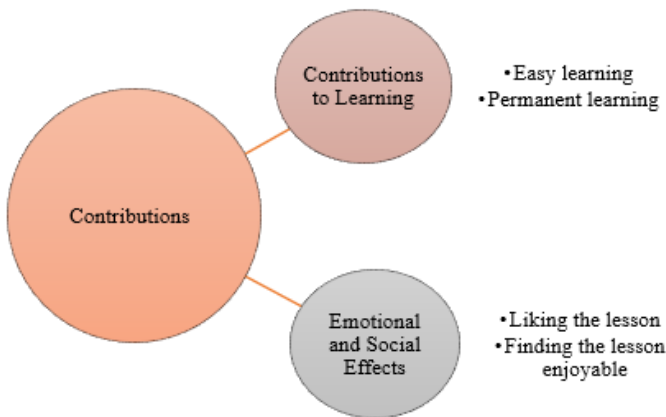


Figure 5. Sub-themes and codes of the contributions theme

In Figure 5, the theme of the contribution regarding the life sciences course supported by virtual exhibitions is addressed under two sub-themes: contributions to learning and social-emotional effects. Students stated that learning the topics was easy and permanent.

Orhan explained that virtual exhibitions provided concrete experiences and practical learning, saying, *Because I feel like I am there, and I do not forget what I learn*. Recai said he remembered the topics better, stating, *It is fun this way, and we understand better; we do not forget*. Similarly, Ahmet said, *I learn and remember*.

Regarding the enjoyment of lessons, Gülsüm shared, *Having virtual exhibitions in our Life Sciences class makes the lesson very fun. I like this lesson more this way*. Didem wrote in her journal, *Today, we revisited museums in our lesson. This way, our lessons are fun, and we visit museums*.

On *loving the lesson*, Nalan explained her reason: *Because I liked it a lot. Doing it virtually. I liked doing it virtually*.

Figure 6 presents the sub-themes and codes of the Liked Features theme.

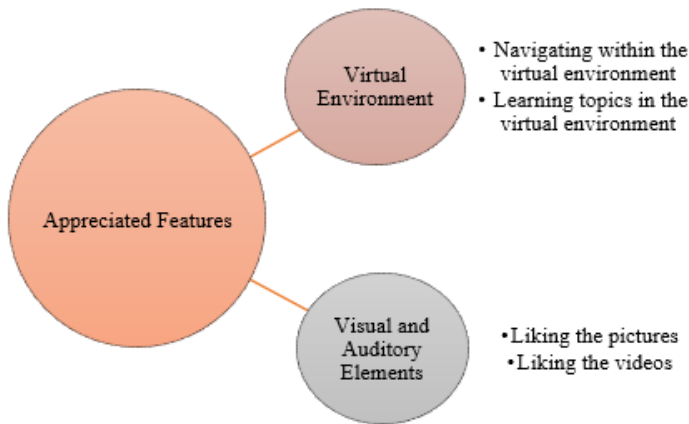


Figure 6. Sub-themes and codes of the liked features theme

The features of the Life Sciences course supported by virtual exhibitions are categorized into two sub-themes: the virtual environment and audiovisual support.

In the virtual environment sub-theme, students enjoyed navigating the virtual space and learning topics there. Şükran noted in her journal, *I liked conducting lessons in the virtual environment and having the avatar ask us questions*. Recai described this experience as *Being inside the topic. Yes, being inside the virtual exhibition*. Similarly, Şükran preferred *Processing digitally, virtual exhibitions*. Didem wrote in her journal, *I liked conducting lessons in the virtual environment*. She also mentioned, *What caught my attention the most was what we did and contributed to the virtual exhibition*.

Audiovisual elements were also among the features that were liked. Hüsna wrote in her journal, *I liked the videos in the museums. I enjoyed Atatürk's speech and Pırl's Republic song*.

Discussion, Conclusion, and Recommendations

This study aims to determine the students' attitudes, enjoyment levels, and opinions toward supporting Life Science lessons with virtual exhibitions. According to the quantitative data obtained from the research, it was concluded that supporting Life Studies lessons with virtual exhibitions positively affected students' attitudes towards the course and their enjoyment levels. In particular, qualitative data revealed that students found the course fun and interesting, expressed positive feelings about the course, and perceived the course as distinctive. The findings obtained from both data sets can be interpreted as positively affecting students' attitudes towards the course. According to Erwin (2024), enjoyment is both a result and a prerequisite for effective learning.

A study of the qualitative data revealed that students liked Life Studies lessons supported by virtual exhibitions, which provided lasting and effortless learning and made the lesson more enjoyable. In the study by Çekiç and Kurtdede Fidan (2024), the views of elementary school students on creating virtual exhibitions in Social Studies lessons were examined. The students emphasized that preparing virtual exhibitions made the learned information more concrete and supported lasting learning. The research findings are complementary. The extant literature on virtual museums also demonstrates that students enjoy the process. Kayaalp, et al. (2024) also stated that virtual museums contribute to pre-service teachers by facilitating learning, being easily accessible, promoting permanent learning, concretizing knowledge, and developing higher-order thinking skills. Turgut (2015), for instance, revealed that virtual museums significantly contribute to learning outcomes, and incorporating student-created virtual museums into group work makes lessons more dynamic. As demonstrated by Gılıç (2020), the integration of virtual museums within educational settings has been shown to enhance the enjoyment of the learning environment, thereby increasing student interest in the subject matter and contributing significantly to the overall effectiveness of the lesson. In addition, studies conducted by Yıldırım and Tahiroğlu (2012) have indicated that the utilization of virtual museum applications, particularly within the context of social studies, has a positive impact on student attitudes. Furthermore, experimental studies undertaken by Besoain, González-Ortega and Gallardo (2022) have demonstrated that virtual museum users exhibit favorable attitudes. Süral and Girmen (2019) discovered that creating enjoyable activities using technology in Life Studies lessons not only created an enjoyable learning environment but also increased interest in the subject. Çelik and Ütkür Güllühan (2022) found in their study that third grade students had higher virtual museum perception scores compared to fourth grade students. All these studies demonstrate that lessons supported by virtual museums help students develop positive attitudes and make lessons more enjoyable. The present study concluded that Life Studies lessons supported by virtual exhibitions developed by the researchers contributed to students' alignment with the research objectives.

This research contributes significantly to the existing literature by demonstrating that using virtual exhibition applications as a Web 3.0 tool in Life Studies lessons creates an effective learning environment. Given that Web 3.0 tools are only beginning to be utilized, this research may guide future studies on this topic. The study shows that virtual exhibition applications foster positive attitudes in Life Studies lessons. Research diaries and interview results also indicate that students found the lessons more enjoyable than before and derived more pleasure from them. Specifically, students enjoyed being part of the virtual exhibition and found it fun to present the lessons themselves in a virtual environment. Furthermore, they wanted lessons to continue being taught using this method. The study by Çekiç and Kurtdede Fidan (2024) also found that students enjoyed features such as the incorporation of sound, music, text, video, and images into the virtual exhibition, as well as the addition of 3D objects and the creation of walls. These results are consistent with Mert's (2023) and Dere and Ateş (2020) findings. Çelik and Ütkür Güllühan's (2022) research on elementary students' satisfaction with virtual museum tours found that students generally had positive perceptions of virtual museums. Çınar, et al. (2021) research, based on student opinions, revealed that students liked virtual museum visits as a class activity and experienced the museum atmosphere in a more enjoyable way through virtual museums.

Limitations of the Study

The present study has identified certain limitations that may constrain the generalisability of the findings. Firstly, the number and scope of participants were limited to a small group of students, which may have introduced bias. Secondly, the experimental method was not randomized, which may have introduced further bias. Thirdly, the profile characteristics of the participants may have influenced the results. Consequently, the findings of this study might not be generalizable to a broader population. Future research should aim to recruit a larger sample size from diverse geographical locations to enhance the representativeness of the results and facilitate a more comprehensive evaluation of the impact of virtual exhibition applications. Secondly, the absence of a control group in the present study limits the experimental data available for analysis. In future research, incorporating a control group to compare virtual exhibition applications with traditional methods could enhance the reliability of the results. Finally, the homogeneity of the socio-economic characteristics of the study participants precluded the determination of potential disparities in the effects of virtual exhibition applications across

diverse student groups. Consequently, subsequent research involving students from varied socio-economic backgrounds will facilitate meaningful comparisons and assist in evaluating this factor.

In this context, the following suggestions can be made for future research:

- To better understand the effect of virtual exhibition applications, experimental studies with control groups can be carried out in different regions and with more extensive diverse student groups.
- Studies can be conducted to determine the effect of virtual exhibitions on students.
- Virtual exhibition applications prepared by teachers can be examined by experts and added to the Education Information Network (EBA) system. In addition, teachers should be encouraged to share the content they have prepared with each other through the EBA platform within the framework of specific topics.

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The Relationship between Pre-Service Teachers' Five-Factor Personality Traits and Public Speaking Anxiety*

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Abstract

The aim of this study is to examine the relationship between pre-service teachers' public speaking anxiety and their five-factor personality traits. The study was conducted with 503 pre-service teachers aged between 18 and 35. The data were collected using the Public Speaking Anxiety Scale, the Quick Big Five Personality Test, and a personal information form. Results from multiple regression analysis indicated that neuroticism and agreeableness significantly and positively predicted public speaking anxiety, whereas extraversion, openness to experience, and conscientiousness significantly and negatively predicted it. In addition, gender was also found to be a significant predictor, with female pre-service teachers reporting higher levels of public speaking anxiety than their male counterparts. The model explained 37% of the variance in public speaking anxiety. Based on the findings, it is recommended to design psychoeducational programs aimed at enhancing the communication skills and reducing the speaking anxiety of pre-service teachers, particularly those with introverted or neurotic personality traits. Such interventions could contribute significantly to their professional competence and effectiveness in classroom communication.

Keywords: Speech anxiety, personality traits, pre-service teachers, public speaking.

* This study was presented as a master's thesis in 2023 by the first author under the supervision of the second author.

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Öğretmen Adaylarının Beş Faktör Kişilik Özellikleri ile Topluluk Önünde Konuşma Kaygıları Arasındaki İlişki*

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Öz

Bu araştırmanın amacı, öğretmen adaylarının topluluk önünde konuşma kaygıları ile beş faktör kişilik özellikleri arasındaki ilişkiyi incelemektir. Çalışma, yaşları 18 ile 35 arasında değişen 503 öğretmen adayıyla yürütülmüştür. Veri toplama aracı olarak Topluluk Önünde Konuşma Kaygısı Ölçeği, Hızlı Beş Faktör Kişilik Testi ve kişisel bilgi formu kullanılmıştır. Çoklu regresyon analizi sonuçları, nevrozizm ve uyumluluk özelliklerinin topluluk önünde konuşma kaygısını anlamlı düzeyde pozitif yönde yordadığını; dışadönüklük, deneyime açıklık ve sorumluluk özelliklerinin ise kaygıyı anlamlı düzeyde negatif yönde yordadığını ortaya koymuştur. Ayrıca, cinsiyet değişkeni de kaygı düzeyini anlamlı şekilde yordamakta olup, kadın öğretmen adaylarının erkeklere kıyasla daha yüksek düzeyde kaygı yaşadığı bulunmuştur. Model genel olarak topluluk önünde konuşma kaygısındaki varyansın %37'sini açıklamaktadır. Elde edilen bulgular doğrultusunda, özellikle içedönük ve nevrozizm kişilik özelliklerine sahip öğretmen adaylarına yönelik iletişim becerilerini geliştirmeyi ve kaygılarını azaltmayı hedefleyen psikoeğitim programlarının geliştirilmesi önerilmektedir. Bu tür müdahaleler, öğretmen adaylarının mesleki yeterliklerine ve sınıf içi iletişim becerilerine önemli katkılar sağlayabilir.

Anahtar Sözcükler: Topluluk önünde konuşma kaygısı, kişilik özellikleri, öğretmen adayları, topluluk önünde konuşma.

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Introduction

Public speaking skills are of great importance for individuals working in many different disciplines because an influential speech sparks interest, helps listeners understand and can influence attitudes and behaviours (Englehart, 2004). One of the groups that frequently use these skills in their professional life is teachers. In this context, teachers must have public speaking skills in order for classroom communication to be effective (Petek, 2014). In particular, the experience of public speaking of pre-service teachers is a necessary condition not only for the teaching activity but also for increasing the effectiveness of the pedagogical activity (Ryndak vd., 2022). Therefore, it is important for pre-service teachers to acquire these skills throughout their training period. However, speaking in public can cause anxiety in some individuals to a level comparable to the fear of death (Dwyer and Davidson, 2012). Public speaking anxiety (PSA) is defined as “a situation-specific social anxiety that occurs during the anticipation or execution of an oral presentation” (Bodie, 2010). PSA is quite common among people and causes individuals to isolate themselves from social and professional environments and hesitate to participate in activities (Hancock et al., 2010; Pull, 2012). PSA is affected by many factors, including social comparison (Ayres, 1986), audience attitudes (Pertaub et al., 2002), past school and family experiences (Erdoğan, 2018), self-focus (Daly et al., 1989), pre-speech preparation (Coker, 2022) and lack of self-confidence (Raja, 2017). The anxiety level of an individual who is assigned to speak in public fluctuates starting from the moment he/she learns that he/she has to give a speech (Behnke and Sawyer, 1999). As can be seen, public speaking anxiety is open to fluctuation depending on situational factors. However, while some individuals feel generally anxious, others do not in the same situation. This anxiety, called “Trait PSA”, refers to a general tendency to feel anxiety about public speaking (Bodie, 2010). In this context, it is thought that people’s attitudes towards communication can be shaped by biologically based dispositions (McCroskey et al., 2001). These innate dispositions have been discussed by different theorists. McCrae and Costa (1987) classified these dispositions as five-factor personality traits and defined them as universal characteristics that can be seen in all cultures. Identifying these personality traits and examining their relationship with PSA can be suggested to contribute to the improvement of the quality of education by enabling pre-service teachers to develop their strengths and recognize potential areas of difficulty early. In this context, it is considered important to conduct the current study on pre-service teachers for whom speaking skills are critical in their profession because teachers need public speaking skills in many situations such as lectures, seminar speeches and parent meetings. Therefore, pre-service teachers need to develop these skills and identify possible obstacles and work on them before starting their professional career. Public speaking anxiety, which is quite common, can be considered one of these obstacles.

According to McCrae and Costa (1987), biologically based dispositions are a hierarchical whole of all personality traits and are defined in five comprehensive dimensions (extraversion, neuroticism, openness to experience, agreeableness, conscientiousness). The trait of extraversion is characterized by being talkative, energetic, active, assertive and enthusiastic. Openness to experience is the sum of the characteristics of curiosity, broad interest, imagination and understanding. Neuroticism refers to a set of anxious, tense, touchy, worried and unbalanced characteristics. Agreeableness refers to the sum of the characteristics of being generous, forgiving, kind, reliable, sympathetic and tolerant. Finally, conscientiousness is related to being organized, planned, responsible, meticulous and productive (McCrae and John, 1992). These dispositions develop throughout a person’s life and have an impact on how the individual thinks and behaves. In addition, dispositions also have an effect on emotions and individual experiences in daily life (Feist and Feist, 2008). For example, in their experimental study, McNiel and Fleeson (2006) revealed that exhibiting behaviours characterized by extraversion leads to positive emotions, and exhibiting behaviours related to neuroticism leads to negative emotions. Examining the effect of these dispositions on pre-service teachers’ classroom experiences and their ability to transfer knowledge to students may be important both educationally and pedagogically. Because personality can be seen as more fundamental than other variables to understand the cause of behavior and it may be necessary to consider the role of personality when interventions for behavior are needed. Therefore, the current study aims to examine the role of five-factor personality traits and gender on public speaking anxiety in pre-service teachers.

Five-Factor Personality Traits, Gender and Public Speaking Anxiety

The characteristics of an individual who is anxious about communication appear to be similar to the characteristics of introversion and neuroticism (Beatty et al., 1998). For example, it has been reported that introverts experience more anxiety and discomfort than extroverts in situations such as group discussions and public speaking (Hz., 2022; Shahzadi et al. 2024). In addition to feeling less anxiety, extroverts speak more effectively (Hamed et al., 2015). In this context, the first hypothesis of the study is as follows:

H₁: Extraversion negatively predicts public speaking anxiety.

Since the personality trait of neuroticism is characterized as a predisposition to negative emotions (Widiger, et al., 2017), it is logical that it is related to communication-based anxieties such as public speaking anxiety. Therefore, neurotic individuals may be expected to feel more anxiety when they are asked to make a speech. For example, neuroticism predicts social anxiety (Newby et al., 2017) and is positively correlated with speech anxiety (Allan, et al., 2016; Daronkolaie & Taghsara, 2024; Kelsen, 2019). In this context, the second hypothesis of the study is as follows:

H₂: Neuroticism positively predicts public speaking anxiety.

In literature the relationship between the other three characteristics and social anxiety or PSA is not as clear as the other two dimensions. In a study examining the relationship between PSA and five-factor personality traits, Kelsen (2019) found that conscientiousness, openness to experience, and extraversion were negatively related to PSA, while neuroticism was positively related to PSA. No significant relationship was found between agreeableness and PSA. In their study examining the relationship between social anxiety and five-factor personality traits, Kaplan et al. (2015) found a negative significant relationship between openness to experience, extraversion and agreeableness and social anxiety, and a positive significant relationship between social anxiety and neuroticism. No significant relationship was found with conscientiousness. Openness to experience can be considered as a trait that reduces public speaking anxiety. Since it leads individuals to exciting activities rather than fixed things (Feist & Feist, 2008). This makes public speaking more desirable for individuals with this trait. Therefore, they may have less anxiety. In addition, individuals with openness to experience may have improved themselves in this regard because they can act more actively. For example, high openness to experience is linked to better semantic memory structure, which leads to more connected, flexible, and unique responses compared to individuals with low openness to experience (Christensen, 2018). Indeed, openness to experience has been reported to be associated with communicative skills (Franco et al., 2020). In this context, the second hypothesis of the study is as follows:

H₃: Openness to experience negatively predicts public speaking anxiety.

Kaplan et al. (2015) found no significant relationship between conscientiousness and social anxiety, while Kelsen (2019) reported a negative relationship between conscientiousness and public speaking anxiety. Thus, the link between conscientiousness and social anxiety or PSA appears to be complex. On the other hand, public speaking may require a planned preparation process, and it is important that the speech is fluent and organized. Individuals with a high sense of responsibility may have less anxiety by planning and managing their speeches better. In this context, the second hypothesis of the study is as follows:

H₄: Conscientiousness negatively predicts public speaking anxiety.

Individuals with high agreeableness exhibit good-natured, submissive and accepting attitudes (Feist & Feist, 2008). The fact that agreeable individuals are more sensitive to social processes may contribute to the development of their social skills. Indeed, Kaplan et al. (2015) reported a negative relationship between agreeableness and social anxiety. However, public speaking is more related to performance, and high agreeableness may cause individuals to become more sensitive to the negative evaluations of the environment and increase their fear of being criticized while speaking in public. This can lead to anxiety during public speaking. In line with this purpose, the following hypotheses were tested:

H₅: Agreeableness positively predicts public speaking anxiety.

In addition to other psychological factors, gender has also been found to play a role in public speaking anxiety and social anxiety. It has been reported that women experience more anxiety than men (Asher & Aderka, 2018; Lintner & Belovecová, 2024). This issue becomes critical in the context of teacher education in Türkiye, where the majority of education faculty students are women (Council of Higher Education, 2024). Therefore, investigating public speaking anxiety among pre-service teachers with a focus on gender is also necessary to inform targeted interventions and improve teacher education programs. In line with this purpose, the following hypotheses were tested:

H₆: Gender significantly predicts public speaking anxiety.

Method

Research Design

The research model is the relational survey model, one of the quantitative research models. The survey model provides a quantitative description of the tendencies, attitudes or opinions in the general population through studies conducted on a sample selected from a population. The researcher makes inferences about the population based on the results obtained from the sample (Creswell, 2017). In this study, the role of five factor personality traits and gender in the public speaking anxiety of pre-service teachers was examined.

Study Group

A total of 503 pre-service teachers from two different public universities in Türkiye voluntarily participated in the study. Of the participants, 387 (76.9%) are female and 116 (23.1%) are male. The mean age of the participants is 20.3 (Sd: 1.62; range: 18-35). Of the participants selected using the convenience sampling method, 195 (38.8%) are first-year, 155 (30.8%) are second-year and 153 (30.4%) are third-year university students attending an education faculty. Moreover, 174 (34.6%) of the participants are from the Department of Primary School Mathematics Teaching, 167 (33.2%) are from the Department of Psychological Counselling and Guidance, 122 (24.3%) are from the Department of Turkish Teaching, 40 (8%) are from the Department of Primary School Teaching.

Research Instrument

Personal Information Form

We developed a form to determine the gender, age and grade level of the participants.

Public Speaking Anxiety Scale

Public Speaking Anxiety Scale (PSAAS) developed by Bartholomay and Houlihan (2016) and adapted into Turkish by Doğru Çabuker et al. (2020) was used in the study. The scale consists of a total of 16 items and has a 5-point Likert-type rating system (1=Never, 5=Extremely). The scale consists of three sub-dimensions: cognitive (7 items), behavioral (4 items) and psychological (5 items). In the Turkish adaptation study of the scale, Cronbach's alpha internal consistency coefficients were found to be .93 for the total score, .88 for the cognitive dimension, .69 for the behavioral dimension and .86 for the psychological dimension. The fit indices obtained in confirmatory factor analysis ($\chi^2=211.55$, $\chi^2/sd=2.18$, GFI=.88, IFI=.947, RMR=.063, RMSEA=.077) confirmed the construct validity of the scale. These results indicate that the scale is a valid and reliable instrument for measuring public speaking anxiety.

Quick Big Five Personality Test

Quick Big Five Personality Test (QBFFT), developed by Vermulst and Gerris (2005) and adapted into Turkish by Morsünbül (2014), consists of a total of 30 items and has a 7-point Likert-type rating system (1=Totally False, 7=Totally True). The scale consists of five sub-dimensions: extraversion, agreeableness, conscientiousness, emotional stability and openness to experience and each sub-dimension is measured with six items. In the Turkish adaptation study of the scale, confirmatory factor analysis (CFA) results revealed that the five-factor structure of the scale was valid ($\chi^2/sd=3.76$, GFI=.91, CFI=.92, NFI=.91, NNFI=.91, RMSEA=.08). Cronbach's alpha internal consistency coefficients were .81 for extraversion, .80 for agreeableness, .86 for conscientiousness, .78 for emotional stability and .73

for openness to experience. These results show that the scale is a valid and reliable tool for measuring personality traits.

Procedure and Data Analysis

The data were gathered from students of the faculty of education at two state universities in Türkiye. Prior to data collection, the necessary permissions were obtained from the relevant faculty members and the students were informed about the purpose of the study. The data were collected face-to-face using the paper-and-pencil method, and the data collection process took approximately 8-10 minutes. The data was transferred to SPSS 26. Total scores were calculated by considering the reverse-scored items. To test the normality of the data, skewness and kurtosis values were checked and it was decided that the data were normal. Prior to conducting the multiple regression analysis, assumptions were tested. Initially, scatterplots were examined, revealing a linear relationship between the independent variables and the dependent variable. Correlation coefficients among independent variables were observed to be below .80, indicating that the assumption of multicollinearity was satisfied. Standardized residual values ranged between -3.29 and +3.29 (min: -2.864; max: 2.878), and Cook's distance was less than 1 (0.54), indicating no influential outliers were present in the dataset (Field, 2018; Steven, 2009). Furthermore, examination of histograms and scatterplots demonstrated that the distribution of residuals was normal, and the assumption of homoscedasticity was met. Finally, multiple regression analysis was conducted to determine whether five-factor personality traits and gender predict public speaking anxiety. Gender was included in the regression analysis as a dummy variable, with female coded as 0 and male coded as 1.

Ethical Procedures

This study was conducted with the approval of the Selcuk University, Faculty of Education Ethics Committee (Approval No: 20 – 31.01.2022) ensuring adherence to ethical standards and protocols for research involving human participants.

Results

Table 1. Mean, standard deviation, kurtosis, skewness, cronbach alpha and correlation values for the variables

Variable	M	Sd	Kurtosis	Skewness	α	1	2	3	4	5
1.PSA	2.80	.74	-.41	.16	.93	1				
2. A	5.51	.80	.06	-.47	.74	-.15*	1			
3. E	4.14	1.1	-.44	.01	.83	-.47*	.25*	1		
4. C	4.80	1.1	-.17	-.43	.83	-.16*	.34*	-.02	1	
5. N	4.02	1	-.19	.15	.74	.45*	-.14*	-.43*	-.06	1
6. O	5.23	.76	-.07	-.15	.72	-.38*	.54*	.36*	.32*	-.14*

* $p < .01$ PSA= Public Speaking Anxiety, A = Agreeableness, E = Extraversion, C = Conscientiousness N = Neuroticism, O = Openness to experience

As seen in Table 1, public speaking anxiety and the five dimensions of the five-factor personality traits appear to have good reliability. Public speaking anxiety is negatively correlated with extraversion ($r = -.47$; $p < .01$), openness to experience ($r = -.38$; $p < .01$), conscientiousness ($r = -.15$; $p < .01$) and agreeableness ($r = -.15$; $p < .01$) while positively correlated with neuroticism ($r = .45$; $p < .01$). When the correlations between the personality traits are examined, it is seen that the highest level of correlation is between openness to experience and agreeableness ($r = .54$; $p < .01$). There is a negative correlation between extraversion and neuroticism ($r = -.44$; $p < .01$). There is a positive correlation between extraversion and openness to experience ($r = .36$; $p < .01$).

Table 2. Multiple regression analysis results related to the prediction of pre-service teachers' public speaking anxiety

Outcome	Predictor	Estimate B	Estimate β	t	p	Partial r	Toleran ce	VIF
PSA	Agreeableness	.28	.11	2.61	<.01	.11	.638	1.56
	Extraversion	-.46	-.28	-6.55	<.01	-.28	.691	1.45
	Conscientiousness	-.18	-.11	-2.82	<.01	-.12	.824	1.21
	Neuroticism	.51	.28	6.88	<.01	.29	.763	1.31
	Openness to experience	-.69	-.26	-5.83	<.01	-.25	.607	1.64
	Gender	-3.5	-.12	-3.38	<.01	-.15	.903	1.10
	Constant	86.96		24.70	<.01			

$R = .62$, $R^2 = .37$, $F = 51.56$, Durbin Watson = 1.921, PSA = Public Speaking Anxiety

It was found that the multiple regression model, in which public speaking anxiety is the dependent variable and five-factor personality traits are the independent variables, is significant ($F = 51.56$, $p < .01$). According to the results of the multiple regression analysis, neuroticism ($\beta = .28$) and agreeableness ($\beta = .11$) positively predicted public speaking anxiety, while openness to experience ($\beta = -.26$), extraversion ($\beta = -.28$) and conscientiousness ($\beta = -.11$) negatively predicted public speaking anxiety. Gender also predicted public speaking anxiety ($\beta = -.12$). Female pre-service teachers reported more public speaking anxiety. The multiple regression model including five-factor personality traits and gender as predictors explained 37% of the variance in public speaking anxiety ($R = .62$, $R^2 = .37$), suggesting that these variables collectively have a substantial predictive effect.

Discussion, Conclusion and Recommendations

The current study shows that extraversion negatively predicts public speaking anxiety. According to the five-factor theory, extroverted individuals are people who have social skills and entrepreneurial interests and like to participate in team sports and club memberships (McCrae and Costa Jr., 2008). This basic tendency allows extroverted individuals to communicate with more people and gain more experience in communication. As a result of these experiences, public speaking is likely to become a more controllable and familiar skill for an extroverted individual. Additionally, extroverted individuals want to be at the centre of attention (Wilt and Revelle, 2016). Therefore, knowing that a group of people are paying attention and listening to him/her seems to be an effective way to meet this desire of an extroverted individual. Therefore, it can be thought that public speaking is perceived by extroverts as an opportunity to meet a desire rather than an anxiety-inducing action. Introverted individuals prefer silence and solitude (Feist and Feist, 2008). These characteristics may lead to fewer communication experiences and avoidance of public speaking.

Openness to experience negatively predicts public speaking anxiety. According to the five-factor theory, individuals with high openness to experience have broader interests, can try different careers, and prefer more diverse life experiences compared to those with low openness to experience (McCrae and Costa, 1985). Speaking in public is an experience that is not routine and not very probable to experience in daily life. It is possible that individuals who are open to experience have experienced public speaking more often than those who are not open to experience. Thus, they may have reduced their anxiety as a result of the experience. For example, pre-service teachers who have done public speaking before feel less anxious than those who have not (Özkan and Kinay, 2015). Individuals who are not open to experience are people with a low sense of curiosity. Therefore, gaining public speaking experience may not be as important for them as individuals who are open to experience. As a result of this lack of experience, public speaking may be perceived as a more anxiety-inducing skill for individuals who are not open to experience.

The current study shows that neuroticism positively predicts public speaking anxiety. Individuals with high levels of neuroticism are emotionally highly reactive and have difficulty returning to normal after emotional outbursts and are also prone to negative emotions such as anxiety, stress and depression (Feist and Feist, 2008). For this reason, neuroticism, along with introversion, can be seen as a subcomponent of speaking anxiety (Beatty et al., 1998). It can be said that individuals with high levels

of neuroticism feel anxiety more intensely when speaking in public. On the other hand, it can be thought that the anxiety felt affects neurotic individuals much more quickly. When feeling anxious, individuals can do various exercises to keep their anxiety under control. However, neurotic individuals may be less successful in regulating emotions.

According to the results of the current study, conscientiousness negatively predicts public speaking anxiety. Individuals with high levels of conscientiousness are more organized, self-disciplined and success-oriented to achieve their future goals (Conner and Abraham, 2001). Speaking in public is an experience that requires pre-speech preparation and practice. On the other hand, public speaking anxiety can also be experienced during the preparation process (Daly et al., 1995). Those with high anxiety cannot also conduct the necessary preparation processes in a healthy manner. Individuals who are highly conscientious but experience public speaking anxiety may want to control their anxiety by preparing in a punctual, goal-oriented and organized manner. However, it seems that individuals with a low level of conscientiousness do not show the necessary interest and attention to the preparation process before the speech due to the effect of these characteristics, and this increases their anxiety levels.

Another finding of the current study is that agreeableness positively predicts public speaking anxiety. According to the five-factor theory, individuals with high agreeableness are accepting, easy-going and reliable. People with a low level of agreeableness are suspicious, critical and unfriendly (Feist and Feist, 2008). When we look at people with social anxiety, we can see that they try to fit in with other people, nodding their heads and smiling. Their aim is to leave an acceptable image (Leary, 2010). Therefore, these individuals may try to adjust and focus more on themselves with the idea of being agreeable. Thus, it can be thought that they experience public speaking anxiety with the fear of not being able to meet the expectations of the audience they are speaking to. Since trying to be agreeable requires paying more attention to behaviours and internal processes, focusing more on oneself and trying to adjust can lead to public speaking anxiety.

Another result of the study is that women experience higher public speaking anxiety than men. The fact that women experience social anxiety disorder more often (Asher and Aderka, 2018) supports this finding. When the reasons for this situation are considered, it is first thought that women, compared to men, have a higher physiological predisposition towards anxiety due to their neurochemical connections (Behnke and Sawyer, 2000). On the other hand, it can be thought that culture has an impact on individuals' public speaking anxiety levels. It is possible to see attitudes that prevent women from improving their speaking skills in collectivist cultures, including that of Türkiye (Chantal et al., 2017). These can be reasons why women want to speak in public as much as men but cannot (De Paola et al., 2021). Women frequently face societal stereotypes that cast doubt on their assertiveness and competence, especially in professional and public settings. This social environment may amplify the stress and anxiety they experience during public speaking, as they may worry that their performance could confirm these negative stereotypes, thereby increasing their public speaking anxiety (Lintner and Belovecová, 2024).

Various suggestions can be made based on the results and limitations of the current study. Firstly, the pre-service teachers' anxiety levels were assessed using quantitative self-report measures, which capture only perceived anxiety rather than actual anxiety experiences. Future research could employ qualitative methodologies, such as interviews or focus groups, to explore deeper insights into the specific triggers, thought processes, and contextual factors that increase anxiety during public speaking tasks among pre-service teachers. Additionally, identifying specific personality traits of pre-service teachers can be valuable. Educational institutions, particularly education faculties, could develop targeted intervention programs aimed at enhancing the communication skills of students who are more introverted or exhibit higher levels of neuroticism. Such targeted interventions may reduce these students' anxieties associated with social interactions and public speaking, ultimately contributing positively to their academic and professional performance. Moreover, future studies might benefit from examining dimensions of personality, such as openness to experience, conscientiousness, and agreeableness, through mediation or moderation models. For example, these traits may predispose individuals to public speaking anxiety through concepts such as perfectionism, cognitive flexibility and irrational beliefs. This broader approach could offer a more comprehensive understanding of the

multifaceted relationship between personality and public speaking anxiety, leading to the development of more holistic and effective anxiety-reduction strategies.

Several limitations should also be considered. Since this study adopts a correlational design, causal inferences about the relationships among personality traits, anxiety, and public speaking cannot be conclusively drawn. Longitudinal studies are needed to better understand the directionality and potential causal mechanisms underlying these relationships. Another limitation of the study is the unequal gender distribution in the sample, with a considerably higher number of female participants compared to male participants. This imbalance may have influenced gender-based comparisons and limits the generalizability of the results across genders. Furthermore, this study is limited to pre-service teachers from specific educational faculties, thus restricting generalizability to different contexts or cultural backgrounds. Expanding the sample to include diverse educational settings and cultural contexts could enhance the external validity and applicability of the findings.

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Effect of Flipped Classroom Model Supported Science Teaching on Learning Responsibility and Perceived Self-Regulation Skills *

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Abstract

The study aims to investigate the effect of Flipped Classroom Model (FCM) supported science teaching on sixth-grade students' learning responsibility and perceived self-regulation skills. A mixed design was adopted to reveal the effects of FCM supported science teaching. The participants consisted of 39 students in total. The research used the Responsibility for Learning Scale (RLS) and Perceived Self-Regulation Scale (PSS) as quantitative data collection tools. An interview form was used as a qualitative data tool. Quantitative data obtained in the study were analyzed with comparative statistical tests. Qualitative data were analyzed with content analysis. Research results found that FCM-supported science teaching effectively improved sixth-grade students' ability to take responsibility for learning and perceived self-regulation. In addition, the FCM supported science teaching increased students' responsibilities, improved self-confidence, made knowledge permanent, and made learning fun. Thus, the FCM can be considered as a useful tool if there is a need to improve regulation and taking responsibility skills.

Keywords: Science teaching, flipped classroom model, taking responsibility, self-regulation skill.

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Tersyüz Edilmiş Sınıf Modeli Destekli Fen Öğretiminin Öğrenme Sorumluluğu ve Algılanan Öz Düzenleme Becerileri Üzerindeki Etkisi *

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Kübra Kılıç**

Hasan Bakırcı***

Yılmaz Kara****

Öz

Çalışmanın amacı, Ters Yüz Sınıf Modeli (TYSM) destekli fen öğretiminin altıncı sınıf öğrencilerinin öğrenme sorumluluğu ve algılanan öz düzenleme becerileri üzerindeki etkisini incelemektir. TYSM destekli fen öğretiminin etkilerini ortaya koymak için karma desen benimsenmiştir. Çalışmanın katılımcıları toplam 39 öğrenciden oluşmaktadır. Araştırmada nicel veri toplama araçları olarak Öğrenme Sorumluluğu Ölçeği ve Algılanan Öz Düzenleme Ölçeği kullanılmıştır. Nitel veri aracı olarak görüşme formu kullanılmıştır. Çalışmada elde edilen nicel veriler karşılaştırmalı istatistik testler ile analiz edilmiştir. Nitel veriler ise içerik analizi ile analiz edilmiştir. Araştırma sonuçlarına göre TYSM destekli fen öğretimi, altıncı sınıf öğrencilerinin öğrenme sorumluluğu alma becerilerini ve algılanan öz düzenlemelerini etkili bir şekilde geliştirmiştir. Ayrıca TYSM destekli fen öğretimi, öğrencilerin sorumluluklarını artırmış, öz güvenlerini geliştirmiş, bilgiyi kalıcı hale getirmiş ve öğrenmeyi eğlenceli hale getirmiştir. Bu nedenle TYSM, düzenleme ve sorumluluk alma becerilerinin geliştirilmesine ihtiyaç duyulduğunda yararlı bir araç olarak düşünülebilir.

Anahtar Sözcükler: Fen öğretimi, ters-yüz sınıf modeli, sorumluluk alma, öz-düzenleme becerisi.

* Bu makale, “Eğitim Bilişim Ağı (EBA) destekli ters yüz sınıf modeline yönelik bir uygulama: Ses ve özellikleri ünitesi” adlı tezden elde edilen veriler kullanılarak hazırlanmıştır.

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Introduction

The Flipped Classroom Model (FCM) is a teaching model that allows more efficient use of time in the classroom by ensuring that course preparations are made outside of school (Strayer, 2012). According to this model, unlike traditional teaching, teachers record their lessons and present these recordings to students on a platform where they can be accessed. Students watch these videos before attending class and have the opportunity to make learning more effective by interacting with their peers and teachers in the classroom. Today's new generation, Generation Z, can easily access information and value information from multiple sources. Therefore, there is a need for learning environments where learning does not only occur within the school's boundaries but also where students can learn according to their learning styles and speed. However, the number of studies about implementing the FCM for science courses is limited in the national and international literature (Nacaroğlu & Bektaş, 2023). The FCM has the potential to improve students' abilities to self-regulate and take responsibility for learning in learning environments (Fauzi & Widjajanti, 2018; Shyr & Chen, 2018).

The cluster of capabilities to control thoughts, feelings, and behaviors can be considered self-regulation (Baumeister & Vohs, 2004). An individual has self-regulation skills as much as actively participates in the learning environment behaviorally, motivationally, and metacognitively (Cheng, 2011). Self-regulated learning environments are needed to raise individuals with good self-regulation skills. Self-regulated learning is primarily about being aware of one's capacity, knowing oneself well by creating appropriate learning environments, determining one's goals, and realizing one's learning using various methods and techniques. Studies show a relationship between students' academic success and self-regulation skills (Nacaroğlu & Bektaş, 2023). Self-regulated learning is essential today, from primary to higher education (Fauzi & Widjajanti, 2018), and this reveals how vital self-regulation skills are at all levels of education. Self-regulation skills are necessary for a student to have awareness, control, and regulation of their learning (Baumeister & Vohs, 2004). From this perspective, the FCM is critical in realizing the self-regulation skills of individuals because one of the focuses of this teaching model is improving individuals' self-regulation skills (Shyr & Chen, 2018).

Learning responsibility means that the students make their own decisions, determine the learning progress, monitor and analyze their learning outcomes, and take precautions regarding the results to improve the quality of their learning (Roper, 2007). Students have specific responsibilities in the learning environment. These responsibilities include coming to classes prepared, attending classes regularly, doing assigned homework, and cooperating with friends. Students can access, use, and produce information due to their responsibilities towards learning. It can be said that the FCM is one of the teaching models that focuses on the concept of learning responsibility. FCM is an implementable model for the development of skills that can be employed in the learning process, especially learning responsibility (Shyr & Chen, 2018). This model induces learning to individuality and provides each student with a process of structuring knowledge based on their pace and learning style. Thus, it is aimed at the student who takes responsibility for learning to gain awareness about his learning process. Therefore, revealing the effect of the FCM on sixth-grade students' learning responsibility will shed light on future studies.

Studies on the FCM in science education are limited in the national and international literature (Ates, 2024; Lo et al., 2018). International studies have focused primarily on foreign language and mathematics education (Fisher et al., 2024; McAlindon et al., 2023). However, studies are also found in engineering, medicine, and social sciences (Mason et al., 2013). National researches on the FCM are conducted in small numbers and primarily by university and graduate students. However, it was found that there were fewer studies at the secondary school level (Eser, 2021). In addition, it seems that studies on the FCM focus mainly on variables such as academic success, high-level skills, and student and teacher perceptions (Eser, 2021). When the skills targeted in the curriculum are looked at holistically, students are expected to acquire existing achievements and develop skills suitable for teaching (Yakar & Saracalaoğlu, 2017). Developing students' self-regulation and learning responsibility skills is essential in this context (Sasson & Yehuda, 2023). In recent years, self-regulation, which is necessary to take responsibility, has drawn attention at the center of studies on academic success (Nacaroğlu & Bektaş, 2023). Thus, the flipped classroom is an applicable model which provides some sort of control on their learning and gain skills for their learning processes (Talbert, 2017).

Purpose of the study

As a result, according to the literature evaluation, the findings obtained vary due to the differences in the implementation methods of the FCM (Ateş, 2024; Fulton, 2012). In addition, it can be said that there are no studies examining the effects of the FCM on self-regulation skills and learning responsibility together (Ateş et al., 2024; Chin, 2023; Lo et al., 2018). It has been determined that studies on the FCM are primarily conducted with university and high school students, and there are very few studies conducted with secondary school students (Shyr & Chen, 2018). Therefore, this study investigates the effect of FCM supported science teaching on sixth-grade students' ability to take responsibility for learning, their perceived self-regulation skills, and their opinions about flipped learning activities. In the context of this purpose, the following questions were sought to be answered.

- 1) Does FCM have an effect on 6th grade students' responsibility for learning skills?
- 2) Does FCM have an effect on 6th grade students' perceived self-regulation skills?
- 3) What are the opinions of 6th grade students regarding FCM practices?

Method

Research Design

Creswell's explanatory sequential mixed design approach was adopted in the study (Creswell & Creswell, 2023). This design was preferred because it enabled the collection and analysis of quantitative data first and then the analysis of qualitative data. In this way, the event or situation was evaluated from different perspectives in the light of qualitative and quantitative data and was used to collect richer and more detailed data, and it was assumed that each data type complemented the other during the analysis (Baki & Gökçek, 2012). The quantitative dimension of the research was designed as quasi-experimental research to reveal the effect of FCM learning activities on learning responsibility and perceived self-regulation within the scope of sound and properties in the science course. Then, qualitative data were obtained with an interview form in the data collection process in order to add depth to the research due to the nature of the research design.

Participants

An easily convenient sampling was chosen for this research because one of the researchers conducted the study with 6th-grade students, provided convenience for the activities, and was the most appropriate sampling method regarding technical facilities and time (Patton, 2005). The participants were 39 students studying in the 2021-2022 academic year. This research included two classes, one as an experimental group (N=20) and one as a control group (N=19). While determining the students who participated in the qualitative part of the research, the RLS and PSS scores of the participants who participated in the quantitative part were calculated separately for each student and categorized under low, medium, and high group. Thus, students at different levels in terms of the variables of interest in scope of this study were included in the interviews. Among the students falling into these categories, six students were interviewed, two students each. The interviewed students were coded as SL1, SL2, SM1, SM2, SH1 and SH2, taking into account the low, medium and high categories.

Data Collection Tools

Responsibility for Learning Scale (RLS)

RLS is a five-point Likert-type scale consisting of 35 items. The expressions in the scale were scored as "Not at all suitable for me = 1", "Not suitable for me = 2", "Somewhat suitable for me = 3", "Suitable for me = 4", and "Extremely suitable for me = 5". The Cronbach Alpha reliability coefficient was 0.94 (Yakar & Saracalaoğlu, 2017). In this study, the researchers recalculated the reliability of RLS. The scale was administered to 350 students in a public middle school in Van. At the end of this administration, the Cronbach Alpha value of the scale was determined as 0.91.

Perceived Self-Regulation Scale (PSS)

PSS was developed by Arslan and Gelisli (2015). PSS consists of 16 items and two subdimensions: openness and seeking. It was created in a 5-point Likert type, appropriate to the middle school student level. The expressions in the scale were scored as "never = 1", "rarely = 2", "occasionally = 3", "often

= 4", "always = 5". Cronbach Alpha internal consistency reliability coefficients were found to be 0.84 for the openness factor, 0.82 for the seeking factor, and 0.90 for the entire scale. In this study, the reliability values of this scale used by the researcher were recalculated. In this context, it was administered to 200 middle school students. The Cronbach Alpha value was recalculated for the openness sub-dimension, and this value was found to be 0.82, 0.81 for the seeking sub-dimension, and 0.83 for the scale (Büyüköztürk et al., 2012).

Semi-structured Interview Form

The opinions of the students about FCM supported science teaching were obtained through an interview form. The form included questions about the FCM experiences. The questions prepared by the researcher were to be clear, understandable, and accessible directions. While preparing the interview questions, the opinions were considered by two faculty members who were experts on science education and had articles about qualitative research, considering the purpose of the research and the students' situations. In line with experts' opinions, it was decided to remove two questions from the interview form. In addition, it was suggested that changes be made to the wording of two questions. The final version of the form is in Appendix 1.

Implementations

The implementations were carried out in three stages. In the first stage, RLS and PSS were applied as pretest two weeks before the courses started in the experimental and control groups. In the second stage, the subject of sound and properties was covered in the science course for five weeks (4 hours per week) in both groups. While the experimental group students experienced a learning process based on FCM activities, the other group experienced a learning experience in the 5E model. Learning experiences were enriched with the Education Information Network (EIN). EIN is an online platform that teachers and students can access through their accounts, providing access to information regardless of location and time and providing social learning and sharing opportunities (MoNE, 2018). In this study, with the instructions given to the students, they were allowed to enter the EIN system before the lesson and watch the lesson videos. The one-week part of the implementations performed in the study groups is explained in Appendix 2. In the third stage, RLS and PSS were applied as posttests two weeks after the end of the implementations in the experimental and control groups. In addition, interviews were conducted with six students participated from the experimental group.

Data Analysis

Quantitative data obtained through the RLS and PSS were transferred to the computer to make statistical operations available. Then, the data obtained from the RLS were subjected to the test of normality before being used to compare the groups before and after the implementation. In this context, the results of the Shapiro-Wilks test ($W=0.954$, $p<0.05$), which is preferred for samples smaller than 50 people, showed that the data obtained from the RLS did not have a normal distribution. Similarly, the data obtained through the PSS were subjected to the Shapiro-Wilks test ($W=0.953$, $p<0.05$) which indicated that the data did not have a normal distribution. So, nonparametric tests were adopted in comparisons based on the data obtained from the PSS (Mayers, 2013).

Content analysis was used to analyze the semi-structured interviews. The primary purpose of content analysis is to simplify and interpret the data obtained by the person conducting the research and present it to the readers in an understandable form (Yıldırım & Şimşek, 2013). The student's answers to the interview questions were transcribed into plain text without any changes. Data reduction was made on the raw data transferred to plain text. In the first stage, codes were determined by two researchers. Then, the agreement rate of the codes determined by two different researchers was determined. To calculate the compatibility of agreement rates, the reliability formula developed by Miles & Huberman (1994) was preferred [$\text{Reliability} = (\text{Consensus/Disagreement}) \times 100$]. Thus, the reliability coefficient of the agreement rate between the coders was 84%. This value indicates that the coding for qualitative studies is reliable (Miles & Huberman, 1994). The codes that emerged from these analyses are given in tables.

Findings

Findings about Responsibility for Learning

In order to reveal if there are any effects of FCM supported science teaching on 6th-grade students' responsibility skills for learning, RLS was administered to the groups. Findings regarding 6th-grade students' learning responsibility skills of flipped classroom-supported science teaching are provided in Table 1.

Table 1. *Comparison of responsibility for learning scale scores*

Test	Group	N	Mean Rank	Sum of Ranks	U	Z	p
Pretest	Experimental	19	19.37	368,00	178.000	-0.338	0.736
	Control	20	20.60	412,00			
Posttest	Experimental	19	28.66	544,50	25.500	-4.625	0.000
	Control	20	11.78	235,50			

When Table 1 was examined, RLS scores were close to each other regarding groups before the implementation. Therefore, no statistically significant difference was found between the RLS pre-test scores of the groups [$Z=-0.338$, $p>.05$]. However, a statistically significant difference was found between the RLS posttest scores of the groups [$Z=-4.625$, $p<.001$]. In addition, the mean rank score of the control group was 11.78 while it was 28.66 for the experimental group. So, this significant difference is in favor of the experimental group regarding the mean rank scores.

Findings about Perceived Self-Regulation

In order to compare the groups about Perceived Self-Regulation before the application, the data obtained from the PSS, which was applied as a pre-test, was examined. The findings resulting from this pre-test are given in Table 2.

Table 2. *Comparison of perceived self-regulation scores before the implementation*

Scale	Group	N	Mean Rank	Sum of Ranks	U	Z	p
Openness	Experimental	19	19.47	370.00	180.000	0.282	0.778
	Control	20	20.50	410.00			
Seeking	Experimental	19	20.37	387.00	183.000	-0.197	0.844
	Control	20	19.65	393.00			
Total	Experimental	19	20.05	381.00	189.000	-0.028	0.978
	Control	20	19.95	399.00			

In Table 2, there is no statistically significant difference between the groups in terms of Perceived Self-Regulation before the application ($Z=0.282$, $p>0.05$). In other words, before the implementation, the students in the groups were identical in terms of Perceived Self-Regulation. The PSS was administered as a post-test to determine whether there was a difference between identical groups after the implementation. The findings resulting from the analysis of this post-test are given in Table 3.

Table 3. *Comparison of perceived self-regulation scores after the implementation*

Scale	Group	N	Mean Rank	Sum of Ranks	U	Z	p
Openness	Experimental	19	25.11	477.00	93.000	-2.737	0.006
	Control	20	15.15	303.00			
Seeking	Experimental	19	21.16	402.00	168.000	-0.622	0.534
	Control	20	18.90	378.00			
Total	Experimental	19	23.79	452.00	118.000	-2.028	0.043
	Control	20	16.40	328.00			

As seen in the table, total scores obtained from the PSS after the implementation indicate a statistically significant difference ($Z=-2.028$, $p<0.05$). Considering the total scores obtained from the scale after the implementation, it was found that the mean rank of the control group was 16.40, while it was 23.79 for the experimental group. A similar situation was also valid for the openness sub-dimension

of the scale ($Z=-2.737$, $p<0.05$). Again, considering the openness sub-dimension after the application, it was found that the mean rank score of the control group was 15.15, while it was 25.11. However, no statistically significant difference was found in the seeking sub-dimension ($Z=-0.922$, $p>0.05$). After the implementation, the statistically significant differences detected in the total and openness sub-dimensions of the PSS were for the good of the experimental group. Thus, FCM supported science teaching practices caused a more significant increase in the Perceived Self-Regulation of the experimental group students than those in the control group.

Findings about Opinions of Students

The codes obtained from the student responses to the question “What are your thoughts about FCM supported science teaching practices?” are given in Table 4.

Table 4. Findings regarding student thoughts about FCM

Codes	SL1	SL2	SM1	SM2	SH1	SH2	f
a. Effective learning	+	+	+	+	+	+	6
b. Readiness	+	+	+	+	+	+	6
c. Interaction with technology	+	+	+	+	+	+	6
d. Positive contribution to lessons	+	+	+	+	+	+	6
e. Academic success	+	+	+	-	+	+	5
f. Active participation	-	+	+	+	+	-	4
g. Gaining self-confidence	+	+	+	-	+	-	4
h. Reinforcement of topics	+	+	+	+	+	+	6
i. Being eye-catching	+	+	+	+	+	+	6
j. Visual richness	+	+	-	+	+	-	4
k. Social learning	+	+	+	+	-	-	4
l. Instant feedback and correction	+	+	+	-	-	-	3

In table 4, students mentioned the codes such as effective learning ($f=6$), readiness ($f=6$), interaction with technology ($f=6$), positive contribution to lessons ($f=6$), academic success ($f=5$), active participation ($f=4$), and gaining self-confidence ($f=4$). In addition, students used the codes of reinforcement of the lesson ($f=6$), being eye-catching ($f=6$), visual richness ($f=4$), social learning ($f=4$), instant feedback and correction ($f=3$). Some excerpts from students' opinions on this subject are given below.

SM1: “*With the FCM, my communication with our teacher and classmates improved since our interaction was intense both before (b) and during the lesson. It increased my success in science classes (e), and I started participating more in class (f). Since we spent more time on experiments, what I learned became more permanent (a)...*”

SM2: “*Our teacher divided us into groups and gave us tasks and responsibilities (f). I liked the fun classroom environment. When I learned this way by discussing and consulting with my friends (d), I realized that I understood the subject better (e) and became happier...*”

SH2: “*With this application in science class, I realized that I could learn a subject independently (a). My self-belief and confidence have increased for my other courses as well (g). Nowadays, technology is used in everything. In this course, our interaction with technology increased (c). First, we learned the subject at home with the help of technological devices, and we reinforced the subject (h) with interactive videos at school...*”

The codes obtained from the answers to the question “What do you think is the contribution of FCM supported science teaching to the ability to take responsibility for learning?” by the students are presented in Table 5.

Table 5. *Findings about the contribution of FCM to learning responsibility skills*

Codes	SL1	SL2	SM1	SM2	SH1	SH2	f
a. Taking responsibility for learning	+	+	+	+	+	+	6
b. Information not readily available	+	+	+	+	+	+	6
c. Positive attitude toward homework	+	+	+	+	+	+	6
d. Ability to accomplish one's task	+	+	+	+	+	-	5
e. Confidence in the face of problems	+	-	+	-	+	+	4
f. Self-confidence boosting	+	+	+	-	+	-	4
g. The desire to explore comes to the fore	-	+	-	+	-	+	3

In Table 5, the students mainly stated that they took responsibility for learning (f=6) and that the information was not presented ready-made (f=6). They also stated that they developed a positive attitude towards homework (f = 6), their ability to perform their tasks (f = 5), their self-confidence increased (f = 4), and their desire to explore became more prominent (f = 3). Excerpts from the data obtained from the interviews conducted with the students on this subject are presented below.

SL2: *"In this activity, since the information was not given directly by the teacher in the course, we had to take responsibility for accessing the information (b). I saw that I could learn the subject independently by taking responsibility (a). This increased my self-belief and self-confidence (f)..."*

SM2: *"When I fulfilled my responsibility by watching the course videos (a), I became more active in the lesson (g), which increased my self-confidence (f)..."*

SH1: *"I think it increased my responsibility skills (a). My participation increased when I prepared for the subject, and my prejudices against science class were destroyed. Since this motivated me more, I started doing my homework more with pleasure (c)..."*

The codes obtained from the responds to the "What are the problems you encountered during the process of science teaching practices supported by the FCM?" question are given in Table 6.

Table 6. *Findings on the problems encountered during the implementation of the FCM*

Codes	SL1	SL2	SM1	SM2	SH1	SH2	f
a. Internet access problem	+	+	+	+	+	+	6
b. Pause in videos	+	+	+	+	+	+	6
c. EIN login error	+	+	+	+	+	+	6
d. Getting kicked out of the system while watching videos	+	-	+	+	+	+	5
e. Inability to ask questions	+	-	+	+	+	-	4
f. Crowded family environment	-	-	+	--	+	+	3
g. Distractibility	-	-	-	+	-	+	2

When Table 6 is examined, students stated that they had internet access problems (f = 6), received an error warning when logging into EBA (f = 6), and experienced technical difficulties while watching the videos (f = 5). They also stated that they experienced problems such as not being able to ask questions during the lecture (f = 4), noise caused by the crowded family environment (f = 3), and distraction (f = 2). Student opinions on this theme are given below.

SL1: *"There was a pause in some videos (b) because our internet connection was not working (a), and when we entered again, the system would give an error and would not open (c). This was a waste of our time..."*

SM1: *"Even though I watched the videos completely, I constantly received an incomplete warning (d). That is why I had to log in to EIN constantly (e)..."*

SH1: *"I had trouble watching the videos because I had younger siblings at home and did not have a study room (f). Voice and noise were distracting me, and I could not focus (g)..."*

Codes created through the responses to the “What are your favorite features of FCM supported science teaching practices?” question by the experimental group students are given in Table 7.

Table 7. Findings regarding the favorite features of FCM

Codes	SL1	SL2	SM1	SM2	SH1	SH2	f
a. Learning at home	+	+	+	+	+	+	6
b. Events/Games on EIN	+	+	+	+	+	+	6
c. Ability to repeat	+	+	+	+	+	+	6
d. Ability to collaborate	+	+	+	+	+	+	6
e. Technology supported learning	-	+	+	+	+	+	5
f. Convenience of accessing information	+	+	+	+	+	-	5
g. Failure to learn in case of illness	+	-	+	+	-	+	4
h. Prevents loss of time	-	+	+	-	+	-	3
i. Increasing course engagement	+	+	-	-	-	+	3

For the enjoyable aspects of the FCM, the students answered that they were able to learn at home (f=6), enjoy the activities/games on EIN (f=6), and offer the opportunity to do it again (f=6). In addition, being able to cooperate with friends in the classroom environment (f=6), using technology effectively in the lesson (f=5), not disrupting learning in case of illness (f=4), preventing loss of time (f=3), increasing engagement in the course (f=3) It was observed that they responded with their codes. Student opinions on this theme are given below.

SL2: “I was studying and learning my subject at home. Since there was much noise in the school environment, I realized I understood better when I learned at home. I liked working at home this way (a)...”

SM1: “I liked EIN's events, interactive games, and animations (b). While watching the videos, we could understand the subject with short videos, which prevented loss of time (h) and did not get bored (j)...”

SH2: “We had become intimate with technology (e). Since my favorite thing is to work on computers and tablets, these homework videos given by my teacher attracted my attention, and I fulfilled my responsibilities without getting bored...”

Discussion, Conclusion, and Recommendations

When the responsibility for learning scores of the groups were compared, a statistically significant difference was detected in favor of the experimental group after the implementation. This finding pointed out that the FCM implemented in the experimental group was effective on sixth-grade students' responsibility skills for learning. The result reveals that the learning process designed with the FCM effectively increases the ability to take responsibility for learning. This situation results from the students' preparation before the lesson, watching the e-learning videos on time every week, and complying with the classroom rules during the lesson's implementation of the FCM. In a study, the most striking feature of the FCM is that the responsibility for learning lies with the students (Medone, 2019). In another study, although students' responsibility for learning was seen as an essential advantage in applying the FCM, it was observed that the increased number of responsibilities caused some difficulties in the implementation process (Faretta, 2016). In this context, it was concluded that implementing FCM in the learning environment improves students' responsibility skills for learning and contributes to their personal development (Liu et al., 2023).

The results also uncovers that the FCM supported by science teaching implemented in the experimental group effectively affects sixth-grade students perceived self-regulation skills. In the national and international literature, there are studies showing that the FCM improves self-regulation skills (Eser, 2021; Shyr & Chen, 2018). Contrarily, some studies revealed that the FCM has no effect on students' self-regulation skills (Elakovich, 2018; Yıldırım, 2022). In their study, Yoon et al. (2021) ensured that students became aware of what should be achieved by participating in the pre-lesson phase to enhance self-regulation. It was determined that providing support to students to improve their self-regulation skills during the online learning phase of the FCM provides them with higher self-regulation

skills (Yoon et al., 2021). Thus, students were provided with learning environments with course videos that they could review at their own pace and master the process before the lesson so that they could take responsibility for learning by using their self-regulation skills.

In study, students' opinions on their FCM based science education experiences were also tried to be determined. In this context, students stated that the FCM helped them to learn the subject effectively and come to class prepared. They also stated that the FCM increased their academic success and self-confidence. In addition, they underlined that the course was interesting, that they studied in a fun classroom environment, and that they cooperated with their friends. On the other hand, students mentioned some problems, such as experiencing internet problems, receiving an error warning when logging, experiencing problems while watching videos, and distractions caused by a crowded family environment. In parallel with our findings, the FCM supported science teaching provides a positive attitude towards the lesson, the lessons are fun of practical learning, and students love the practices (Chin, 2023; Yanardağ, 2021). So, in FCM supported teaching, students take more responsibility (Bursa & Cengeli Kose, 2020).

As a result, it has been revealed that flipped learning activities on sound and their properties increase perceived self-regulation with responsibility for learning and positively impact student opinions regarding flipped learning-based science activities. In addition, it was understood that students who had a learning experience by participating in flipped learning-based science learning activities mostly viewed the learning environments as beneficial and described them as fun and instructive. However, it has been observed that students sometimes have difficulties accessing learning materials over the internet due to infrastructure problems. For this reason, in cases where students' learning responsibility and self-regulation skills are desired to be developed, it is recommended to include more flipped learning-based science activities, considering subject compatibility and student expectations. In addition, for the success of FCM activities, it is recommended that homework assignments are well determined, assignments suitable for student characteristics are selected, homework follow-up is carried out through an online system, if possible, students are allowed to communicate with each other and auxiliary materials such as instructions and worksheets are provided. Moreover, EFN-based activities are included in the FCM activities implemented within the scope of the study and it is recommended that the effects of FCM activities developed using educational technologies such as Edpuzzle, kahoot, Google classroom etc. be investigated. Furthermore, in this study, the flipped classroom model was applied to sixth grade students in the Science course "Sound and Its Properties" unit, and it is recommended that further research be conducted to show that the model is applicable in different classes and courses, as it will contribute to the literature.

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Appendixes

Appendix 1: Interview Questions

1. What are your thoughts about FCM practices?
2. What do you think the contributions of FCM supported science teaching are to the ability to take responsibility for learning?
3. What problems did you encounter during the FCM supported science teaching practices?
4. What did you enjoy most in the FCM supported science teaching practices?

Appendix 2: Implementation Stages in Groups

The experimental and control group implementations prepared within the scope of the “F.6.5.1.1. Predicts the environments in which sound can spread and tests its predictions” outcome (MoNE, 2018) are given in the tables below.

Experimental Group

Introduction	Before starting the implementation, the students were informed about the FCM. For the experimental group students, the course videos of the FCM they were required to watch outside the classroom were conducted through the EBA application. In this context, students with access to the internet and digital tools (computer, phone, tablet, etc.) can watch the course videos sent by the teacher using their own EBA accounts. Classroom arrangements were made for students who have limited internet access and they were allowed to watch course videos by logging into EBA via a smart board. Thus, the problem of students being unable to watch videos before class was eliminated.
Inquiry	A few questions were asked during the lesson to check whether the students watched the video. After considering the answers to the questions, the necessary materials were prepared to conduct experiments on the subject. The students were divided into four groups, each preparing their experimental setups. First, the students were asked to fill the experimental tub with water. They were then asked to place the ruler on the bathtub, fix it, and touch the ruler lightly. As a result of the experiment, it was observed that waves were formed as a result of the vibration coming from the ruler. With this experiment, it was deduced that sound is created as a result of vibration and spreads in waves.
Evaluation	At this stage, students were asked to think about the environments in which sound can spread, give an example for each state of matter, and write them in their notebooks. Necessary feedback was provided to the answers given by the students.

Control Group

Introduction	At this stage, the teacher conveyed some questions to students: “Does sound pass through walls?”, “Can Sea creatures hear sounds?”, “Would it be possible to hear conversations in space?”. Thus, an attempt was made to activate students’ prior knowledge regarding the subject.
Exploration	Before starting the activity, the teacher asked students, “Why don’t we hear the explosion sounds in the sun?”. After taking the students’ opinions, the audio recording made by NASA’s new generation spacecraft Perseverance on Mars was played to the students. After the audio recording was listened to by the students, the teacher asked questions to the students. These questions were “Although no sound can be heard in space, how did the Perseverance spacecraft manage to record the sound of Planet Mars?” and “How was this recorded sound sent to Earth?”. Students wrote the answers to these questions in their notebooks. Then students required to share their responses with the class. Finally, students gave examples of the transmission of sound.
Explanation	The teacher helps to structure basic concepts through teaching methods such as lecture, discussion, and question-answer. The activities proving that solids and liquids transmit sound, on page 165 of the textbook, were done by forming heterogeneous groups of 3-4 students, and the course ended by answering the questions under the activities together with the students. At the beginning of the second lesson, after the students understood that solid, liquid, and gaseous environments transmit sound, they were asked whether sound spreads in space and whether space is a material medium, and their answers were received. It was then stated that sound would not spread because space is not a material medium. Finally, the question “Does Sound spread in Space?” was asked on the smart board. The video of the experiment was shown to the students.
Elaboration	The activity on page 166 in the textbook was carried out so the teachers could relate the objectives that the students learned in the course to daily life.
Evaluation	At this stage, teacher asked questions to check the learnings about sound transition in the material medium. These questions are: “How does sound spread?”, “In which medium does sound spread the fastest?”, “Is a material medium necessary for sound to spread?”. Students’ answers to these questions were received. Feedback was given to the students’ answers by the teacher. The course process was implemented in the following weeks, as in the first week.

Pre-service Teachers' Views on Teaching Practice Experiences

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Abstract

This study was conducted based on a qualitative research design. The data were collected through a questionnaire form prepared by the researcher and analyzed using the descriptive analysis method. The study group of the research consisted of a total of 6 pre-service teachers, 5 female and 1 male students, who were attending the 4th grade in the fall semester of the 2024-2025 academic year at Ankara University, Faculty of Educational Sciences. The opinions of the pre-service teachers about the course planning and implementation processes were collected under certain categories and themes and interpreted by supporting them with direct participant views. The data obtained in this framework were grouped into 4 categories; (1) presentation style, (2) participation and interaction, (3) making sense of and relating what was learned, (4) evaluation and reinforcement. The findings of the study showed that pre-service teachers used various teaching methods and techniques (question-answer, group work, drama, etc.) in their course presentations and effectively integrated technology and whiteboard for different purposes. In addition, it was found that they frequently used strategies such as ensuring students' active participation in the lesson, maintaining interest and curiosity, and conducting group work. In the process of making sense of what was learned, approaches such as reminding previous knowledge and associating it with daily life came to the fore, while in the process of evaluation and reinforcement, it was determined that they used various measurement tools, homework and research tasks. The results obtained show that pre-service teachers adopt a student-centered and interactive teaching approach. In line with these results, it can be recommended to increase practice-based studies in teacher education programs.

Keywords: Pre-service teachers, teaching practice, teaching experience, pre-service teachers' views.

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Öğretmen Adaylarının Öğretmenlik Uygulaması Deneyimlerine Yönelik Görüşleri

Makale Türü	Başvuru Tarihi	Kabul Tarihi
Araştırma	24.05.2025	20.07.2025

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Öz

Bu araştırmanın amacı, öğretmen adaylarının öğretmenlik uygulaması deneyimlerine yönelik görüşlerini belirlemektir. Nitel araştırma desenine dayalı olarak yürütülen bu çalışmada veriler, araştırmacı tarafından hazırlanan anket formu ile toplanmış ve betimsel analiz yöntemiyle çözümlenmiştir. Araştırmanın çalışma grubunu; Ankara Üniversitesi Eğitim Bilimleri Fakültesi'nde, 2024-2025 Eğitim Öğretim yılı güz yarıyılında 4. sınıfa devam eden, 5 kadın ve 1 erkek öğrenci olmak üzere toplam 6 öğretmen adayı oluşturmaktadır. Öğretmen adaylarının dersi planlama ve uygulama süreçlerine ilişkin görüşleri belirli kategoriler ve temalar altında toplanmış, doğrudan katılımcı görüşleriyle desteklenerek yorumlanmıştır. Bu çerçevede elde edilen veriler, belirlenen 4 kategoride gruplandırılmıştır; (1) sunum biçimi, (2) katılım ve etkileşim, (3) öğrenilenleri anlamlandırma ve ilişkilendirme, (4) değerlendirme ve pekiştirme. Araştırma bulguları, öğretmen adaylarının ders sunumlarında çeşitli öğretim yöntem ve tekniklerini (soru-cevap, grup çalışması, drama vb.) kullandıklarını, teknoloji ve yazı tahtasını farklı amaçlarla etkin biçimde bütünleştirdiklerini göstermiştir. Ayrıca, öğrencilerin derse aktif katılımını sağlama, ilgi ve merakı sürdürme, grup çalışmaları yapma gibi stratejilere sıklıkla başvurdukları tespit edilmiştir. Öğrenilenleri anlamlandırma sürecinde önceki bilgileri hatırlatma ve günlük yaşamla ilişkilendirme gibi yaklaşımlar ön plana çıkarken, değerlendirme ve pekiştirme sürecinde çeşitli ölçme araçları, ödev ve araştırma görevlerini kullandıkları belirlenmiştir. Elde edilen sonuçlar, öğretmen adaylarının öğrenci merkezli ve etkileşimli öğretim anlayışını benimsediklerini göstermektedir. Bu bulgular doğrultusunda öğretmen eğitimi programlarında uygulamaya dayalı çalışmaların artırılması önerilebilir.

Anahtar Sözcükler: Öğretmen adayları, öğretmenlik uygulaması, öğretmenlik deneyimi, öğretmen adaylarının görüşleri.

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Introduction

Teaching practice is an essential component of teacher education programs, aiming to bridge the gap between theory and practice. For pre-service teachers, the teaching practice provides them the opportunity to use their theoretical knowledge in practice and supports their professional development significantly. This process enables pre-service teachers to gain experience in key areas such as classroom management, student interaction, lesson design and teaching strategies (Kagan, 1992). Teaching practice also allows pre-service teachers to observe the real situations they encounter in the education and training process and to develop solutions. Thus, it contributes to shaping their future teaching approaches (Borko, 2004). Moreover, their experiences in the practicum process help pre-service teachers to better evaluate themselves and improve their professional skills (Hammerness, 2006).

Course planning is an important professional skill for pre-service teachers. The lesson plan serves as a guide for the teacher to determine the strategies to be applied to achieve educational goals and to organize each stage of the lesson in a systematic way (Tomlinson, 2001). Through the process of lesson planning, pre-service teachers are able to adapt the content of the lesson to the needs of the students and ensure that the teaching process proceeds efficiently. Lesson planning also gives pre-service teachers the opportunity to analyze the different factors they need to consider when making instructional decisions. This is an important step that prepares them for teaching practice (Richards & Rodgers, 2014).

An effective learning-teaching process is directly related to the teacher's pedagogical skills, classroom management and effective use of teaching materials (Shulman, 1987). Pre-service teachers' utilization of tools and materials during course presentations plays a critical role in keeping student interest alive while increasing the comprehensibility of the lesson (MoNE, 2018). The blackboard, a traditional teaching tool, both allows the teacher to visualize the subject and helps students focus their attention (Gagne, Briggs, & Wager, 1992). However, today, the integration of educational technologies into lessons provides content that is more appropriate to students' individual learning needs and makes the learning process more effective (Higgins, Xiao, & Katsipataki, 2012). The use of technological tools provides students with different learning environments, increases their interest in the lesson and encourages their active participation.

Ensuring students' active participation in the lesson is an important factor in increasing their academic achievement (Prince, 2004). Strategies used by pre-service teachers to create effective learning environments include question-answer techniques, discussions, drama and group work. In particular, group work contributes to the development of students' critical thinking and problem solving skills by encouraging collaborative learning (Johnson & Johnson, 1999). In addition, the questions posed by the teacher to the students during the lesson ensure their active participation in the lesson, while associating the subject with previous learning and daily life makes the information more meaningful (Ausubel, 1968). In order for students to be more involved in the learning process, the lesson should be organized in a way to attract their interest and should be supported by various teaching methods, techniques and materials (Ormrod, 2016). In addition, teachers' giving appropriate feedback to students supports their academic development and makes learning processes more effective (Hattie & Timperley, 2007).

Effective classroom management is one of the main factors determining the success of teaching. Effective classroom management ensures that the teaching process proceeds in an organized and efficient manner and increases students' motivation and participation (Marzano, Marzano, & Pickering, 2003). The rules that the teacher establishes in the classroom, the teaching strategies he/she applies and the communication he/she establishes with the students directly affect the success of classroom management (Wong & Wong, 2009). A safe and supportive learning environment in the classroom helps students to express themselves comfortably and actively participate in the lesson process. In this context, it is of great importance for pre-service teachers to gain experience in classroom management in order to improve their professional competencies.

One of the important stages of the teaching process is summarizing and evaluating at the end of the lesson. This process, which allows students to consolidate what they have learned and organize their knowledge better, also helps teachers to identify students' deficiencies and adapt their teaching methods

accordingly (Black & Wiliam, 1998). In addition, directing students to research and following up on assignments supports their more active participation in the learning process and improves their independent learning skills (Zimmerman, 2002). Regularly checking the homework assignments to reinforce the knowledge acquired by the students in the course increases the importance they attach to the learning process and contributes to their sense of responsibility.

Student teachers' teaching practice experiences play a critical role in their professional development. This process provides pre-service teachers with the opportunity to apply their theoretical knowledge in practice. Thus, they improve their ability to apply what they have learned about teaching strategies, classroom management and student interaction (Kagan, 1992). The process of preparing and implementing lesson plans enables pre-service teachers to gain important skills in achieving instructional goals, taking into account student needs and organizing the teaching process (Tomlinson, 2001). These skills constitute the basic building blocks of pre-service teachers' professional development and prepare them better equipped for the teaching profession (Richards & Rodgers, 2014). Lesson plans prepared and implemented during the teaching practicum process enable pre-service teachers to gain the skills necessary for self-evaluation and continuous development (Borko, 2004).

Pre-service teachers' views on lesson planning and implementation are critical for their professional development (Grossman, 1990). Based on this idea, the purpose of this study is to determine the opinions of pre-service teachers about their teaching practice experiences. In line with this purpose, answers to the following questions were sought:

- 1) What are the pre-service teachers' preferences for the presentation style of the course?
- 2) What do pre-service teachers do to ensure student participation and interaction?
- 3) What do pre-service teachers do to make sense of and relate what is learned?
- 4) What do pre-service teachers do at the end of the course to evaluate and reinforce what has been learned?

Method

Research Model

This study is a qualitative research and descriptive analysis was used to analyze the data obtained in the research. In descriptive analysis, it is aimed to organize and interpret the data within the framework of certain themes (Yıldırım & Şimşek, 2021). This analysis method involves systematically categorizing, interpreting and describing the data obtained based on the research questions (Patton, 2015). In descriptive analysis, the researcher organizes the data according to predetermined themes, supports them with direct quotations and ensures that the findings are presented in a meaningful integrity (Miles & Huberman, 1994).

Study Group

The study group of the research consists of a total of 6 pre-service teachers, 5 female and 1 male students, who are attending the 4th grade in the fall semester of the 2024-2025 academic year at Ankara University, Faculty of Educational Sciences. The study group of the research was formed by easily accessible case sampling, one of the purposeful sampling methods. This sampling method provides speed and practicality to the research. Because in this method, the researcher selects a situation that is close and easy to access (Yıldırım & Şimşek, 2000).

Research Instruments and Procedures

In this study, a questionnaire prepared by the researcher was used to evaluate pre-service teachers' teaching practice experiences. There are 4 open-ended questions in the questionnaire. The opinions of two field experts were taken and it was decided to remove 2 questions from the questionnaire. The questionnaire was given after the pre-service teachers prepared and implemented 6 lesson plans in the practicum school where they went for teaching practice. The pre-service teachers were asked to answer the questions in the printed questionnaire by considering the 6 lesson plans they prepared and implemented. The answers of the pre-service teachers to the questions in the questionnaire were analyzed by descriptive analysis method.

The descriptive analysis process generally consists of four basic stages: (1) coding the data in line with the thematic framework, (2) collecting the coded data under the determined categories and themes, (3) describing the findings in a clear and systematic way, and (4) interpreting and evaluating the results obtained within the framework of the existing literature (Creswell, 2013). In this process, the researcher aims to convey the views of the participants as transparently and objectively as possible and includes direct quotations to support their interpretations (Merriam, 2009). Descriptive analysis increases the reliability of research results by ensuring that the findings are better understood by readers (Büyükoztürk, Çakmak, Akgün, Karadeniz & Demirel, 2017).

In this study, using the descriptive analysis method, pre-service teachers' views on the planning and implementation processes of the course were collected under certain categories and themes, and interpreted by supporting them with direct participant views. In this framework, the data obtained in this study were grouped under 4 categories. The categories are; (1) presentation style, (2) participation and interaction, (3) making sense of and associating what is learned, (4) evaluation and reinforcement.

Results

In this section, the answers given by the pre-service teachers participating in the research to the questions prepared in line with the purpose of the research have been presented and interpreted in tables and figures and examples of the students' opinions are given.

1) What are pre-service teachers' preferences for the way the course is presented?

The distribution of the 4 themes identified under the category of “presentation style” is shown in Figure 1:

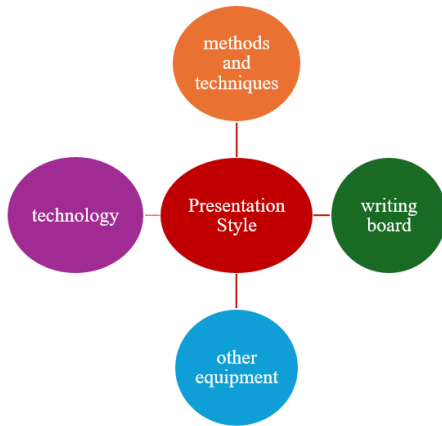


Figure 1. Distribution of themes identified under the category of “presentation style”

The distribution of pre-service teachers' preferences for the presentation style of the course is presented in Table 1:

Table 1. The distribution of pre-service teachers' preferences for the presentation style of the course

Themes	Preferences for Presentation Style
Methods and techniques	Question and answer (6), discussion (3), group work (3), drama (3), lecture (3), educational game (3), concept cartoon (2), brainstorming (2), animation (2), case study (2), six-hat thinking (1), opinion development (1), mind map (1).
Technology	Smart board (6), interactive application tools (5), educational videos (4), animation (1).
Writing board	I used the blackboard (2) - I used the blackboard a little (4) To write important information and key concepts (4), to solve problems (3), to summarize the lesson (2), for students to write examples (2), to draw visuals (1).
Other equipment	Worksheet (5), colored visuals (5), concrete materials (cardboard cups, sticks, etc.) (4).

The findings of the study show that pre-service teachers utilized various methods, techniques and tools in the presentation of the lesson. In terms of methods and techniques, the most frequently used method was question-answer technique (n=6). This shows that pre-service teachers used questioning to increase student participation and interaction (Black & Wiliam, 1998). In addition, methods such as discussion, group work, drama and lecture (n=3) were also preferred. These methods are strategies that support students' active participation in the lesson process and make learning more permanent (Prince, 2004). However, the fact that techniques such as six-hat thinking, opinion development and mind mapping (n=1) were less preferred may suggest that pre-service teachers do not feel confident enough in using alternative teaching strategies (Marzano et al., 2003).

In terms of technology use, smart board (n=6) and interactive applications (n=5) were the technological tools that pre-service teachers utilized the most in their course presentations. This shows that digital technologies enable lessons to become interactive and preservice teachers use these tools effectively for pedagogical purposes (Higgins, Xiao & Katsipataki, 2012). Educational videos (n=4) also occupied an important place, which may reflect the aim of supporting students' visual and auditory learning channels (Mayer, 2009). However, the low use of animation (n=1) suggests that pre-service teachers may have limited experience in utilizing more advanced digital content.

Regarding the use of the blackboard, the majority of the pre-service teachers stated that they used the blackboard a little bit (n=4), while only two of them stated that they actively used the blackboard (n=2). The most common purpose of using the blackboard was to write important information and key concepts (n=4). In addition, it was also used for problem solving (n=3), summarizing the lesson (n=2) and students writing examples (n=2). This shows that pre-service teachers generally see the blackboard as an explanatory and supportive tool, but they may need more experience in using it effectively (Shulman, 1987).

In terms of other materials, worksheets (n=5) and colored visuals (n=5) were frequently used by pre-service teachers. The preference of these materials points to the aim of supporting learning by providing concrete examples to students (Ormrod, 2016). The use of concrete materials (n=4) can be considered as a preferred strategy to enable students to better comprehend subjects, especially in courses such as science and mathematics (Gagne, Briggs & Wager, 1992).

It is seen that pre-service teachers try to diversify their lessons by using different methods, techniques and tools in their course presentations. However, there is room for improvement, especially in the effective use of whiteboards, utilizing advanced digital tools and using more creative teaching techniques. This suggests that more experience in instructional strategies can increase pre-service teachers' professional competencies (Wong & Wong, 2009).

Some examples of pre-service teachers' statements regarding the themes under the category of "presentation style" are as follows:

"I used tools for game-based learning. I think these methods attract children's attention and make learning processes fun." (P1)

"I did not use the blackboard often. I usually used the smart board to avoid wasting time. When I put the students up on the board, they used it more. Sometimes when I needed to write something on the board, I would write it down before the lesson started and have it ready. Sometimes I would write the point I wanted to emphasize in a few words on the board while lecturing." (P3)

Primary school 4th grade students are in the process of transitioning from the concrete operational period to the abstract operational period. Concrete materials are needed for some subjects to be realized and explored. For this reason, I tried to use concrete materials while presenting the lesson. (P4)

"I don't think I used the blackboard effectively. I used it only because I had to make a lecture using numbers during the lecture phase of the math lesson." (P5)

2) What do pre-service teachers do to ensure student participation and interaction?

The distribution of the 3 themes identified under the “participation and interaction” category of the research is shown in Figure 2:



Figure 2. Distribution of themes identified under the category of “participation and interaction”

The distribution of what pre-service teachers did to ensure students' participation and interaction is presented in Table 2:

Table 2. Distribution of what pre-service teachers did to ensure students' participation and interaction

Themes	Practices to ensure student participation and interaction
Ensuring active participation	Question and answer (4), discussion (3), playing games (3), drama (3), giving each student the right to speak (2), preparing a poster (1).
Maintaining interest and curiosity	Engaging activities (5), asking interesting questions (4), educational video (3), giving examples from daily life (3), performing physical movements (2).
Doing group work	To reinforce the topic (4), to summarize (3), to enable peer learning (2).

The data obtained under the category of “participation and interaction” show that pre-service teachers used various strategies to increase students' participation and interaction in the lesson. These strategies were categorized under three main themes: ensuring active participation, maintaining interest and curiosity, and group work.

Question-answer ($n=4$), discussion ($n=3$), game playing ($n=3$) and drama ($n=3$) were the most frequently preferred methods under the theme of ensuring active participation. This finding shows that pre-service teachers aim to involve students as active participants in the process instead of keeping them only as listeners. Especially question-answer and discussion methods are effective strategies that encourage students to think, express their ideas and interact (Black & Wiliam, 1998). In addition, student-centered practices such as giving each student a voice ($n=2$) and making posters ($n=1$) support individual participation and active involvement in learning (Slavin, 2014). These practices play an important role in creating a democratic classroom environment and a positive learning climate.

Under the theme of sustaining interest and curiosity, the most common strategy used by pre-service teachers was organizing interesting activities ($n=5$). This shows that special importance is given to making the lesson meaningful and motivating for students. In addition, methods such as asking attention-grabbing questions ($n=4$), using educational videos ($n=3$), and making connections with daily life ($n=3$) are effective tools that keep students mentally engaged in the lesson and make them participate more willingly in the learning process (Mayer, 2009; Ormrod, 2016). Making bodily movements ($n=2$)

stands out as an adaptive and remarkable strategy for kinesthetic learners. This diversity reveals that pre-service teachers tend to consider different learning styles (Gardner, 2006).

Within the scope of the theme of doing group work, pre-service teachers used group activities to reinforce the subject (n=4), summarize (n=3) and support peer learning (n=2). Group activities develop students' skills of cooperation, thinking together and learning from each other (Johnson & Johnson, 1999). The fact that pre-service teachers see such activities not only as a means of socialization but also as a means of achieving learning goals shows that they approach the structured teaching approach.

In general, these findings show that pre-service teachers use a variety of methods to ensure student participation and interaction, adopt a student-centered approach and develop strategies for different learning needs. However, the more limited use of some strategies also reveals that pre-service teachers need to explore and diversify differentiated teaching techniques.

Some examples of pre-service teachers' statements regarding the themes under the category of “participation and interaction” are as follows:

“In order to ensure students' active participation in the lesson, I asked students various questions in line with the visuals I found or the visuals I prepared in the attention drawing phase. In the explanation phase, after completing the subject expression, I asked students to give various examples about the subject I explained.” (P4)

“I took care to give each student the right to speak, I took care to prepare activities that would attract their interest. Thus, their enthusiasm for the lesson increased more. I included games in which they could actively participate.” (P2)

“In order to maintain students' interest and curiosity in the subject throughout the lesson, I asked them various interesting questions at different stages of the lesson.” (P6)

3) What do pre-service teachers do to make sense of and relate what they have learned?

The distribution of the 2 themes identified under the category of “making sense of and relating what is learned” is shown in Figure 3:

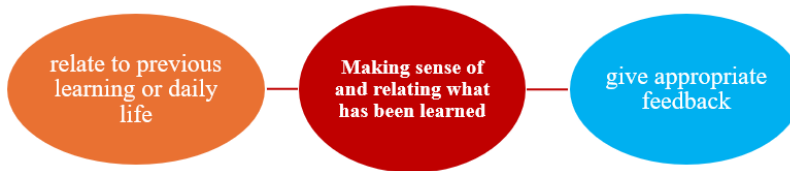


Figure 3. *Distribution of the themes identified under the category of “Making sense of and relating what is learned”*

The distribution of what pre-service teachers did to make sense of and relate what they learned is presented in Table 3:

Table 3. *The distribution of what pre-service teachers did to make sense of and relate what they learned*

Themes	Practices for making sense of or relating what has been learned
Relating to previous learning or daily life	Reminding the students about the subjects previously covered in the lesson (4), associating the subject with what they have learned in other lessons (3), asking questions about their own lives (3), asking them to give examples from their own lives (2).
Giving appropriate feedback	Giving verbal feedback (6), giving feedback through body language (4), giving written feedback (1)

The data obtained under the category of “making sense of and relating what has been learned” show that pre-service teachers try to support students' making sense of new information by making connections with both their previous learning and daily life. In addition, it is seen that feedback giving behaviors, which is another important element supporting this process, are also carefully implemented.

In the context of the first theme, associating with previous learning or daily life, the most frequently used strategy by the pre-service teachers was reminding the previously covered topics (n=4). This strategy is an important teaching technique that supports the permanence of learning and the establishment of cognitive connections (Ausubel, 1968). In addition, practices such as associating the subject with information learned in other courses (n=3), asking questions about their own lives (n=3) and asking students to give examples from their own lives (n=2) facilitate students' integration of new information into their own lives and contribute to the realization of meaningful learning (Bransford, Brown & Cocking, 2000). Such associations enable the activation of the schemas present in students' cognitive structures and enrich the learning process (Ormrod, 2016).

Regarding the second theme, giving appropriate feedback, it is seen that pre-service teachers mostly used verbal feedback (n=6). Verbal feedback enables students to realize their mistakes and make necessary corrections by receiving instant feedback (Hattie & Timperley, 2007). In addition, the fact that non-verbal communication methods such as giving feedback with body language (n=4) were also taken into consideration reveals that pre-service teachers show versatility in their communication skills. However, the low rate of written feedback (n=1) indicates that pre-service teachers may need to improve their ability to provide more permanent and detailed feedback.

When evaluated in general, it is seen that pre-service teachers adopt student-centered approaches such as making connections with students' background and associating with personal experiences in order to make learning meaningful. In addition, feedback practices that supportively guide students in the learning process are also used as an important component of the teaching process. However, it can be said that more guidance and practice opportunities should be provided for pre-service teachers for more widespread and effective use of written and structured feedback methods.

Examples of some of the pre-service teachers' statements regarding the themes under the category of “making sense of and associating what is learned” are as follows:

“At the beginning of each lesson, I took care to make connections with previous learning. For example, while teaching addition in mathematics, I gave concrete examples by associating it with experiences in students' daily lives such as shopping and sharing.” (P1)

For example, while teaching a text in the Turkish lesson, I related it to the subject of the benefits of using resources sparingly for the household budget in the Life Science lesson. I gave examples of problems they might encounter at school and at home. (P2)

“Have you ever seen this before? Does it have a place in your life? Have you ever witnessed such an event before?” (P3)

4) What do pre-service teachers do at the end of the course to evaluate and reinforce what they have learned?

The distribution of the 2 themes identified under the category of “evaluation and reinforcement” is shown in Figure 4:



Figure 4. Distribution of themes identified under the category of “evaluation and reinforcement”

The distribution of what pre-service teachers did to evaluate and reinforce what they learned at the end of the course is presented in Table 4:

Table 4. *The distribution of what pre-service teachers did to evaluate and reinforce what they learned at the end of the course*

Themes	Practices for evaluating and reinforcing what has been learned
Evaluation	Asking questions (5), using digital tools (5), using worksheets (4), self-assessment (3), peer assessment (2)
Reinforcement	Giving homework (5), doing group work (3), directing to research (3)

The findings obtained under the category of “assessment and reinforcement” show that pre-service teachers used various strategies to measure and evaluate students' learning at the end of the course and to increase retention. The data revealed that both traditional and innovative assessment approaches were integrated into teaching processes.

When the assessment theme was analyzed, the most common methods used by pre-service teachers were asking questions (n=5) and using digital tools (n=5). Asking questions stands out as an effective and practical method for quickly probing students' understanding of concepts (Black & Wiliam, 1998). In addition, the use of digital assessment tools (e.g., Kahoot, Mentimeter, Google Forms) shows that pre-service teachers are open to interactive assessment methods with technology. This is a positive trend in terms of the integration of technology into learning-teaching processes in today's classroom environments.

The use of worksheets (n=4) provides the opportunity to observe students' comprehension skills at the individual level, while self-assessment (n=3) and peer assessment (n=2) stand out as student-centered assessment strategies that increase students' awareness of the learning process and support their self-regulation skills (Andrade, 2010). These strategies enable students to actively participate in the learning process not only through the teacher's observation but also through their own and their peers' evaluations.

The data obtained under the theme of reinforcement revealed that pre-service teachers most frequently used the method of giving homework (n=5) to make the learned information permanent. Homework supports the continuity of learning by enabling students to continue learning outside the classroom (Cooper, 2001). In addition, group work (n=3) both supports cooperative learning and reinforces the subjects. Research orientation (n=3) is very important in terms of developing students' higher-order thinking skills, questioning information and in-depth learning (Kuhlthau, Maniotes & Caspari, 2007).

It is seen that pre-service teachers use various and balanced methods in assessment and reinforcement processes; they use both classical and contemporary practices together to monitor students' participation and learning. However, the limited proportion of written and structured assessment methods shows that the depth of practices in this area can be increased. In addition, supporting practices that encourage students to become researchers, such as directing them to research, can be considered as an area of development in line with the contemporary educational approach.

Examples of some of the statements of pre-service teachers regarding the themes under the category of “making sense of and associating what is learned” are as follows:

“In some lessons, I did this by distributing the worksheet I prepared to the students. In some lessons, I did this by opening the fun games I prepared on the smart board and giving the floor to different students.” (P4)

“After covering the topic, I gave students an assignment to understand the differences between different needs and wants. I asked students to research the prices of various products they encounter in their daily lives and evaluate which needs these products meet.” (P1)

“In the Science lesson on magnets, I asked them to investigate in which areas magnets are used.” (P5)

“I asked the students to research the prices of various products they encounter in their daily lives and determine which needs these products meet.” (P3)

Discussion, Conclusion and Recommendations

In this study, pre-service teachers' experiences in the dimensions of (1) presentation style, (2) participation and interaction, (3) making sense of and relating what has been learned, (4) evaluation and reinforcement were examined. The findings show that pre-service teachers develop various pedagogical strategies for classroom practices during the professional development process, but there are limitations in some dimensions of these strategies.

In the study, it was observed that student-centered techniques such as question-answer, discussion, group work, drama and lecture were the most frequently preferred methods and techniques in the course presentations of pre-service teachers. This finding indicated that active learning approach is adopted by pre-service teachers. Indeed, Bonwell and Eison (1991) emphasize that student-centered methods are effective in increasing deep learning and participation. This result shows that teaching approaches that prioritize students' active participation in the lesson are developing. Studies conducted abroad also show a similar tendency. For example, Darling-Hammond and Bransford (2005) emphasize that effective teachers prioritize collaborative learning and problem solving skills in classroom practices. However, techniques targeting higher-order thinking such as concept cartoons, mind maps, and six-hat thinking are used in a more limited number. This suggests that pre-service teachers need more guidance in recognizing and applying various techniques.

The findings related to the use of technology showed that pre-service teachers commonly use smart boards, interactive digital tools and educational videos in course presentations. This result shows that the integration of technology into the teaching process is increasing and that pre-service teachers make conscious choices in this regard. This finding shows that technology-supported teaching has become widespread among pre-service teachers. This is in line with 21st century teacher competencies (ISTE, 2017). However, the use of technology is generally limited to the presentation or attention-grabbing stage, and is used less in higher level processes such as assessment or guiding research. On the other hand, the question of how effectively technology is used for pedagogical purposes is important.

One of the striking findings of the study is that the blackboard is still seen as an important tool in the teaching process and is used especially for writing key concepts, solving problems and summarizing the lesson. This finding shows that traditional tools have not lost their impact, but their functionality has changed. In similar studies conducted abroad, for example, Miller and Glover (2010) state that interactive whiteboards are particularly effective in supporting visual learning styles and that traditional whiteboards are still important for teaching. On the other hand, it was found that tools such as colored visuals, concrete materials and worksheets were frequently preferred to support teaching. This reflects the role of diversity in the use of materials to support learning (Mayer, 2009).

It is seen that pre-service teachers applied various strategies to ensure students' active participation and interaction in the lesson, among which methods such as question-answer, educational games and dramatization stand out. This shows that student-centered teaching approach is adopted. The use of multi-sensory approaches such as attention-grabbing questions, daily life examples and physical movements in order to maintain students' interest and curiosity are pedagogical preferences that will contribute to the permanence of learning. This finding is in line with the "interest" and "association" dimensions of Keller's ARCS motivation model (1987). These findings point to effective strategies for increasing motivation and maintaining learner interest (Ryan & Deci, 2000). However, the fact that practices such as giving each student the right to speak and preparing posters were less preferred indicates that there is room for improvement in diversifying participation.

It was observed that the pre-service teachers used methods such as associating the subject with previous learning and making connections with daily life in order to make sense of and relate what was learned. In this context, it is understood that pre-service teachers directed students to use their knowledge actively in accordance with the constructivist teaching approach (Brooks & Brooks, 1999). In addition, the preference for verbal and body language feedback in giving appropriate feedback shows that communication skills have improved. Nicol and Macfarlane-Dick (2006) emphasize that effective feedback improves learners' self-regulation skills. However, the fact that written feedback is limited suggests that more awareness should be developed on this issue. Especially the prominence of verbal

and body language feedback behaviors shows how central effective communication is in the classroom environment.

At the end of the course, it was determined that pre-service teachers frequently used questioning, digital assessment tools and worksheets for the assessment and reinforcement process. The use of contemporary assessment and evaluation approaches such as self-assessment and peer assessment is an important development in terms of supporting the learning process (Black & Wiliam, 2009). Reinforcement strategies such as assigning homework and directing students to research are also frequently preferred, indicating a tendency to deepen students' learning. This diversity shows that different methods are blended in the assessment process (Black & Wiliam, 2009). These findings reflect the efforts to ensure the retention of the information learned.

The results of the study showed that pre-service teachers developed many strengths in the teaching process; however, they had difficulties in preparing creative activities, adapting to different types of plans and considering students' individual differences. This finding points to the importance of increasing the supportive structures for practice in teacher education programs.

In line with the data obtained in the study, the following suggestions may be made:

- More applied studies can be conducted for pre-service teachers to learn different methods and techniques more effectively.
- In the use of technology, trainings can be provided on digital tools that support high-level skills such as evaluation and research, not just attention-grabbing.
- Guidance can be provided on creative strategies and differentiated instructional techniques to increase student engagement and interest.
- Practical trainings on feedback types can be provided; effective use of body language, verbal and written feedback can be supported.
- In future studies, comparative analyses of pre-service teachers from different branches can be conducted.

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Teaching Turkish as a Second Language: Research Trends, Results, and Future Perspectives*

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Abstract

The present study reviewed research on teaching Turkish as a second language in primary schools in Türkiye using a descriptive approach. A total of 127 articles and postgraduate theses were analyzed through descriptive content analysis, with discussions about research “trends” and “results” for each study. The findings indicated that the number of publications rose in 2020, 2021, and 2023, and the studies primarily aimed to determine the current status of teaching Turkish as a second language in primary schools. These studies were conducted using qualitative research methods; the study groups included teachers, and data were collected through interviews and analyzed using content analysis. Most studies did not examine a specific language skill but focused on educational environments, characteristics of teachers and students, and innovative methods. Results of the studies were categorized as structural and functional concerning educational environments, teacher and student characteristics, and innovative approaches and methods. The present study's findings were discussed based on the literature, and several recommendations were provided for future research.

Keywords: Second language teaching, Turkish language instruction, research trends, descriptive content analysis.

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İlkokullarda İkinci Dil Olarak Türkçe Öğretimi: Araştırma Eğilimleri, Sonuçlar ve Gelecek Perspektifleri*

Makale Türü	Başvuru Tarihi	Kabul Tarihi
Araştırma	27.01.2025	30.07.2025

Fisun Güngör Yereyıklmaz**

Mediha Güner Özer***

Öz

Bu çalışmada, Türkiye’de ilkokul düzeyinde ikinci dil olarak Türkçe öğretimine yönelik çalışmalar betimleyici bir perspektifle incelenmiştir. Bu doğrultuda 127 araştırma makalesi ve lisansüstü tez betimsel içerik analizi yöntemiyle analiz edilmiş, çalışmalar “eğilimleri” ve “sonuçları” açısından ayrı ayrı ele alınmıştır. Bulgular; araştırmaların 2020, 2021 ve 2023 yıllarında arttığını; genellikle mevcut yapıyı belirlemeye odaklandığını, nitel araştırma yöntemlerinin, öğretmenlerden oluşan çalışma gruplarının, veri toplama aracı olarak görüşme yönteminin, veri analizinde ise içerik analizinin sıklıkla tercih edildiğini göstermektedir. Araştırmaların çoğunluğunda belirli bir dil becerisi ele alınmamış, konular ise eğitim ortamları, öğretmen ve öğrenci özellikleri ile yenilikçi yöntemlere yoğunlaşmıştır. Araştırmaların sonuçları ise eğitim ortamlarının yapısı ve işleyişine ilişkin sonuçlar, öğretmen ve öğrenci özelliklerine ilişkin sonuçlar ve yenilikçi yaklaşım ve yöntemlere ilişkin sonuçlar olmak üzere üç başlık altında toplanmıştır. Sonuçlar, mevcut literatür ışığında tartışılmış ve alanın geleceğine yönelik öneriler getirilmiştir.

Anahtar Sözcükler: İkinci dil öğretimi, Türkçe öğretimi, araştırma eğilimleri, betimsel içerik analizi.

* Bu çalışma, 2024 yılı Ağustos ayında “Uluslararası Eğitim Kongresi” nde sözlü olarak sunulmuştur.

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Introduction

The Transformation of Turkish Language Instruction in Türkiye Due to Migration

Globalization has transformed political, economic, and social structures, and migration has become a vital issue worldwide. Türkiye has emerged as a transit country for several nationals, primarily Syrians, who became refugees due to the civil war that began in 2011. In addition to the need for a safe haven and other essential requirements, the educational needs of the refugees have become increasingly important. As temporary foreign students in Türkiye transition to permanence, teaching Turkish as a second language and related studies is vital for both foreign students and the education system. Migration has influenced various fields, including education. There are 4,708,555 foreign nationals in Türkiye, 1,317,122 of whom are of compulsory education age. Of these, 1 million have been enrolled in formal education, and 433,304 attend primary schools (Directorate General for Lifelong Learning, 2024). One of the most significant challenges faced by children integrated into the Turkish education system is continuing their education without having attained sufficient proficiency in Turkish, the language of the society. Most students experience difficulties both in using and comprehending Turkish when they start school, which negatively impacts not only their academic achievement but also their adaptation to the classroom and social environment (Dryden-Peterson, 2016; Crul et al., 2019; Taş & Minaz, 2022; Güngör Yereyikılmaz & Boyacı, 2024). In particular, bilingual students at the primary school level encounter problems in listening, speaking, reading, and writing skills, and face various challenges in understanding their teachers and lessons, communicating with peers, and adapting to the school environment (Koyama & Menken, 2013; Bunar, 2015; Güngör Yereyikılmaz & Boyacı, 2024). For these children, insufficient language skills directly affect not only their classroom participation, but also their academic achievement, self-confidence, sense of belonging, and overall social integration (Schachner et al., 2016; Suárez-Orozco et al., 2018). To address these issues, Türkiye has implemented various measures in education and language instruction. To enhance the language acquisition of foreign students and support their integration, two models have been adopted based on their duration of stay and the evolving dynamics of migration. Initially, students were enrolled in classes set up in camps and Temporary Education Centers (TECs) following the “segregation” model. In cities without centers, the “direct inclusion” model was implemented. As students were accepted as permanent residents, TECs were closed, and the Project for Supporting Inclusive Education for Kids in the Turkish Education System (PITES) launched in 2016, aimed to address issues in Turkish instruction, support their integration into society, and ensure their transition to public schools. Teacher training was organized in collaboration with UNICEF, and Turkish language instruction began for the 6-12 age group (A1-A2 levels), based on the Common European Framework of Reference for Languages. However, due to challenges faced in the direct inclusion model, “compensatory education/courses” were introduced. It was decided that compensatory courses would be offered to students who could not meet the established goals in Turkish language and mathematics skills through the Primary Schools Catch-up Program (IYEP). Additionally, “adaptation classes” were created to assist students with inadequate Turkish language skills. These developments sparked discussions about bilingualism, specifically the preservation of the students' native language while they learn the local language, along with related pedagogical approaches.

International literature indicates that the challenges faced by immigrant and refugee students receiving education in the language of the host society are not limited to linguistic difficulties but also encompass social, psychological, and pedagogical dimensions (Cummins, 2000; García & Wei, 2014). In particular, communication barriers impact not only students' academic achievement but also their self-confidence, peer relationships, and overall well-being (Schachner et al., 2016; Bialystok, 2017). For successful integration, the primary aim of language instruction is to ensure that students develop sufficient academic language proficiency to meet both everyday communicative needs and to comprehend lessons and teachers (Block et al., 2014). Within this framework, the societal impacts of migration and multilingualism have increasingly come to the forefront, not only in educational settings but also in language education research. In light of these developments, both approaches and practices related to teaching Turkish as a second language, as well as research trends in this field, have gained growing significance.

Research on Teaching Turkish as a Second Language

The terms “second language” and “foreign language” are often confused in the literature on teaching Turkish as a second language. According to Karaağaç (2011), a second language is one that an individual learns in an environment where it is spoken as a native language. In contrast, a foreign language is not commonly spoken in the learner’s immediate environment and is typically acquired through education (Saville-Troike, 2006). Therefore, for the current study, Turkish should be regarded as a second language for the foreign student profile in Türkiye. Due to this terminological confusion, bilingualism studies in Türkiye have generally focused on teaching Turkish as a foreign language. These studies aimed to determine the language proficiency of adults learning Turkish, develop materials, and enhance teaching practices (Biçer, 2017; Gülen Canlı & Tepeli, 2019; Kardoğan & Kardaş, 2023).

However, the teaching of Turkish is an extremely critical issue not only in terms of being taught as a foreign language, but also in situations where it should be addressed as a second language, especially at the early age groups level. Indeed, when teaching Turkish as a second language at a young age, primary education is the most critical stage for acquiring listening, speaking, reading, and writing skills. Foreign primary school students encounter various challenges in learning Turkish, and addressing these issues is vital for language proficiency, social communication, and academic success (Güngör Yereyikılmaz & Boyacı, 2024). This reality necessitates a better understanding and fulfillment of the specific needs unique to this age group and context. Therefore, it has become essential to systematically examine the scope, trends, and findings of research conducted within this framework in order to advance both theoretical and practical knowledge. However, a review of the existing literature reveals that studies which systematically classify and evaluate research focusing on teaching Turkish as a second language at the primary school level in Türkiye are still limited. Therefore, further research is needed on teaching Turkish as a second language in primary schools. Previous studies have primarily focused on bilingual Turkish children abroad, analyzed during specific periods, based on year patterns, and examined the aim of instruction, limited target language skills, and emerging trends (Avcı & Kurudayıoğlu, 2022; Büyükkiz & Güler Yıldız, 2021; Can & Kardaş, 2023; Kesik & Halistoprak, 2023). As observed, a significant portion of existing research either focuses on Turkish children living abroad or on adults; the current language, communication, and adaptation problems faced by migrant, refugee, and bilingual primary school students receiving education in a second language in Turkey have not been systematically analyzed. The unique aspect of this study is its systematic review of all qualitative and quantitative research conducted on teaching Turkish as a second language at the primary school level in Türkiye. The study not only reveals the current situation but also clearly identifies gaps in the literature and offers guiding recommendations in the areas of policy development, implementation, and teacher training. In this respect, the research is considered to make a significant contribution to the literature and to guide future applied studies by providing an up-to-date and multidimensional data set that will serve as a basis for inclusive and integrative education policies.

This study aims to enhance understanding of the current status and trends, systematically demonstrating existing limitations through a comprehensive review of research on Turkish as a second language. The findings could assist in addressing challenges and achieving the objectives of inclusive education. Accordingly, the research questions were established as follows:

1. What are the trends in studies conducted on teaching Turkish as a second language in primary education in Türkiye regarding (a) years, (b) research goals, (c) research designs, (d) study groups, (e) data collection tools, (f) data analysis methods, (g) focused language skills, and (h) topics?
2. What are the results from research conducted on teaching Turkish as a second language in Turkish primary education?

Method

Research Design

Content analysis was employed in the study. Suri and Clarke (2009) define the content analysis method as research syntheses that are critical in disseminating researched information and shaping future research, policies, practices, and public perception. Content analysis examines data sources using

a summative and systematic approach grounded in essential scientific principles such as objectivity, intersubjective validity, reliability, generalizability, repeatability, and hypothesis testing (Neuendorf, 2002). The study utilized the descriptive content analysis method. The descriptive content analysis integrates quantitative and qualitative analytical methods to reveal general trends in research findings through a descriptive approach (Creswell, 2008; Cohen, Manion, & Marison, 2018). This study aims to identify research trends in teaching Turkish as a second language in Turkish primary schools and to analyze the results using a descriptive approach. The primary conceptual and methodological trends in both quantitative and qualitative research were examined. Thus, descriptive content analysis was deemed sufficient.

Data Sources

The data sources included four databases: Google Scholar, Dergipark, TR Index, and YÖKTEZ. The following keywords were used in the search: “primary school” and “Turkish for foreigners,” “primary school” and “Turkish as a foreign language,” “primary school” and “Turkish as a second language,” “primary school” and “foreign national” and “Turkish,” “primary school” and “refugee” and “Turkish,” “primary school” and “immigrant” and “Turkish,” “primary school” and “Syrian” and “Turkish,” “primary school” and “asylum seeker” and “Turkish.” The search was conducted between May 13 and July 30, 2024. A total of 15,669 studies were identified in the Google Scholar database, 39,942 in the Dergipark database, 49 in the TR Index database, and 65 studies in the YÖKTEZ database. The studies were reviewed based on the inclusion criteria to determine the final dataset. Studies that (1) focused on teaching Turkish as a second language, (2) were conducted in Türkiye, and (3) used empirical methods were included. Duplicated publications across various databases, along with non-empirical and inaccessible texts, were excluded. When theses were later published as articles in subsequent years, the article versions were incorporated. The final dataset included 127 publications.

Data Analysis

Two different analysis approaches were used in the data analysis process of the study. Features such as the year of the studies, research design, study group, data collection tools, data analysis methods, and the language skills focused on were analyzed using the descriptive analysis method. In contrast, the inductive content analysis method was used to identify trends regarding the aim, research topics, and findings. These two methods were selected based on the nature of the sub-objectives of the study and the quality of the data obtained. Thus, both the quantitative and qualitative aspects of the study were systematically and holistically presented. To identify the trends in the studies based on the year of publication, research design, study sample, data collection tool, data analysis method, and relevant language skills, two authors compiled the data. The data were cross-checked and finalized. The final data were coded according to previously defined categories and cross-checked again. The inter-coder agreement was 96% (Miles & Huberman, 1994). To identify the trends in the study research goals, topics, and results, the two authors created codes and independently assessed the correlations among these codes. The two code sets were compared, and any inconsistent codes were eliminated. The codes were then organized into categories, and the categories were grouped into themes. During the categorization process, the authors independently reviewed the data and established separate categories. Subsequently, the categories were revised and finalized to ensure their reliability. The inter-coder agreement was 96% for the research aim trends, 94% for the study topic trends, and 85% for study results (Miles & Huberman, 1994). While making methodological classifications in the examined studies, the research designs, data collection methods, and analysis approaches reported by the authors in the relevant articles and theses were taken as they were. In other words, the information presented in the method sections of the studies was accepted as accurate and complete, and the analysis process was conducted accordingly. This approach was preferred in content analyses to comparatively evaluate the diversity of methodological terminology across different studies and to ensure objectivity in the analysis.

Findings

In the first section, the research trends in teaching Turkish as a second language in primary schools in Türkiye are discussed, and the trends in research findings are addressed in the second section.

Section 1. Research Trends in Teaching Turkish as a Second Language at Primary Schools in Türkiye

Years

The initial study on teaching Turkish as a second language in Turkish primary schools was conducted in 2016. The greatest number of studies was published in 2020, 2021, and 2023. Figure 1 illustrates the annual distribution of studies.

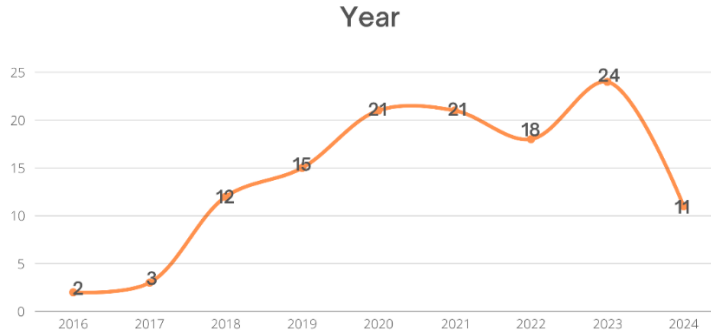


Figure 1. *Annual distribution of studies*

Research Goals

The goals of the studies were categorized into three themes: (1) assessing the current status, (2) exploring various approaches, and (3) developing curricula. The themes and categories associated with the research goals are presented in Table 1.

Table 1. *Themes and categories for research goals*

Theme	Category	Frequency	Percentage
Assessing the current status	Current status, problems, and solution recommendations	56	44,1
	Investigating applications, course materials, and curricula	41	32,3
	Determining teacher characteristics	11	8,7
	Total	108	85
Exploring various approaches	Determining the impact of various approaches	15	11,8
	Applicability of these approaches	3	2,4
	Total	18	14,2
Developing curricula	Developing draft curricula	1	1
	Total	1	0,8
Total		127	100

Most studies aimed to determine the current status ($n=108$, 85%). The most frequently studied category within this theme was assessing the current status, problems, and solution suggestions ($n=56$, 44.1%). This was followed by examining practices, course materials, and curricula ($n=41$, 32.3%). Fewer studies concentrated on identifying teacher characteristics ($n=11$, about 8.7%). Eighteen studies explored various approaches (14.2%). Within this theme, the majority of studies focused on assessing the impacts of various approaches ($n=15$, 11.8%) and their applicability ($n=3$, 2.4%). Curriculum development is a minimally studied area; only one study ($n=1$, 0.8%) was conducted on curriculum design. The distribution of studies based on research goals is presented in Figure 2.

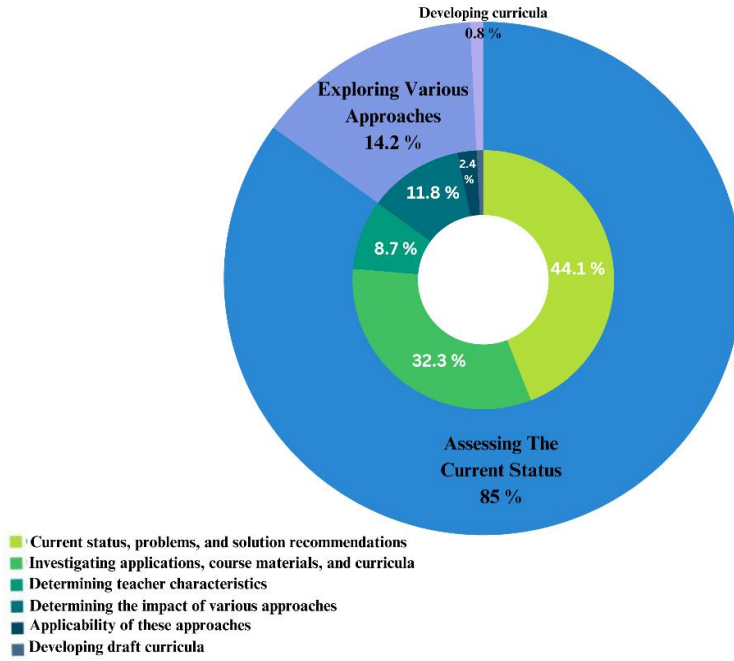


Figure 2. *Distribution of studies based on research goals*

Research Designs

Most studies were qualitative (n=85, 66.9%), while fewer were quantitative (n=26, 20.5%). The least utilized research design was the mixed method (n=11, 8.7%). 4% of the studies (n=5) did not specify a methodology. Figure 3 illustrates the distribution of studies based on research design.

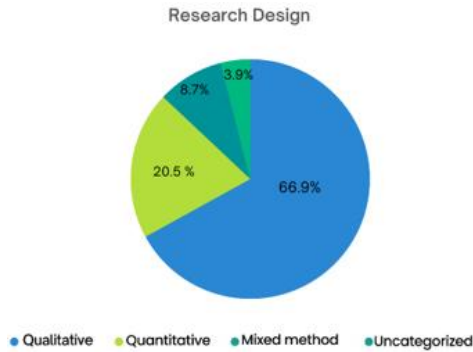


Figure 3. *Distribution of studies based on research design*

The Study Groups

Studies were conducted with various study groups. These groups are detailed in Table 2.

Table 2. *Distribution of the studies based on study group*

Study group	f
Teachers	77
Students	46
Course material	28
Administrators	5
Parents	4
Textbook authors	1
Official documents and instructions	1

The most studied group was teachers ($f=77$). Students ($f=46$) were the second most popular study group. Course materials such as curricula, textbooks, and exams ($f=28$) were also studied. It was observed that only a few studies investigated administrators ($n=5$) and parents ($n=4$). Textbook authors ($n=1$) and official documents and instructions ($n=1$) were studied less. Certain studies were conducted with more than one group. The distribution of the studies based on the study group is presented in Figure 4.

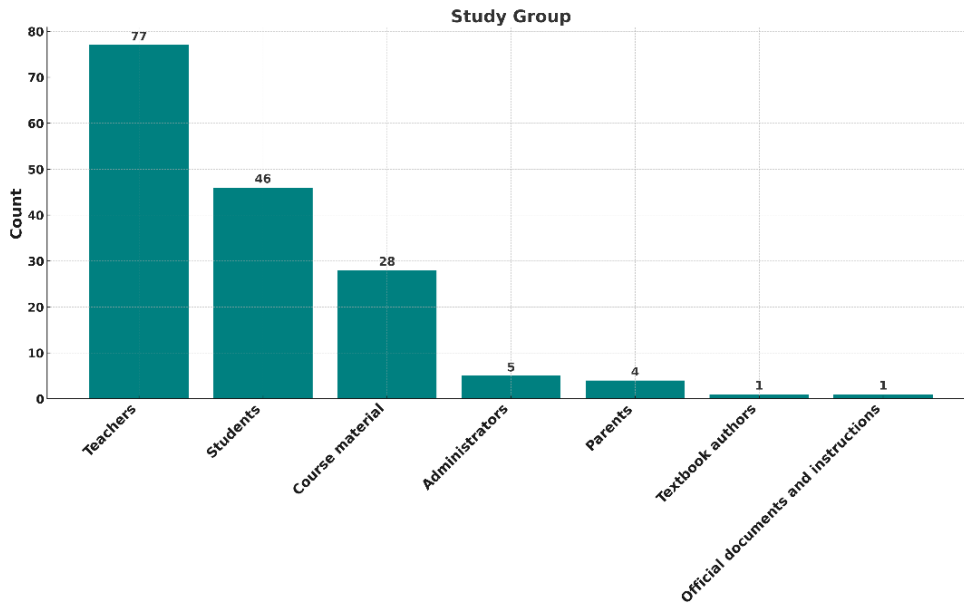


Figure 4. *Distribution of studies based on study group*

Data Collection Tools

It was observed that participant-, material-, or product-based data collection tools have been used in the studies. The data collection tools employed are presented in Table 3.

Table 3. *Distribution of studies based on data collection tools*

Data collection tools		f
Participant-based tools	Interview form	64
	Scale	30
	Achievement test	11
	Survey	9
	Observation form/Field note	8
	Researcher diary	4
	Audio and video recordings	2
	Inventory	1
	Math problems	1
Material- or product-based tools	Document analysis	13
	Student products	9
	Rubric	2
	Checklist	1
N/A		3

Participant-based tools in Table 3 refer to those that collected data directly from the participants, while material- or product-based tools refer to those that analyzed a document, product, or material. The most common tool was interview forms ($f=64$), followed by scales ($f=30$). Document analysis ($f=13$) and achievement tests ($f=11$) were also common data collection tools. Fewer studies employed surveys ($f=9$), student products ($f=9$), observation forms/field notes ($f=8$), researcher diaries ($f=4$), and audio and video recordings ($f=2$). Additionally, certain studies used specific tools such as rubrics ($f=2$),

checklists ($f=1$), inventories ($f=1$), and math problems ($f=1$). Certain studies did not specify their data collection tools ($f=3$), suggesting that some studies lack detailed information about these tools. It was noted that multiple tools were used in some studies. The distribution of studies based on data collection tools is illustrated in Figure 5.



Figure 5. Distribution of studies based on data collection tools

Data Analysis Methods

It was observed that various data analysis methods were used in the studies. The data analysis methods employed are shown in Table 4.

Table 4. Distribution of studies based on data analysis methods

Data analysis method		f
Qualitative	Content analysis	52
	Descriptive analysis	28
	Document analysis	6
	Thematic analysis	4
	Induction	1
Quantitative	Descriptive analysis (Frequency, percentage, etc.)	25
	Predictive analysis	
	t-test	14
	Mann Whitney U Test	7
	ANOVA	5
	Wilcoxon Signed Ranks Test	3
	Kruskal Wallis	2
	Correlation	2
	Chi-square	1
	Regression	1
	N/A	6

The most common data analysis method was qualitative analysis. The preferred qualitative analysis method was content analysis ($n=52$), followed by descriptive analysis ($n=28$), document analysis ($n=6$), thematic analysis ($n=4$), and induction ($n=1$). Descriptive analysis (frequency, percentage, etc.) ($n=25$) was the most common quantitative analysis method. The most common predictive analysis method was the t-test ($n=14$), followed by the Mann Whitney U test ($n=7$), ANOVA ($n=5$), Wilcoxon Signed Rank test ($n=3$), Kruskal Wallis test ($n=2$), correlation ($n=2$), chi-square test ($n=1$), and regression analysis ($n=1$). Six studies did not specify a data analysis method. Some studies utilized more than one data analysis method. The distribution of studies based on the data analysis methods is illustrated in Figure 6.

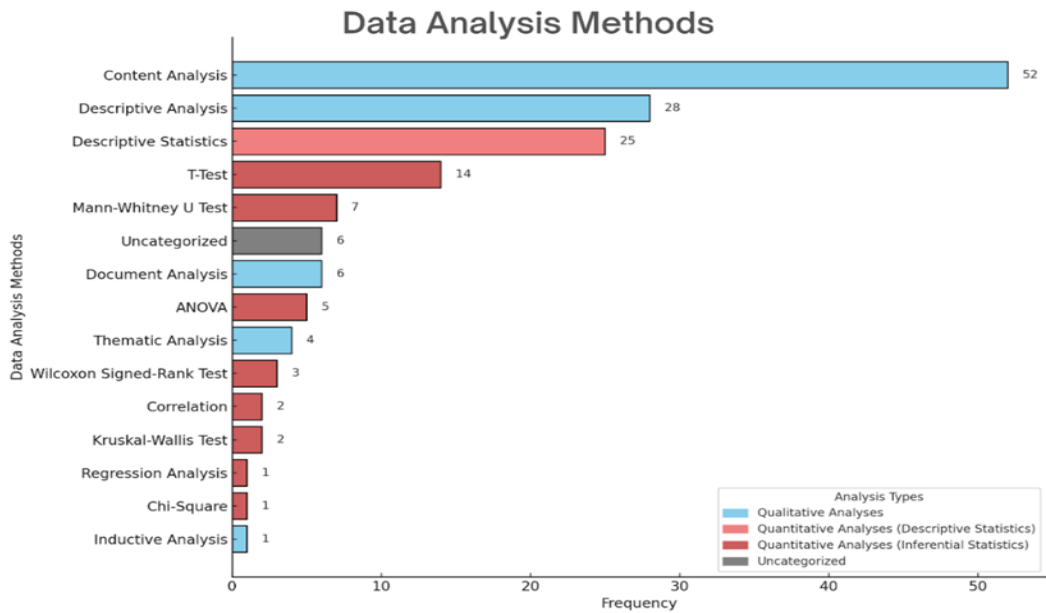


Figure 6. Distribution of studies based on the data analysis method

Focused Language Skills

Various language skills were examined in the studies. However, some studies did not focus on a specific language skill ($f=51$). The majority of studies concentrated on the four fundamental language skills ($f=20$). The most frequently focused language skills included reading ($f=32$), writing ($f=23$), and speaking ($f=8$). Listening was the least focused language skill ($f=4$). The distribution of the studies based on the focused language skills is presented in Figure 7.

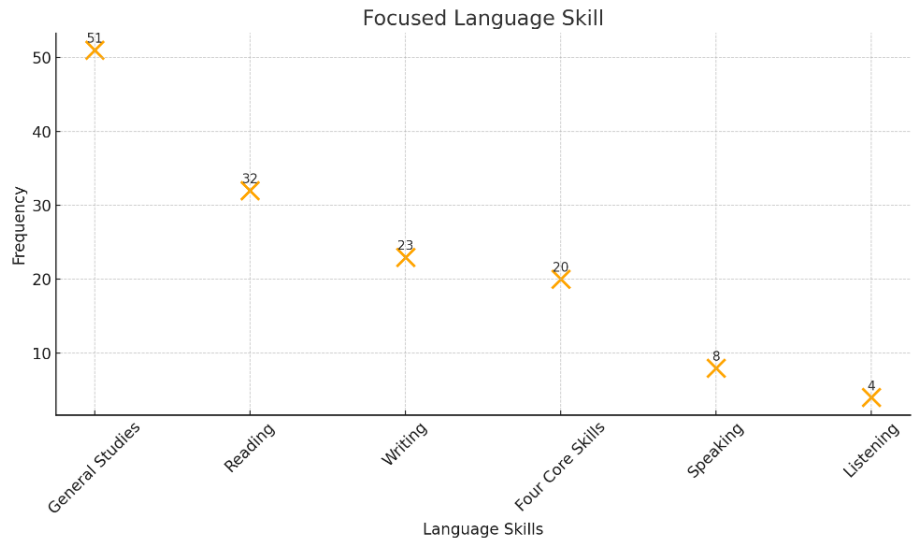


Figure 7. Distribution of studies by focused language skill

Topics

The studies were organized into three themes based on their topics: (1) the structure and functions of educational environments, (2) characteristics of teachers and students, and (3) innovative methods and approaches in language teaching. Table 5 presents the themes, categories, and codes related to the study topic.

Table 5. *The themes, categories, and codes related to the study topic*

Theme	Category	Code
The structure and functions of educational environments	Educational applications and projects	Inclusive classes IYEP PIKTES
	Material and resources	Textbooks Story books Curricula Dictionaries
	Learning-teaching processes	General teaching process Problems
	Characteristics of teachers	Burnout Self-efficacy Professional satisfaction Attitude Communication skills Technological and pedagogical content knowledge
Characteristics of teachers and students	Characteristics of students	Readiness Language skills Cognitive skills Metaphorical perception
	Game-assisted instruction	Educational games Digital games Gamified language skills program
Innovative methods and approaches in language teaching	Strategic applications	Dual teacher method
	Creative and interactive instruction methods	Aktive learning Word wall Class diary Dramatization Word recognition inventory Children's songs Children's literature
	Cultural and contextual teaching approaches	Culturally responsive instruction Inclusive education
	Collaborative and social instruction methods	Peer instruction Parental support

The studies concentrated on the structure and functions of educational environments, the characteristics of teachers and students, and innovative language teaching methods and approaches. The categories within the theme of structure and functions of educational environments included educational applications and projects, materials and resources, and learning-teaching processes. The category of educational practices and projects encompassed inclusive classes, PIKTES, and IYEP. Studies on materials and resources have examined the quality of materials such as textbooks, storybooks, curricula, and dictionaries. The learning-teaching processes reflect general educational functions and the challenges associated with them. In the area of teacher and student characteristics, studies have analyzed the professional and personal characteristics of teachers alongside various student attributes. The theme of innovative approaches and methods in language teaching encompasses topics such as game-assisted instruction, strategic applications, creative and interactive instructional methods, cultural and contextual approaches, and collaborative and social instructional methods. Some studies have evaluated the effects of these methods on students' language skills, while others have analyzed their applicability. The trends in research topics are presented in Figure 8.

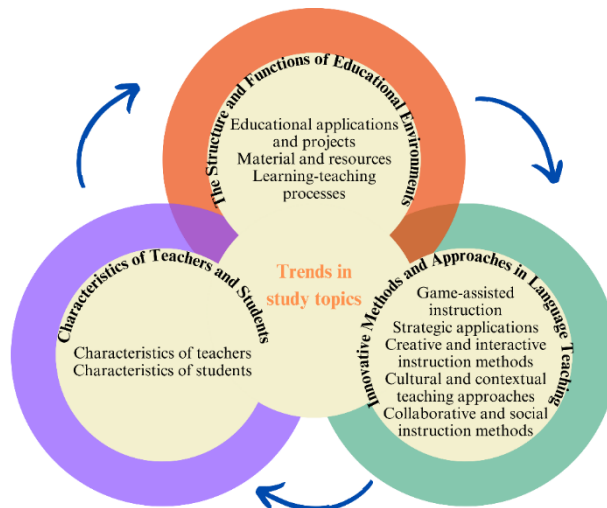


Figure 8. *Trends in research topics*

Section 2: The Results Presented in Research on Teaching Turkish as a Second Language in Turkish Primary Schools

The previous study results were organized into the themes of (1) results related to the structure and functions of educational environments, (2) results related to teacher and student characteristics, and (3) results related to innovative approaches and methods. These themes are illustrated in Figure 9.

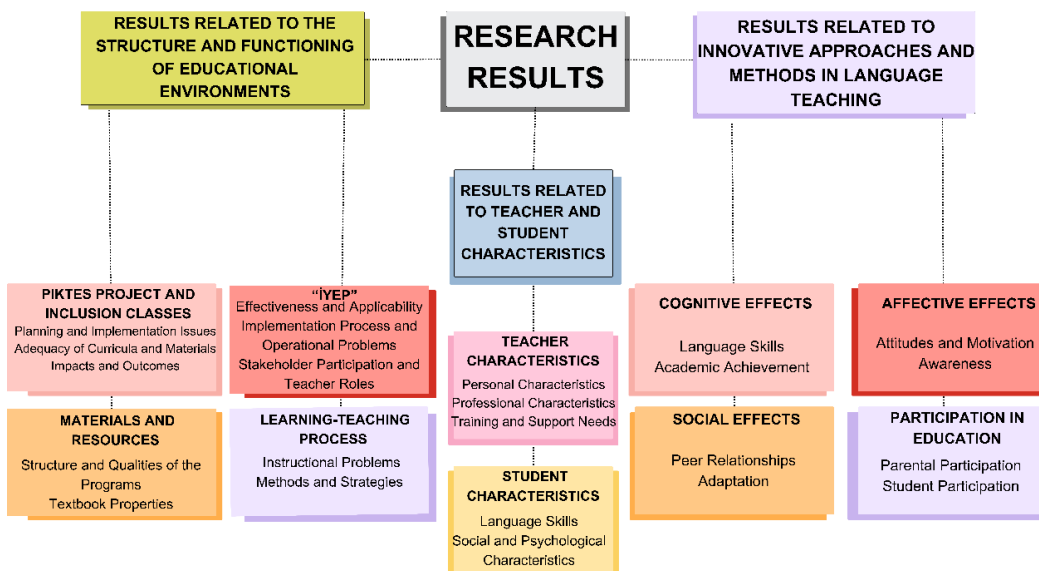


Figure 9. *Research results*

Theme 1: Results Related to the Structure and Functions of Educational Environments

This theme addresses the results of the research on the structure and functions of educational environments in four categories: (1) results on the PIKTES project and inclusion classes, (2) results on IYEP, (3) results on materials and resources, and (4) results on learning-teaching process.

The results on the PIKTES project and inclusion classes revealed planning and implementation issues, such as inadequate planning, inappropriate class levels, limitations of the project to certain classes and provinces, and physical problems within the classrooms. Additionally, it was reported that practices unsuitable for inclusive education restricted the interaction of students with the Turkish

language and students. It was found that the curricula and materials were inadequate. Reports indicated that certain practices led to the exclusion of students, negatively impacting their language development and resulting in academic failure; however, in some instances, these practices supported academic, emotional, and social growth. Regarding the effectiveness and applicability of the IYEP subcategory, it was noted that the program was applicable and improved academic achievement, school commitment, student self-confidence, and Turkish language skills. The textbooks were suitable for the students' level.

In the subcategory related to implementation process and operational problems, issues such as insufficient time, lack of activities, inadequate financial support for teachers, the inclusion of students with varying levels in the same group, and absenteeism were reported. The research also concluded that student selection was inappropriate, module durations were unbalanced, and the implementation of the program after the classes had negative effects. Adequate information was not provided to parents, administrators lacked awareness, and teachers were not trained. In the sub-category of stakeholder participation and teacher roles, it was noted that teacher participation was voluntary and that they considered the program essential. In the sub-category focusing on the structure and qualities of the programs regarding materials and resources, it was determined that the Turkish as a second language curricula were generally well-qualified and incorporated various types of literacy; however, the curricular achievements were limited concerning 21st century skills and lacked fundamental language skills. In the subcategory of textbook properties, it was reported that the visual and cultural aspects of the textbooks were adequate; however, language elements and student levels were insufficient, and the activities lacked diversity. In the subcategory of instructional problems, it was concluded that issues were encountered in initial reading and writing, student readiness was lacking, and the application of the same curriculum for both native Turkish speakers and foreigners led to certain complications. Additionally, problems such as physical issues in educational environments, a lack of parental involvement, adaptation difficulties, and insufficient emphasis on listening skills were also noted. In the subcategory of methods and strategies, it was determined that teachers employed techniques such as visualization, dictation, role-play, technology-assisted instruction, game-based learning, peer instruction, and traditional measurement and evaluation methods.

Theme 2: Results Related to Teacher and Student Characteristics

This theme examined the results of studies on teacher and student characteristics in two categories: (1) Teacher characteristics and (2) Student characteristics. In the subcategory of personal characteristics, the studies reported that teachers possess high cultural intelligence, low burnout, moderate life satisfaction, and effective communication skills. Within the professional characteristics subcategory, it was noted that the professional attitudes, satisfaction, and job satisfaction of teachers were moderate, while their technological and pedagogical knowledge was rated highly. In the training and support needs subcategory, the authors highlighted the inadequacy of pre-service and in-service training; however, they also acknowledged the positive impact of in-service training when available. The results regarding student characteristics revealed that the students' four basic language skills and vocabulary were lacking. The authors noted that the students faced issues related to social and psychological adaptation, discipline problems, lack of motivation, anxiety about losing their identity, and resistance to learning Turkish; however, they exhibited positive emotional attitudes towards the Turkish language and held high self-efficacy perceptions about their writing skills.

Theme 3: Results Related to Innovative Approaches and Methods in Language Teaching

This theme investigates the results of research on innovative approaches and methods for language instruction, organized into four categories: (1) cognitive effects, (2) affective effects, (3) social effects, and (4) participation in education. The results indicated that innovative methods contributed to the development of students' cognitive skills, comprehension, expressive abilities, vocabulary, and grammar. These approaches also enhanced academic achievement and facilitated lasting learning. In the affective effects category, it was reported that students developed positive attitudes toward the Turkish language, felt motivated to learn, and became more aware of Turkish culture. In terms of social effects, it was observed that peer relationships strengthened, and students' social and educational adaptation improved. The results regarding participation in education showed that these methods increased both parental and student involvement in educational activities and ensured attendance.

Conclusion, Discussion and Recommendations

The findings of the study demonstrate that research on teaching Turkish as a second language in Turkish primary schools has increased since 2016, with a significant rise occurring between 2020 and 2023. Günaydın (2020) noted that the number of studies focused on bilingual Turkish children grew from 2015 to 2020. Both Avcı and Kurudayıoğlu (2022) and Can and Kardaş (2023) reported an uptick in related studies following 2013–2014. Research on teaching Turkish as a foreign language (Kardoğan & Kardaş, 2023) indicated that the number of studies rose between 2011 and 2015; however, it saw a decline after 2015. The findings of the present study were inconsistent with previous reports regarding the annual distribution of studies on teaching Turkish as a foreign language, yet they aligned with findings on bilingual Turkish children and teaching Turkish as a second language. The results revealed that changes in migration and education policies significantly impacted research on teaching Turkish as a second language after 2016.

Most studies focused on determining the current status, and only a few investigated different approaches and curricular development. Studies on teaching Turkish to bilingual Turkish children and as a foreign language generally investigated related problems (Kesik & Halistoprak, 2023; Kardoğan & Kardaş, 2023). Although studies on determining the current status could provide a foundation, the lack of studies on solutions, innovative approaches, and curricular development should be noted. This demonstrates that the literature lacked studies that developed advanced solutions and curricula.

Most studies were qualitative, while mixed-method studies were rare. Günaydın (2020) noted that qualitative research was prevalent among studies focused on bilingual Turkish children, and a similar pattern was observed in research on teaching Turkish as a foreign language (Biçer, 2017; Kardoğan & Kardaş, 2023; Can & Kardaş, 2023). These findings highlighted the need for more mixed-method studies in Turkish language instruction. Most studies involved teachers, and Cengiz and Halistoprak (2023) indicated that this research mainly examined primary school teachers. A comparable trend was noted in studies on teaching Turkish as a second language. Günaydın (2020) also pointed out that primary and junior high school students represented the most studied group of bilingual Turkish children. Interview forms were the most preferred data collection tools, followed by scales, document reviews, and achievement tests. Qualitative content analysis has been the most common data analysis method, followed by descriptive, document, thematic, and inductive analyses, while descriptive analysis has been frequently used in quantitative studies. Günaydın (2020) and Cengiz and Halistoprak (2023) emphasized that content analysis has been prominent in research, while descriptive statistics have been favored in quantitative research, in contrast to predictive analysis. In the classification of qualitative data analysis, although the term “content analysis” is used in a significant portion of the reviewed studies, a closer examination shows that most of these studies are limited to descriptive analysis and do not possess the theoretical and methodological depth required for content analysis. Previous research conducted in Turkey has emphasized that the types of qualitative analysis are not well understood and that there is conceptual confusion in methodological statements (Çalık & Sözbilir, 2014; Yıldırım & Şimşek, 2021). Nevertheless, in this review, the methodological classification was based on the types of analysis reported by the authors in each study. This approach was preferred to ensure comparability and objectivity in systematic reviews. As a result, the findings indicate that the widespread use of qualitative data analysis reflects a focus on obtaining in-depth information in the studies, whereas the limited use of quantitative methods suggests that data diversity remains insufficient.

Studies have generally focused on reading and writing skills, while listening and speaking skills have rarely been investigated, as reading and writing skills are easier to measure, whereas listening and speaking skills are inherently difficult to evaluate. Avcı and Kurudayıoğlu (2022) observed that research on bilingual Turkish children has centered on writing and reading skills. Can and Kardaş (2023) noted that these studies prioritized speaking, reading, and listening skills, following writing skills. The differing linguistic needs of the study groups may explain this disparity. There are a limited number of studies on listening and speaking skills in Turkish as a foreign language (Gülen Canlı & Tepeli, 2019; Kardoğan & Kardaş, 2023). Despite the crucial role of these skills in everyday communication, their neglect hindered the acquisition of verbal proficiency in the target language. Therefore, there is a need for research on speaking and listening skills in teaching Turkish as a second language. The study also

concluded that a notable number of studies did not examine any language skill, resulting in a significant gap in evaluating learning processes, monitoring language development, and identifying challenges.

The topical trends included the structure and functions of educational environments, characteristics of teachers and students, and innovative approaches and methods. The first group of research focused on inclusion classes, educational applications, and projects such as PIKTES and IYEP, along with materials, resources, and learning-teaching processes. The second group concentrated on the characteristics of teachers and students that may be significant in language instruction. Studies on innovative approaches and methods examined game-assisted teaching, strategic applications, creative and interactive methods, cultural and contextual techniques, and collaborative and social instructional methods. Previous research on teaching Turkish as a foreign language has explored problems, teacher and student characteristics, materials, methods, and techniques (Biçer, 2017; Kardoğan & Kardaş, 2023). In contrast to the present study's findings, the studies on bilingual Turkish children mainly focused on speech anxiety, communication issues, writing skills, pedagogical knowledge, and perspectives on bilingualism, while also examining textbooks, teacher requirements, and the comparison between monolingual and bilingual children (Günaydın, 2020; Kırımlı & Kayhan, 2022). The differences in these topical trends may be attributed to the contextual distinctions between bilingualism and teaching Turkish as a foreign language.

The results reported in these studies were categorized into the themes of the structure and functions of educational environments, teacher and student characteristics, and innovative approaches and methods. Within the scope of the structure and functions of educational environments, challenges related to planning and implementation in the PIKTES project and inclusion classes, curricula, and materials have been documented. The project led to the exclusion of certain students, along with issues in language skills and academic failure, but it also contributed to academic, emotional, and social development under specific conditions. Similarly, Oyar Uzun (2023) concluded that the project faced challenges in areas such as functions, communication and adaptation, course content, instructor competencies, and physical conditions. The results regarding IYEP indicated that the program was applicable and contributed to the academic and emotional skills of the students. Despite operational challenges, the teachers participated willingly and viewed the program as essential. These findings suggested that to enhance the effectiveness of current applications, a holistic approach should be adopted, with a focus on planning, material development, and teacher training. The results concerning the materials and resources revealed that the curricula, while well-designed, did not adequately address basic language skills. The visual and cultural aspects of the textbooks were sufficient; however, there were issues with linguistic elements, as the textbooks were not suitable for the students' level, and the activities lacked variety, negatively impacting instruction. These findings revealed a lack of a systematic and balanced approach to the four basic language skills, demonstrating that instructional materials should be reviewed for pedagogical adequacy, activity diversity, aesthetics, and content. To develop all language skills effectively, materials should be designed with a holistic and student-centered approach. Study findings indicated issues such as instruction in initial reading and writing, student readiness, physical classroom facilities, curricula, parental participation, and adaptation. Teachers employed visualization, dictation, and role-play in their instruction, along with innovative methods like technology-assisted and game-assisted learning, as well as peer instruction. However, they relied on traditional methods for measurement and evaluation, which limited the effectiveness of the innovative strategies due to the inability to assess the impact of these approaches on student performance. This led to an inconsistency between instructional methods and evaluation tools.

The study emphasized the significance of teachers' personal and professional traits, as well as their training and support needs. Findings showed that teachers demonstrated high cultural intelligence, strong communication, and technological-pedagogical knowledge while experiencing low burnout and moderate life and job satisfaction. Student analysis focused on language skills and social-psychological conditions, revealing challenges in basic language skills, vocabulary, adaptation, discipline, motivation, and self-concerns. Güngör Yereyikılmaz and Boyacı (2024) highlighted that students learning Turkish as a second language faced difficulties in language skills and vocabulary. This research also identified strengths such as a high sense of self-efficacy in writing and positive emotional attitudes toward the Turkish language among students who are resistant to learning it. These findings underscore the need

for comprehensive teacher training and individualized approaches to enhance students' language development and well-being.

Innovative approaches and methods in teaching Turkish as a second language enhance cognitive, emotional, and social skills, improving comprehension, expression, vocabulary, and grammar, which contribute to academic success and long-term learning. They also foster positive attitudes, motivation, and cultural awareness while strengthening peer relationships and social adaptation. Language instruction should be seen as both an individual and social process, with increased parental involvement and student participation promoting attendance. Gülen Canlı and Tepeli (2019) highlight these methods' role in fostering achievements and positive attitudes. Their findings affirm that innovative approaches support language skills alongside emotional, social, and cultural development, making language education an inclusive, multidimensional process. Thus, policies should prioritize student-centered, interaction-oriented methods.

The study is constrained by the studies accessed using the method outlined in the methodology section. In this study, the research designs and types of analysis reported by the authors in the reviewed studies were accepted as accurate as they were presented. It was assumed that possible conceptual or practical errors in the researchers' methodological statements were not taken into account during the content analysis, and that this constitutes one of the main limitations of the study. Future research could incorporate different indexes and types of research. Given current trends, one might expect an increase in "solution-oriented," "application-based," and "curricular development" research. The findings underscored the need for further quantitative and mixed-method studies to achieve comprehensive and generalizable results. Future research should concentrate on language skills, identify student needs, and develop effective methods and curricula. This focus would enhance instruction and help students adapt to social life and the education system.

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The Investigation of the Freshman and Senior Pre-service EFL Teachers' Teaching Self-Efficacy Beliefs

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Abstract

Self-efficacy, a central concept in social cognitive theory, refers to an individual's confidence in performing tasks and achieving desired outcomes. This study explores differences in self-efficacy perceptions among freshman and senior pre-service teachers enrolled in English Language Teaching programs at state universities and examines factors influencing these differences. The study included 136 English as a Foreign Language (EFL) teacher candidates from the freshman and senior years at a major state university in Ankara, with additional semi-structured interviews conducted with 10 participants. Findings reveal that while gender has minimal effect on self-efficacy, educational stages and satisfaction levels have significant effects. Notably, no significant difference was found between freshman and senior self-efficacy levels, and higher program satisfaction was paradoxically associated with lower self-efficacy. Interview responses highlight that EFL teacher candidates can enhance self-efficacy by adapting to evolving systems, recognizing strengths and weaknesses, following field developments, broadening skills beyond English, and addressing concerns about English proficiency. Based on these findings, the study recommends that teacher education programs integrate early teaching practice experiences, provide structured guidance on self-directed learning strategies, and implement support systems to address the emotional complexity that emerges with professional experience. This study contributes to understanding factors that impact self-efficacy in teacher education and offers practical implications for curriculum developers, academic advisors, and policy makers.

Keywords: Educational satisfaction factors, english language teaching, pre-service teacher training, self-efficacy.

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Birinci ve Dördüncü Sınıf İngilizce Öğretmenliği Adaylarının Öz-Yeterlik Algılarının İncelenmesi

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Araştırma	1.11.2024	30.07.2025

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Öz

Öz-yeterlik, sosyal bilişsel teoride kişinin görevleri başarma ve istenen sonuçlara ulaşma konusundaki güvenini ifade eder. Bu çalışmada, devlet üniversitelerinin İngiliz Dili Eğitimi programlarında okuyan birinci ve dördüncü sınıf öğretmen adaylarının öz-yeterlik algılarındaki farklar ve bu farklara etki eden faktörler incelenmiştir. Ankara'daki büyük bir devlet üniversitesinde birinci ve son sınıfta okuyan 136 İngilizce öğretmen adayı çalışmaya katılmış, ayrıca 10 katılımcıyla yarı yapılandırılmış görüşmeler yapılmıştır. Bulgular, cinsiyetin öz-yeterlik üzerinde çok az etkisi olduğunu, ancak eğitim aşamaları ve memnuniyet düzeylerinin belirgin bir fark yarattığını göstermektedir. Dikkat çekici şekilde, birinci ve dördüncü sınıf öğrencilerinin öz-yeterlik düzeyleri arasında anlamlı bir fark bulunmamış ve program memnuniyeti yüksek olan öğrencilerin paradoks olarak daha düşük öz-yeterlik gösterdiği saptanmıştır. Görüşmelerden elde edilen bilgiler, öğretmen adaylarının gelişen sistemlere uyum sağlayarak, kendi güçlü ve zayıf yanlarını tanıyarak, alanlarındaki gelişmeleri takip ederek, İngilizce dışındaki becerilerini geliştirerek ve İngilizce yeterlilikleri konusundaki kaygılarını gidererek öz-yeterliliklerini artırabileceğini vurgulamaktadır. Bu bulgular doğrultusunda, öğretmen yetiştirme programlarının erken dönem öğretmenlik deneyimleri entegre etmesi, öz-yönelimli öğrenme stratejileri konusunda yapılandırılmış rehberlik sağlaması ve mesleki deneyimle ortaya çıkan duygusal karmaşıklığı ele alacak destek sistemleri uygulaması önerilmektedir. Bu araştırma, öğretmen eğitiminde öz-yeterlik üzerinde etkili olan faktörleri anlamaya katkı sağlamakta ve müfredat geliştiriciler, akademik danışmanlar ve politika yapımcılar için pratik çıkarımlar sunmaktadır.

Anahtar Sözcükler: Eğitim memnuniyeti faktörleri, hizmet öncesi öğretmen eğitimi, İngilizce dil eğitimi, öz yeterlik.

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Introduction

In today's globalized world, English is the most widely spoken language, facilitating communication in science, business, and tourism (Ilyosovna, 2020; Mahu, 2012). Beyond communication, it helps individuals adapt to evolving societal needs (Putra, 2020). Nishanti (2018) sees English as a gateway to modernity, enabling interaction across diverse domains such as media, culture, and industry (Civriz & Gelmez-Burakgazi, 2021). Its global role has made effective English instruction a priority worldwide (Karakaş & Yavuz, 2018).

In Türkiye, English is a key foreign language, yet proficiency levels remain low. According to EF Education First (2020), Türkiye ranks 69th globally. Çomoğlu & Kic-Drgas (2017) note that English use in Türkiye still falls short of international standards. Musset (2010) links such gaps to teacher training quality, which influences teacher preparedness. Effective instruction requires well-equipped teachers with pedagogical skills, field knowledge, global awareness, and professional competence (Berkant, 2017). Training programs must focus on cultivating these attributes (Kickbusch et al., 2020), alongside fostering self-efficacy, which significantly affects teacher performance (Oğuz, 2009).

Rooted in Bandura's (1977) social cognitive theory, self-efficacy refers to individuals' beliefs in their ability to manage tasks and challenges (Bandura, 1994, 1997; Flammer, 2001; Ajzen, 1987; Pajares & Schunk, 2002). Teacher self-efficacy reflects confidence in fostering learning and academic success (Bandura, 1993; Tschannen-Moran & Woolfolk-Hoy, 2001; Yılmaz & Turan, 2020). As English grows in global importance (Pethman Estliden, 2017; McKay, 2002; Reddy & Mahavidyalaya, 2016), teacher competencies including self-efficacy become critical.

This study explores differences in self-efficacy between first- and fourth-year pre-service English teachers in Turkish state universities. It examines whether changes in self-efficacy result from time alone or from specific pedagogical experiences during training. The study also considers how instructional quality and time in the program influence these beliefs.

Self-efficacy

Self-efficacy, defined within Bandura's (1977) social cognitive theory, refers to individuals' beliefs in their capacity to execute actions necessary for managing prospective situations. In education, teacher self-efficacy represents educators' confidence in facilitating student learning, managing classroom dynamics, and positively influencing academic outcomes (Bandura, 1993; Tschannen-Moran & Woolfolk Hoy, 2001). Teachers with high self-efficacy adopt innovative practices such as differentiated instruction, technology integration, and collaborative learning, enhancing student engagement and accommodating diverse learning styles, ultimately improving academic performance (Hattie, 2009).

Additionally, robust self-efficacy fosters educator resilience. Teachers with strong self-beliefs view challenges (behavioral issues, learning difficulties, classroom management obstacles) as growth opportunities, demonstrating persistence and proactive problem-solving (Bandura, 1997; Skaalvik & Skaalvik, 2014). This resilience creates supportive classroom atmospheres and reinforces students' self-beliefs. Research indicates that when teachers confidently endorse student potential, it correlates with heightened expectations, increased motivation, and enhanced performance (You et al., 2019).

While generally positive, excessively high self-efficacy may occasionally lead to reluctance in adapting instructional methods, as educators become overly reliant on established practices (Catalano et al., 2019). Nevertheless, literature positions teacher self-efficacy as fundamental to teaching effectiveness, significantly impacting student success, motivation, and literacy skills (Delican & Adiyaman, 2021), while facilitating technology integration (Türkeli, 2022).

In conclusion, teacher self-efficacy is not merely an individual attribute but a foundational factor in determining teaching quality and student achievement. It underpins the capacity for innovation, adaptation, and the creation of inclusive, transformative learning environments, thereby representing a critical target for educational policies and professional development initiatives.

Importance of the Study

Self-efficacy reflects individuals' belief in their capacity to succeed. It plays a key role in areas such as career development (Lent et al., 2002) and academic performance (Pajares, 2003), linking to self-regulation and learning strategies.

This study contributes by examining how self-efficacy beliefs vary between first- and fourth-year pre-service English teachers in Türkiye. While many studies have explored teacher self-efficacy broadly, this research focuses on its development within Turkish ELT programs—an area with limited empirical insight.

By analyzing how perceptions evolve throughout training, the study sheds light on the role of program duration and pedagogical exposure. Its originality lies in addressing the intersection of education level and self-efficacy within Türkiye's specific teacher training context, helping bridge a notable research gap.

Research Questions:

- 1) Is there a significant difference in self-efficacy perceptions between first-year and fourth-year pre-service English language teachers?
- 2) What factors influence the self-efficacy perceptions of first- and fourth-year pre-service English language teachers?
- 3) What are the perceptions of first- and fourth-year pre-service EFL teachers on effective language learning?

Method

Research Design

This study adopts a mixed-method approach, combining quantitative and qualitative methods to provide comprehensive insights into the research questions. To effectively address the research objectives, an explanatory sequential research design was implemented. This design involves collecting quantitative data initially, followed by qualitative data to further elaborate on the quantitative findings (Creswell & Plano Clark, 2011).

The quantitative strand utilized a survey design to systematically gather self-efficacy data from a substantial sample of pre-service teachers. The qualitative strand employed a basic qualitative research design through semi-structured interviews, enabling in-depth exploration of participants' lived experiences and perceptions regarding self-efficacy development. This qualitative approach facilitated rich data collection about the factors influencing participants' teaching confidence and professional growth, with interview data subsequently analyzed using Strauss and Corbin's (1990) descriptive analytical framework to systematically identify emergent themes and categorize influential factors.

Data Collection Instruments

For quantitative data collection, a survey design was used. Self-Efficacy Perception Scale (Erdem & Demirel, 2007), which consists of 28 items rated on a 5-point Likert scale was employed. Factor analysis (KMO = 0.933; significant Bartlett's test) and high loadings for 27 items supported a unidimensional structure, and a Cronbach's alpha of 0.92 indicated excellent internal consistency.

In addition, participants were asked a single-item question regarding their satisfaction levels: "How satisfied are you with studying in your department?" (1 = "Strongly dissatisfied," 5 = "strongly satisfied"). Table 1 presents the distribution of these satisfaction responses, ranging from "Strongly Dissatisfied" to "Strongly Satisfied."

For qualitative data collection, a semi-structured interview form was developed by the researchers. The interview protocol underwent expert review by three professors specializing in curriculum and instruction, and the form was refined based on their feedback (e.g., question clarity, theoretical alignment, and content validity) and the results of a pilot interview. The pilot study led to minor wording adjustments, and the addition of follow-up prompts to encourage more detailed responses.

Participants of the Study

The quantitative phase included 136 first- and fourth-year EFL teacher candidates from a major state university in Ankara, selected through convenience sampling for practical accessibility within time and resource constraints (Patton, 2005).

Although the study compares self-efficacy between first- and fourth-year students without longitudinal tracking, both groups were selected from the same department with identical curricula and institutional settings to ensure comparability. However, factors like personal motivation, prior education, and cohort-specific traits may still influence outcomes, requiring cautious interpretation supplemented by qualitative data.

For the interview phase, deviant case sampling identified participants with self-efficacy scores significantly above or below the mean to explore differences between theoretical expectations and lived experience (Lieberson, 1992). Ten participants were selected to balance depth and manageability. All eligible students completed the Self-Efficacy Scale during class, while selected participants joined 20–30 minute semi-structured interviews, audio-recorded with consent.

Table 1. *Demographics of the participants*

		f	%
Gender	Female	95	69.9
	Male	41	30.1
Year	Freshman	54	39.7
	Senior	82	60.3
Satisfaction Levels	Strongly Dissatisfied	5	3.7
	Dissatisfied	15	11
	Neutral	35	25.7
	Satisfied	63	46.3
	Strongly Satisfied	18	13.2

Data Collection

Permission for the study was obtained from the University Ethics Committee. Following ethical approval, the researchers distributed the self-efficacy scale to participants. Before administering the scale, a consent form was provided to participants to document their voluntary participation.

Semi-structured interviews were conducted individually with the participants, with each interview lasting 20-30 minutes. All interviews were audio-recorded with participants' explicit consent and took place in a quiet, private setting to ensure confidentiality. The interviews were conducted in Turkish to allow participants to express themselves more naturally and comprehensively.

Following data collection, interview recordings were transcribed verbatim by the researchers. During the member-checking phase, participants were asked to review their transcribed responses and approve any corrections to statements they felt were inaccurately represented (focusing on factual accuracy, clarity of meaning, and completeness of responses). Data collection continued until data saturation was reached, as indicated by recurring themes and the accumulation of sufficient data (Yıldırım & Şimşek, 2016).

Data Analysis

The reliability of the Self-Efficacy Scale was assessed using Cronbach's alpha via IBM® SPSS 23®, yielding a coefficient of .92, indicating excellent internal consistency above the .70 threshold (Field, 2018; Kline, 1999; Tabachnick & Fidell, 2014). Initial screening showed violations of normality and variance homogeneity, leading to non-parametric tests. Mann-Whitney U tests compared self-efficacy scores between freshman and senior students and between genders. Kruskal-Wallis H tests assessed differences across satisfaction levels, while Spearman's rank-order correlation examined relationships between self-efficacy, academic year, and CGPA.

Qualitative data were analyzed using Strauss and Corbin's (1990) descriptive approach. Interview transcripts were coded thematically, with key themes illustrated through direct quotations reflecting participants' experiences. This method allowed nuanced understanding of self-efficacy development across educational stages.

To enhance credibility, Creswell's (2009) triangulation strategy was employed. Survey and interview data were cross-checked to identify converging patterns and address discrepancies, with interview themes compared against survey findings for validation. Member checking confirmed preliminary findings accuracy, with participants reviewing summaries and thematic categories. Interrater reliability was established through peer debriefing: two independent researchers coded transcripts and reached 92% agreement (Miles & Huberman, 1994). Discrepancies were resolved by consensus, strengthening analytical rigor.

The Role of Researchers

In qualitative research, Creswell (2009) describes the researcher's role as that of an active participant who objectively narrates events based on data obtained from participants.

The research team brought extensive experience in English language teaching and curriculum development to this study. Two researchers are practicing ELT teachers and doctoral candidates in curriculum and instruction, one is a curriculum specialist and doctoral candidate in curriculum and instruction, and two are academics in curriculum and instruction. This collective expertise in both ELT practice and teacher education research provided valuable insights into pre-service teacher development while requiring careful attention to potential biases.

The researchers' shared background facilitated deeper understanding of participants' experiences and contextual factors influencing self-efficacy development. However, to maintain analytical objectivity, systematic protocols were established to separate personal teaching experiences from data interpretation. Regular reflexivity discussions among team members identified and addressed potential subjective influences on data collection and analysis processes.

Following Creswell's (2009) framework of active yet objective participation, the team maintained detailed methodological notes throughout the research process, ensuring all analytical decisions were grounded in data rather than professional assumptions..

Ethical Procedures

The Ethics Committee of the (The name of the institution has been removed due to ethical concerns.) University Institute of Educational Sciences approved this study as ethically appropriate, under decision number E-35853172-600-00001927374, dated 20.12.2021.

Results

This study aimed to explore the relationship between the self-efficacy perception levels of first- and fourth-grade pre-service English teachers and to determine if these levels varied according to independent variables. The research utilized a self-efficacy belief scale and semi-structured interviews, conducted with participants at the beginning of the term. The findings are presented in alignment with the research questions.

The self-efficacy belief scale was used to assess potential differences between 1st and 4th grade pre-service EFL teachers based on independent variables, such as gender and educational stage. The findings are as follows:

A Mann–Whitney U test was conducted to compare self-efficacy scores between Freshman ($n = 54$) and Senior ($n = 82$) pre-service EFL teachers. The results indicated that the distributions of self-efficacy scores did not differ significantly between the two groups, $U = 2100.0$, $z = -0.85$, $p = .395$. These findings suggest that the educational stage (Freshman vs. Senior) does not significantly impact self-efficacy perceptions among the participants.

Table 2. Comparison of self-efficacy perceptions between freshman and senior pre-service EFL teachers

Group	n	Median	U Value	z	p
Freshman	54	69.0	2100.0	-0.85	0.395
Senior	82	70.0			

Since the Mann–Whitney U test is nonparametric, it compares the distributions (i.e., median ranks) rather than the arithmetic means of the two groups. The analysis revealed no statistically significant difference between females (median = 68.30) and males (median = 68.96), $U = 1928.5$, $z = -0.09$, $p = .928$ (two-tailed). These results suggest that gender is not associated with differences in self-efficacy perception scores in this sample.

Table 3. Comparison of perceptions by gender

Gender	n	Median	U Value	z	p
Male	41	68.96	1928.5	-0.09	0.928
Female	95	68.3			

A Kruskal–Wallis H test examined whether self-efficacy scores differed by participants' satisfaction with their program, measured on a 5-point scale (1 = Strongly Dissatisfied to 5 = Strongly Satisfied). Results showed a significant difference, $\chi^2(4) = 11.24$, $p = .024$, indicating that self-efficacy varies by satisfaction level. Post hoc Dunn's tests with Bonferroni correction revealed that "Strongly Satisfied" participants had significantly lower self-efficacy scores than those who were "Dissatisfied" (mean rank difference = -0.53221 , $p = .010$). This unexpected result suggests that higher satisfaction was associated with lower self-efficacy perceptions in this sample.

Table 4. Comparison of self-efficacy perceptions across satisfaction levels

Satisfaction Level	n	Median Self-Efficacy Score	Mean Rank
1: Strongly Dissatisfied	20	72	75.5
2: Dissatisfied	30	73	85
3: Neutral	40	70.5	68.3
4: Satisfied	25	69	65
5: Strongly Satisfied	20	68	60.2

Kruskal–Wallis $H(4) = 11.24$, $p = .024$

Post hoc: Dunn's test with Bonferroni correction indicated that the difference between the Dissatisfied and Strongly Satisfied groups was statistically significant (mean rank difference = -0.53221 , $p = .010$).

Spearman's rank-order correlation was performed to assess the relationship between raw CGPA scores and self-efficacy perception scores among pre-service English language teachers ($N = 136$). The analysis revealed a moderate, statistically significant positive correlation, $r_s = 0.35$, $p < .001$, indicating that higher CGPA scores are associated with higher self-efficacy perceptions.

Table 5. Spearman's rank-order correlation between CGPA and self-efficacy perception scores

Variable	M	SD	1	2
1. CGPA	3.45	0.42	1	0.35**
2. Self-Efficacy	4.08	0.6	0.35**	1

Another Spearman's rank-order correlation was employed between academic year and self-efficacy perception scores for a sample of $N = 136$ pre-service English language teachers. The analysis revealed a weak positive correlation, $r_s = 0.12$, which was not statistically significant, $p = .175$. This indicates that progression from the freshman to senior year is not strongly associated with differences in self-efficacy perceptions among these pre-service teachers.

Table 6. *Spearman's rank-order correlation between academic year and self-efficacy perception*

Variable	M	SD	1	2
1. Year	1.6	0.49	1	0.12
2. Self-Efficacy	4.08	0.6	0.12	1

The findings of the semi-structured interviews are organized according to the research questions, focusing on the factors that influence and alter self-efficacy perceptions among first- and fourth-grade pre-service English language teachers.

Pre-service teachers identified various activities that enhance both their English skills and self-efficacy beliefs. The researcher asked volunteer first- and fourth-grade pre-service teachers about their strategies for improving English teaching and learning. Strategies and practices that improve Pre-service teachers' learning and teaching of English are presented in Table 7.

Table 7. *Strategies and practices to improve pre-service teachers' learning and teaching of English*

Strategies and Practices to Improve English Learning	Strategies and Practices to Improve English Teaching
Social media	Udemy
Watching English series	Online tests
Playing games	Conducting research on challenges in English teaching
Following English-related pages	Engaging in online teaching Tutoring
Foreign Language Exam	Attending webinars and seminars, using the online teaching platform "İnekle"
Working on a TÜBİTAK (Scientific and Technological Research Council of Türkiye) project	Creating teaching materials
Cambly	Following the EFL Network and relevant magazines
Erasmus+ Program	Teaching English
Reading English books	
Using devices set to English	
Listening to audiobooks, podcasts etc.	
Listening to English music	
Reviewing studies on teaching English	
Attending webinars, seminars, and certificate programs	
Viewing videos on teaching experiences both locally and internationally	
Following the BBC Learning English page	

Three first-year pre-service teachers mentioned using social media, watching English series, playing games, tutoring, and following English-related pages as effective methods for improving English proficiency.

In contrast, fourth-year pre-service teachers cited broader strategies including preparing for the "Foreign Language Exam," using Cambly, participating in Erasmus+ programs, engaging on social media, working on TÜBİTAK projects, reading English books, using English-language device settings, listening to audiobooks and music, watching podcasts, reviewing English teaching studies, attending webinars and certificate programs, viewing local and international teaching experience videos, and following BBC Learning English.

"It may sound cliché about what I do on a daily basis, but if I were to buy a book on the subjects I love, it would be in English. Trying to provide input as much as possible—input, right?—again, it's very stupid, but using English devices was a phone, a computer; everything I had was English."
(PT1)

"I took a Cambridge course in speaking English at an advanced level... And also, I participated in the Erasmus+ program, which was very beneficial and impressive for me. (PT2)

"I use social media to improve my English. All my accounts are in English. I'm trying to read. I'm reading my studies. I love reading the papers in the methods course." (PT4)

"I participated in a project in the scope of TÜBİTAK; it provided me with opportunities to improve my English. Since exposure is important in language learning, I listen to English music and watch English TV series and movies." (PT10)

Fourth-year pre-service teachers identified additional resources and strategies supporting English teaching, including Udemy, online tests, research on English teaching challenges, webinars and seminars, the online platform "İnekle," creating teaching materials, online teaching, tutoring, following the EFL Network and relevant magazines, and teaching English to others. In contrast, most first-year pre-service teachers reported that their English teaching skills develop primarily through university-provided education.

"There is a program that teaches English as a mother tongue, Udemy. I bought this program, started learning how to teach English at a basic level, and finished it." (PT1)

"İnekle" is an online tutoring platform. I have been giving lessons regularly for about 5 months. I have 3 students. I am preparing two of them for the university exam. I taught 6th and 10th grade students. I taught English to a 65-year-old person. I am preparing material also." (PT3)

The researcher asked volunteer first- and fourth-grade pre-service teachers about their feelings towards teaching English. The positive and negative feelings of pre-service teachers are presented in Table 8.

Table 8. Positive and negative feelings of pre-service teachers

Positive Feelings of Pre-service Teachers	Negative Feelings of Pre-service Teachers
Confident	Anxious
Motivated	Nervous
Sufficient	Fearful
Happy	Biased
Lucky	Insufficient
Comfortable	Interrogant
Efficient	Boredom
	Distress
	Hesitant

According to the results of the semi-structured interview, first grade pre-service teachers feel confident and motivated while teaching English, whereas fourth grade pre-service teachers stated that they feel both confident, motivated, sufficient, happy, lucky, comfortable, efficient, and anxious, nervous, fearful, biased, insufficient, interrogant, boredom, distress, and hesitant in teaching English.

"I was more comfortable as a student. I get anxious when I'm a teacher." (PT1)

"So, I am both self-confident, but of course I also have some fears. These fears of me not being sufficient come from inexperience; I think I am sufficient in terms of knowledge." (PT2)

"I haven't had any problems with in-class practices yet, so now it's going smoothly since I came from preparatory school... I don't feel like there will be any problem; I consider myself sufficient for the applications; frankly, it changes depending on the activities we do..." (PT8).

The semi-structured interviews revealed that three first-grade pre-service teachers have no teaching experience. Most fourth-grade pre-service teachers reported conducting classroom practices in a planned manner when teaching English, although some also mentioned engaging in both planned and spontaneous practices.

"I haven't had the chance to practice much yet, but I think it would be more beneficial to make plans. I think it would be more beneficial to prioritize lesson plans, make a draft in my mind, and teach the lesson accordingly." (PT8)

"During my internship, I planned everything in my head. Yes, we have a lesson plan that we give to our academic advisor, but not everything goes as it should." (PT1)

"I plan by taking the time into consideration, and accordingly, I select or prepare interesting materials, taking into account the level of the students. The first thing I do is determine the materials. I plan the lesson based on it." (PT10)

The researcher asked first- and fourth-grade pre-service teachers to make self-evaluations regarding English language teaching. The strengths and weaknesses of pre-service teachers regarding English language teaching are presented in Table 9.

Table 9. *Strengths and weaknesses of pre-service teachers regarding English language teaching*

Strengths	Weaknesses
Openness to development and change	Forgetfulness
Dedication to studying	Anxiety and fear in teaching English,
A desire for perfection	Insufficient skills in teaching writing and speaking
Strong speaking skills	Challenges in classroom management
Attentiveness	Difficulty in making lessons engaging
Ability to identify deficiencies	Adapting to students' levels
Lesson variety	Preparing lesson plans
A friendly attitude	Problem-solving in practice
Proficiency in teaching grammar	Assessing student levels
Teaching through concretization	Managing time effectively
Simplification	Balancing classroom dynamics
Effective student communication	Reaching all students
Classroom management	Concerns about inexperience and busy schedules
Engaging uninterested students	
Teaching adults	
Teaching vocabulary	
Offering individual support	
Engaging students	
Effective material use	

Both first- and fourth-grade pre-service teachers identified several strengths: openness to development and change, dedication to studying, a desire for perfection, strong speaking skills, attentiveness, ability to identify deficiencies, lesson variety, a friendly attitude, proficiency in teaching grammar, teaching through concretization, simplification, effective student communication, classroom management, engaging uninterested students, teaching adults, teaching vocabulary, offering individual support, engaging students, and effective material use.

"First of all, the people whom I give the most importance to in my evaluation are my students. How can I say it? What I see as my mirror, not a person, are my students. Students' opinions are important." (PT2)

"I consider both online and internships, and I am successful in speaking classes. I used to say that I could not speak English well, but after two students, I could manage the lesson well." (PT3)

"I consider myself competent in terms of lecturing, involving students in the lesson, and using the materials effectively." (PT10).

The weaknesses identified by both first- and fourth-grade pre-service teachers include forgetfulness, anxiety and fear in teaching English, insufficient skills in teaching writing and speaking, challenges in classroom management, difficulty making lessons engaging, adapting to students' levels, preparing lesson plans, problem-solving in practice, assessing student levels, managing time effectively, balancing classroom dynamics, and reaching all students, with concerns about inexperience and busy schedules.

"...My limitations... Well, how should I say that? I'm a bit forgetful and distracted... Sometimes I watch videos about grammar in case I forget the rules, and I love studying. I am constantly trying to compensate for my shortcomings. (PT1)

"I think I need to improve myself more in terms of making the course interesting to students and understanding the subject in a way that students can understand." (PT5)

"I can say that I have difficulty with smaller student groups... I do not think I am very sufficient in terms of teaching speaking and writing lessons." (PT8)

The following are the views and suggestions of 1st and 4th-year pre-service EFL teachers regarding effective language learning and teaching. The suggestions from first- and fourth-year pre-service teachers to fellow pre-service teachers and Council of Higher Education (YÖK) are presented in Table 10.

Table 10. *Suggestions to Fellow Pre-service Teachers and Council of Higher Education*

To Fellow Pre-service Teachers	To Council of Higher Education
Being adaptable to rapidly changing systems and programs	Teaching training courses should be included in the curriculum from the first year
Recognizing personal strengths and weaknesses	The frequency of teaching training course should be increased throughout the program
Aiming to raise well-rounded individuals by developing in multiple areas	Internship periods should be extended and more guidance should be provided.
Staying updated with field developments and attending workshops	Practical courses in writing and speaking should be increased.
Enhancing skills and hobbies beyond English	Early classroom observation opportunities should be provided to prospective teachers.
Improving psychological understanding	
Practicing speaking regularly	
Overcoming proficiency-related fears	
Revisiting foundational knowledge like grammar	
Maintaining effective communication with students	
Being open to and adaptable with feedback from others	
Participating in Erasmus and certificate programs	
Learning to use technology effectively	
Being proactive in anticipating student challenges	
Achieving a high level of English proficiency	
Utilizing helpful resources	
Networking with experienced educators via social media	
Gaining extensive classroom practice	
Preparing for current teaching methods and practices	

First- and fourth-year pre-service teachers offered several recommendations to their peers. They emphasized the importance of adaptability to evolving educational systems, self-awareness regarding personal strengths and weaknesses, and the goal of nurturing well-rounded learners through multidimensional development. Staying informed about field trends, attending workshops, and developing interests beyond English were also encouraged along with cultivating psychological insight.

Language-specific suggestions included regular speaking practice, confronting language-related anxieties, reinforcing foundational grammar, and fostering effective communication with students. Openness to feedback and flexibility in implementation were seen as critical.

Additional advice involved engaging in Erasmus and certificate programs, integrating technology effectively, anticipating student needs, achieving high English proficiency, using reliable resources, networking with experienced educators via social media, gaining substantial classroom experience, and familiarizing oneself with contemporary teaching approaches.

"Especially now in Türkiye, the system is changing very quickly. It is important to be more flexible and keep up with the day rather than sticking strictly to any method." (PT1)

"They should be aware of their strengths and weaknesses. The reason for this is that, after all, we will train people, not for teaching purposes." (PT2)

"The more we foresee the problems that students may experience, the better teaching we can provide." (PT5)

"I think teaching is something to be learned and improved in the classroom. Therefore, it is necessary to gain as much experience as possible." (PT10)

The first- and fourth-grade pre-service teachers suggest to the Council of Higher Education (CoHE) that teaching training courses be included in the curriculum from the first year and that the frequency of these courses be increased throughout the program.

"Teaching experience should start in the first year, and an internship in the last year is insufficient. It may be one month in the first year, but the duration of the second semester may be increased. If internships were offered in earlier years, one would have to enter teaching earlier." (PT3)

"Being an English teacher is a profession that can be learned by doing a lot of practice, so I think it would be better if the internship, which will be the last year, could be done earlier." (PT8).

Discussion, Conclusion and Recommendations

Self-efficacy, central to social cognitive theory, refers to individuals' confidence in their ability to succeed. It plays a critical role in various domains, including career development (Lent & Brown, 2002) and academic performance (Pajares, 2003), closely tied to self-regulation and adaptive strategies.

This study found no significant gender-based differences in self-efficacy, aligning with Hyde's (2014) gender similarities hypothesis. Supporting studies also report equivalent self-efficacy levels among male and female teachers (Orakcı et al., 2023), with only minor, balanced differences in specific skills (Nielsen et al., 2021). These consistent findings suggest that gender has little practical impact on self-efficacy.

Similarly, no significant correlation emerged between self-efficacy and academic year, contradicting Bandura's (1997) expectation that experience enhances self-efficacy. However, qualitative findings revealed that pre-service teachers engage in diverse self-directed learning strategies such as watching English series, using platforms like Cambly, participating in Erasmus+, and exploring resources like BBC Learning English. These activities appeared to boost both proficiency and confidence. Prior research supports this: social media (Fathgi, 2021), Cambly (Alshammari, 2020), and multimedia input (Yang, 2014) positively influence language development.

These findings suggest that teacher education programs should incorporate structured guidance on self-directed learning strategies rather than leaving them to chance. Advisors should offer training on digital platforms and encourage international opportunities. Institutions could partner with tools like Cambly and curate resource banks for podcasts, series, and online materials. Pre-service teachers might benefit from building personal learning portfolios that combine formal instruction with informal, authentic practice. At the policy level, integrating these strategies into national standards could enhance teacher preparation.

Interview results also highlight emotional complexity among pre-service teachers. While both first- and fourth-year students feel confident in teaching English, senior students express more nuanced emotions including motivation and confidence but also anxiety and self-doubt. These feelings likely stem from practicum exposure and increased awareness of classroom realities. This mirrors findings by Martínez Agudo and Azzaro (2018) and Tarman (2012), who emphasize the emotional shifts that occur during field experiences.

To address this, teacher education programs should normalize emotional fluctuations as part of professional development. Reflective practices, peer mentoring, and early exposure to classroom simulations can help students manage expectations. Stress management and emotional intelligence training should be embedded throughout the program.

Participants also recommended that teaching practice be introduced from the first year, gradually increasing over time. This aligns with Bay et al. (2020) and Tarman (2012), who argue that practice

fosters professional growth and deeper classroom understanding. Current final-year internships were viewed as insufficient. A graduated practicum model starting with brief exposures and increasing in complexity was favored, an approach supported by previous studies (Collier, 1999; Çakmakcı, 2009).

The importance of self-efficacy is further reinforced by its links to better performance, self-regulation, and adaptability (Avery & Meyer, 2012; Kazempour & Sadler, 2015), alongside CGPA correlations found in this study, emphasizing self-efficacy's central role in teacher development.

In conclusion, this study enhances understanding of pre-service English teachers' self-efficacy. While gender was not a determining factor, educational experiences and satisfaction levels influenced self-beliefs. The complex interplay of personal and contextual factors suggests the need for multifaceted strategies in teacher education. Future research should consider longitudinal designs to trace self-efficacy development and its impact on classroom practice.

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Professional Development Experiences of Early Childhood Teachers in Türkiye*

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Abstract

Professional development efforts have become one of the key factors in the success of many countries. Effective professional development practices that include the core features defined in the literature are critical for improving the quality of early learning. This phenomenological study explores views and experiences of early childhood teachers on professional development. The participants in the study were ten early childhood teachers. The data of the study were obtained through semi-structured interviews and professional development experience forms. The data were analyzed through the core features of effective professional development under the themes of active learning, content focus, collective participation, coherence, and duration. The study indicates that practices which promote active participation and respond to teachers' specific professional needs foster ongoing professional learning and support the implementation of new instructional strategies in the classroom. The findings suggest that early childhood teachers' professional development can be enhanced through collaborative, needs-based, and reflective methods. The study's findings are believed to provide valuable insights for the development of professional development processes and for researchers in early childhood education.

Keywords: professional development, early childhood education, early childhood teacher, professional learning, teacher education

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Türkiye’de Okul Öncesi Öğretmenlerinin Mesleki Gelişim Deneyimleri*

Makale Türü	Başvuru Tarihi	Kabul Tarihi
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Öz

Mesleki gelişim çalışmaları birçok ülkenin başarıya ulaşmasındaki önemli unsurlardan biri olarak nitelendirilmektedir. Alan yazınında tanımlanan birtakım temel özellikleri içeren etkili mesleki gelişim uygulamaları erken çocukluk eğitiminin kalitesini artırmak için kritik öneme sahiptir. Bu fenomenolojik çalışma okul öncesi öğretmenlerinin mesleki gelişim deneyimlerini ve görüşlerini araştırmaktadır. Çalışmaya on okul öncesi öğretmeni katılmıştır. Çalışmanın verileri yarı yapılandırılmış görüşmeler ve mesleki gelişim deneyim formları aracılığıyla elde edilmiştir. Veriler etkili mesleki gelişimin temel özellikleri aracılığıyla aktif öğrenme, içerik odaklılık, kolektif katılım, tutarlılık ve süre temaları altında analiz edilmiştir. Bu çalışma, aktif katılımı teşvik eden ve öğretmenlerin spesifik mesleki ihtiyaçlarına yanıt veren uygulamaların, öğretmenlerin sürekli mesleki öğrenmeye katılımlarını artırdığını ve sınıflarında yeni öğretim stratejilerini uygulamalarını desteklediğini ortaya koymaktadır. Bulgular, okul öncesi öğretmenlerinin mesleki gelişiminin iş birlikçi, ihtiyaç temelli ve yansıtıcı yöntemlerle artırılabilirliğini göstermektedir. Çalışmanın bulgularının mesleki gelişim süreçlerinin geliştirilmesi ve erken çocukluk eğitimi araştırmacıları için değerli öngörüler sağlayacağı düşünülmektedir.

Anahtar Sözcükler: Mesleki gelişim, erken çocukluk eğitimi, okul öncesi öğretmeni, mesleki öğrenme, öğretmen eğitimi.

* Bu makale birinci yazarın, ikinci yazar danışmanlığında tamamladığı yüksek lisans tezinden üretilmiştir.

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Introduction

Professional development is conceptualized as a learning process that is planned, purposeful, aligned with content, and aimed at improving teacher practice. Effectively designed professional development practices can transform teachers' ways of thinking, classroom decisions, and pedagogical practices (Desimone, 2011; Darling-Hammond et al., 2017). The organization of these practices, the importance of which is advocated worldwide, based on various professional development components increases the efficiency of the practices (Clarke et al., 2021). Many traditional professional development models include processes that render teachers' passive participants (Margolis, 2023), that are far from the school context (Borko et al., 2010), do not provide opportunities for collaboration, fail to meet the ever-evolving professional needs of teachers (Little, 2006), and contradict the principles of adult learning (Richards & Farrell, 2005). Thus, these top-down approach methods have several notable consequences including lack of engagement, limited long-term effect, and limited collaboration (Margolis, 2023; Murphy & Calway, 2010). Desimone (2009; 2011) provides a framework for effective professional development programs that include the core features of content focus, active learning, coherence, duration, and collective participation. He argues that a professional development program with these components can lead to significant improvements in teaching practices. Effective professional development programs should have a meaningful and practical structure that occurs at regular intervals, incorporating training, practice, and feedback. They should address the needs and aspirations of teachers as learners, consider the interests and needs of students, focus on enhancing student learning, provide teacher-centered and professionally integrated learning experiences, and promote active and collaborative learning (Desimone, 2011).

Quality professional development practices have also become the focal point of early childhood education reforms worldwide and stand out as a critical element that directly affects the quality of early childhood education. (Olsson et al., 2025; Liu et al., 2024). Early childhood teachers' professional development experiences are not limited to the acquisition of knowledge and skills but also have the potential to transform their child-centered pedagogical approaches (Machado & Oliveira-Formosinho, 2024). In particular, the content, duration and practical applicability of the professional development programs that teachers participate in are of great importance for adopting contemporary teaching approaches such as play-based learning (Lee et al., 2024). All these findings reveal the need for more in-depth, context-sensitive, and experience-driven research on the professional development processes of early childhood teachers. Questions such as how teachers construct meaning in these processes, the challenges they face, and how they experience their development can provide important insights into improving the quality of early childhood education. Current literature reveals a gap in understanding how professional development experiences translate into daily classroom practices (Gardner-Neblett et al., 2021).

Studies suggest that professional development initiatives should consider teachers as active agents in their learning and be adapted to their unique early childhood environments (eg. Şahin et al., 2024; Egert et al., 2020). This highlights a gap in the inclusion of teacher perspectives and contextual factors in research (Baker, 2018). Thus, exploring the professional development experiences of early childhood teachers is crucial for enhancing educational practices and addressing the unique challenges faced by this group. Professional development serves as a vital tool for equipping teachers with the skills necessary to implement developmentally appropriate practices and manage classroom dynamics effectively (Hooper et al., 2023). Recognizing the influence of such practices on the quality of early childhood education, many countries around the world have emphasized the importance of professional development practices in early childhood. However, these opportunities have differed widely in terms of accessibility and content (OECD, 2012). Research often overlooks teachers' voices and the specific contexts in which they work.

As in many countries around the world, in Türkiye, the importance of professional development for early childhood educators has been increasingly recognized, aligning with global trends in educational reforms. Over the past two decades, significant steps have been taken to enhance teacher professional development through various reform initiatives, although challenges persist in ensuring these opportunities meet the diverse needs of educators in different contexts (OECD, 2023). In Türkiye, in-service teacher professional development is coordinated by the Directorate General for Teacher Training and Development under the Ministry of National Education (MoNE). The

Directorate offers workshops, seminars, and other activities—often held two weeks before or after the school year—in collaboration with universities, public institutions, and non-governmental organizations. Most training is delivered face-to-face or via distance learning. Teachers can also apply for programs aligned with their individual needs and interests. Despite increased funding and activity variety, the effectiveness of professional development programs in Türkiye has been questioned by teachers and researchers (Gokmenoglu et al., 2016). The exploration of early childhood teachers' experiences can reveal insights into context-specific programs that address the unique challenges and knowledge gaps of early childhood educators. Investigating such issues appears to be crucial for understanding how professional development programs can affect the practices of early childhood teachers, what might be done to support their professional growth and development as teachers of young children, and what gaps/omissions remain in the literature. Although many studies (Darling-Hammond & McLaughlin, 2011; Desimone, 2011; Garet et al., 2001; Patton et al., 2015; Schachter et al., 2019) have been carried out on the implementation and evaluation of professional development programs worldwide, the limited number of studies conducted in Türkiye draws attention (Can, 2019; Eroğlu & Özbek, 2018; Yüner, 2022). Thus, the aim of this study is to investigate the views and experiences of early childhood teachers on professional development practices. The research questions are as follows:

- 1) What are the experiences of early childhood teachers on professional development practices?
- 2) What are the views of early childhood teachers on professional development practices?

Method

Research Design and Sample

In this research, the phenomenological method was used to have in-depth information and interpret the experiences (Creswell, 2013). The experiences and views of ten early childhood teachers working in the central city of Türkiye were analyzed in depth based on Desimone's (2009) professional development components. The study group consisted of three teachers working in independent kindergartens and seven teachers working in preschools affiliated with primary education. The years of teaching experience of the participants ranged from five to eighteen years.

Research Instruments and Procedures

The main data collection tools of this research were semi-structured interviews and the Professional Development Experience Form. The first part of the interview questions included demographic information about the participants, the second part included questions to obtain their experiences on professional development practices, and the last part included questions to understand their experiences and views on professional development components. The Professional Development Experience Form, developed by the researchers based on Desimone's (2009) five core components of effective professional development, included items designed to capture teachers' experiences. The form consisted of a total of 14 items about the experiences of teachers regarding their professional development.

Data Analysis

The data obtained from the interviews were first transcribed by listening to the audio recordings and participants' statements were presented verbatim. Once the transcriptions were completed, the data obtained were categorized into themes according to Desimone's (2009, 2011) five basic components of effective professional development: active learning, content-focused, coherence, collective participation, and duration. In this study, the data obtained from the semi-structured interview questions were analyzed using a deductive analysis approach and then, the inductive analysis method was used (Gibson & Brown, 2009). With the deductive analysis approach, professional development components were used as five themes by Desimone (2009). These themes were referenced, and the data were read many times, thoroughly examined, and organized accordingly. Subsequently, various codes were generated and the data regarding the pre-determined themes were grouped into clusters. The data were read many times and analyzed thoroughly, and inductive analysis was used to make sense of the data (Bingham, 2023). In this process, the explanations of the codes were re-examined and developed, and the ideas obtained from the data were determined. Then, the interpretation phase of the data was completed by identifying the categories aligned with the

developed themes, and by analyzing the research findings through the codes and categories generated using both deductive and inductive analysis methods.

To ensure the validity and reliability of the study, data triangulation, peer review, expert consultation, and a pilot study were employed (Creswell, 2013). The interview questions and the Turkish version of the Professional Development Experience Form were first submitted to three early childhood researchers for their evaluation. Then, a pilot study was conducted with three early childhood teachers from the target group to identify potential issues and make necessary revisions before the main data collection phase (Creswell, 2013).

Ethical Procedures

Ethical approval for the study was obtained from the relevant university on September 27, 2022.

Results

Active Learning

The professional development experience form findings for the active learning theme are presented in Table 1.

Table 1. Professional development experience form findings for the active learning component

	Never	Rarely	Sometimes	Usually	Always
The professional development programs include active learning environment.		T2, T3, T4, T5, T8,	T1	T9	T7, T10
I participate in professional development programs.		T2,	T1,	T3, T4, T6, T8, T9	T5, T7, T10
Teachers' professional needs are considered before designing professional development programs.	T5	T3, T4, T6, T8, T9, T10	T1, T2	T7	

According to the findings, almost all the teachers had professional development experiences that involved direct instruction through presentation. While describing their experiences in terms of active learning, the participants noted that many professional development practices lacked interactive processes. Some excerpts from teacher statements reflecting these experiences are provided below:

T2: I think it's a problem when a trainer simply presents slides during a workshop... For example, they introduce themselves and immediately open their slides.

T3: In some activities, they cannot involve us in the process, they just tell us and move on, and we cannot learn much this way.

Considering active learning, the participants reported that professional development practices oriented toward active learning were the ones they could remember more easily. As evident from the findings, combining theoretical knowledge with practical application was considered particularly effective for teachers. Furthermore, they reported the importance of using various and concrete materials, related to the subject matter, on enhancing their learning and increasing their motivation. Below is an excerpt reflecting these experiences:

T5: The processes in which we are always active and fully practice-orientated are wonderful. It is great when something is taught beforehand, and then we get to apply it afterward.

The findings revealed that receiving feedback during professional development practices was essential for their engagement. Teachers reported a strong desire to have their voices heard, particularly in settings where they could address uncertainties arising from their experiences and discuss aspects they believed needed improvement. They emphasized the importance of engaging in professional development activities alongside experts in their field to facilitate this process. The role of receiving feedback throughout the process was defined as a tool that encouraged more active participation in the process and made it easier to follow up. A participant's statement regarding this is presented below:

T7: ... Let's be included in the process a little. Let's write a plan—design an activity or create a pool for that activity. We can send it there; they can read it and evaluate it. There should be spaces where we can actually create and produce something. That would be active learning.

Content Focus

The professional development experience form findings for the content focus theme are presented in Table 2.

Table 2. Findings from the professional development experience form for the content focus component

	Never	Rarely	Sometimes	Usually	Always
What I have experienced in the professional development programs contributes to my practices.			T3, T4, T6,	T1, T2, T5, T8	T7, T9, T10
My school provides me with professional development opportunities in addition to the professional development programs offered by the municipality.	T1	T3, T4, T5, T8, T9, T10	T6, T2	T7	
The professional development programs offer different contents.		T1, T2, T7		T3, T4, T5, T6, T8, T9, T10	

The findings revealed that teachers found professional development practices focusing on specific content related to early childhood education more effective. Professional development activities were found beneficial when they focus on subject matter content, the implementation in classroom and how young children learn that content. Teachers emphasized that professional development activities should contribute to children's learning and be tailored to their needs. However, most professional development practices were reported as not aligned with these needs and were instead compulsory, which reduced both motivation and effectiveness. In addition to these, all teachers highlighted the importance of incorporating current updates into professional development practices to adapt to the changing profiles of children each year. The following quote corroborates this finding:

T2: Over the years, both children change, we ourselves change, and technology advances. Any kind of development inevitably affects us. The dynamics are constantly changing. We need to keep up with the changes, because our audience, I mean, we are affected first-hand because we are preschoolers. Naturally, the education we received and current education, or even this year's education processes, must be different.

Almost all participants agreed that effective professional development practices could be transferred to the learning environment as long as they contributed to their own professional growth and were part of a mutually beneficial cycle. The participants reported that when professional development enhanced their own learning, they could more effectively and positively transfer their knowledge to the classroom. It was found that professional development practices were more effective when they contributed to teachers' understanding of child development and its practical implementation. An excerpt regarding this finding is given below:

T3: The ones that I find effective, as far as I see on children, motivate them and involve them better in the education and training process. It also motivates me. This is because I feel professionally satisfied when I can make progress in children. If I cannot make any progress, I'm not professionally satisfied with the education I receive from those programs.

Collective Participation

The findings of the experience form are presented in Table 3.

Table 3. Findings of the professional development experience form for the collective participation component

	Never	Rarely	Sometimes	Usually	Always
Only early childhood teachers participate in the professional development programs.		T3, T6, T8	T1, T4, T7	T5, T2, T9, T10	
The professional development programs include sharing ideas among colleagues.		T10	T2, T8	T1, T3, T5, T9	T4, T6, T7
After the professional development programs, I share my professional learning with people who did not attend it (such as colleagues and administrators).			T10, T8	T1, T2, T3, T4, T5	T6, T7, T9
After the practices, my school provides a suitable environment for the exchange of information and ideas about the practices.	T1	T4, T5, T9, T10	T3, T2	T7, T8	T6

The findings revealed that some professional development practices were offered to all teachers from their schools. Teachers found it beneficial to share ideas and engage in brainstorming sessions with their colleagues after these activities in their school environment. Early childhood teachers who shared similar experiences gained new perspectives on current situations, which in return positively influenced the classroom environment. Teachers who were fed from different perspectives benefited from a more diverse learning environment. In addition, it was also among the statements that teachers transferred the things they learned from practices to their colleagues who had not participated. One of the statements of the participants regarding these experiences is given below:

T3: Definitely, it should be because you are discussing, maybe something that I would not think of in that environment comes to the mind of a friend in that group. ...We positively influence each other.

Furthermore, they emphasized that the professional development activities should be in a structure that allows for collaborative sharing, not only afterwards. Considering the experiences of the participants, it was found that the exchange of ideas and brainstorming about the practices among colleagues, which were carried out during the professional development practices contributed to their professional development. Teachers stated that hearing the classroom examples of others and sharing their practices with their colleagues were important for their professional development. Some examples of these experiences are presented below:

T4: It should be collaborative. The teacher should contribute to the process.

T7: Firstly, knowledge increases as we share it. ... My learning is also permanent. The more I explain, the more I tell the theories, the more I give examples of applications, the easier it is for me to assimilate...Then we exchange ideas about what we can do more. As long as there is interaction, there is development.

Participants believed that incorporating their professional experiences in professional development practices positively impacted the process. They expressed that sharing similar experiences with colleagues increased their focus and interest in the process. They also stated that taking examples from participants could enable them to be involved in the subject. A few examples of these views are given below:

T6: Maybe a friend applies a method I once used with a child—but in a different way—and gets a result. That could be an example for me.

Overall, it was found that the participants described collaborative experiences as effective professional development practices. There were opinions that the practices in which the participants were stakeholders increased the motivation of the participants and facilitated the integration of the subjects discussed.

Coherence

The professional development experience form findings for the coherence theme are presented in Table 4.

Table 4. Findings from the professional development experience form for the coherence component

	Never	Rarely	Sometimes	Usually	Always
The professional development programs are effective for teachers.		T1, T2, T8, T10	T3, T7	T9, T5	T4, T6
The professional development programs have coherency.		T3, T5	T8, T1, T2	T4, T6, T7, T9, T10	

It was found that the coherence between the school conditions and the content of the professional development activity was an important element for teachers. Teachers preferred practices that aligned with their current working conditions, which could negatively affect their application of learning. Teachers learn in professional development activities that are consistent with the national program and socio-economic background of the environment. The consistency of subjects, practices, and samples with common classroom situations increased the sense of belonging for professional development among teachers. It was seen from the data that professional development practices that teachers are required to attend were not sufficient for them to improve themselves and resulted in low satisfaction in terms of meeting the requirements of the current program and children's profiles in schools; therefore, they participated in private professional development practices. Among the statements are that paid practices are effective practices in terms of organization and meeting the needs of teachers. An excerpt is given below:

T3: ...unfortunately, many professional development activities do not motivate us and that is why I receive training privately.

It is noteworthy that the professional development practices were not consistent with the facilities of the schools where the participants are working. Most professional development practices were implemented throughout the country. Teachers reported that they found it more effective if they were part of training oriented towards the conditions and needs of their current schools:

T8: It should be suitable for the conditions of the place where I work. It should be applicable, it should not be left up in the air, in other words, if I cannot come and apply something they explain in my classroom, it will not be of any use. It will not be of any use to the child either. Conditions should not be considered as if everywhere were like Ankara.

When the views of early childhood teachers on the coherence component were examined, a striking consensus emerged regarding the necessity of conducting a needs analysis. The participants emphasized that professional development practices that take into account their professional needs contributed more to their development and that the conditions of the school they worked at played an important role in shaping and diversifying these needs. Some of the participant views on this are presented below:

T5: I think that needs assessment should be conducted beforehand for the teachers.

T7: I think that even a small survey to teachers, in other words, getting their valuable opinions, is the first thing to do.

Duration

The professional development experience form findings for the duration theme are presented in Table 5.

Table 5. Findings of the professional development experience form for the duration component

	Never	Rarely	Sometimes	Usually	Always
I find the duration of the professional development programs sufficient.		T3, T5	T1, T2, T4, T6, T9, T10	T7	T8
The duration of the professional development programs should be increased.	T7	T1, T2, T4, T5, T8, T9, T10		T3	T6

The findings indicated that the duration of the professional development practices teachers attended was not fixed and could vary from one and a half hours to five days. It was observed that this variation in duration depended on the subjects related to subject and the locations where the practices were conducted. It was reported as a part of their experience that the municipality could frequently provide distance education and teachers could also participate in residential professional development practices outside the city, lasting three to five days.

T9: We attend seminars at the beginning of the year, during mid-term breaks, and at the end of the year. There are also additional trainings. Some are 18 hours long, while others vary depending on whether it's a 1-hour training. The 18-hour ones are usually compressed into two days.

The findings also revealed that the professional development practices were mostly carried out outside the classroom hours. It is noteworthy that requiring teachers to dedicate additional time beyond school hours and making this compulsory for the teachers decreased both their motivation and the effectiveness of the process. Two of the statements of the participants are presented below:

T2: The trainings are usually held after school, and the time is not appropriate.

T5: Timing really matters. The teacher will both come to school and attend the seminar after leaving there.

In addition, there were one-off and short-term professional development practices among the experiences of the participants. It is important to mention that the fast-paced structure and brief duration of these activities were perceived to negatively affect both the overall effectiveness of the training. The statements of the participants regarding this are presented below:

T9: For example, most things were rushed, and went too quickly, there was no need for that much.

T10: Some seminars only last one hour.

It is striking that teachers perceive the continuous integration of professional development practices throughout the academic year as beneficial for their learning and implementation. They advocate for these practices to be distributed across the academic year, rather than being concentrated in high-intensity, compressed sessions during specific seminar periods. This approach, they argue, would enhance the teaching and internalization of the provided content, as opposed to being confined to singular events. Some examples of these views are presented below:

T5: I think these seminars could be continued at certain intervals.

T7: ... If these were spread out over the course of the program... Maybe if we spread the timings of professional development activities over the term a little bit, this could be more manageable.

Overall, teachers emphasized that it would be more effective if the duration of the professional development activity was aligned with the subject and the way it was applied.

Discussion, Conclusion, and Recommendations

In this study, the views and experiences of early childhood teachers regarding professional development were examined through the lens of Desimone's (2009; 2011) five key components: active learning, collective participation, duration, content focus, and coherence. The findings indicated that professional development activities were predominantly conducted through direct explanations via presentations, lacking interactive processes. In active learning environments, the objective is to engage actively in the practices they are acquiring, with applications that incorporate interactive activities to facilitate comprehensive learning (Darling-Hammond et al., 2017). It was found that teachers were not sufficiently engaged in active learning processes during their professional development experiences. Hooper and his colleagues (2023) noted that teachers are frequently positioned as passive participants, resulting in superficial experiences. It is well-known that considering active learning features in the planning and implementation of these processes enhances the effectiveness of professional development (Desimone, 2009; Garet et al., 2001). Practices such as seminars, one-time workshops, and similar sessions have often been criticized for their minimal contribution to teacher development and their failure to provide an active learning environment (Hooper et al., 2023). It is seen that professional development programs in Türkiye are mostly carried out in the form of courses and seminars (Atal & Sancar, 2021). In these programs, teachers frequently remained passive listeners for extended periods, becoming reliant on the presenter, which diminished their potential and discouraged them from taking responsibility for their professional growth (Darling-Hammond & McLaughlin, 2011). A notable aspect of the participants' experiences was their assertion that

incorporating practices that facilitated engagement enhanced the programs' effectiveness. The literature reveals that teachers regard opportunities for practical work in professional development programs as highly valuable (Garet et al., 2001; Machado & Oliveira-Formosinho 2024). Furthermore, the OECD (2005) review highlights that effective programs provide teachers with specific content applicable in the classroom, offer feedback, and maintain participant engagement throughout the process. This examination of teachers' views and experiences revealed that programs incorporating feedback and active learning components effectively addressed teacher needs.

Professional development practices should prioritize and foster collective participation and interaction. The exchange of ideas among colleagues within these practices offers diverse perspectives and enhances learning by providing varied approaches (Desimone, 2011). Such practices promote a collaborative environment where strong professional relationships are established and information exchange is encouraged (Methlagl, 2022). Similarly, opportunities for collaboration should be structurally supported, impeding sustainable collaborative learning processes (Liu et al., 2024). Supporting that research, teachers' views indicated that professional development experiences offering collaborative learning opportunities contributed more significantly to their classroom practices. Moreover, teachers emphasized that when the knowledge and experiences gained are not transferable to their daily classroom practices, they may struggle to maintain focus and motivation. Differentiated practices tailored to each school's specific needs are critical for the effectiveness of professional development. In order to maximize the impact of professional development, it is important to take into account the professional needs of teachers in the planning process (Yüner, 2022). Therefore, ensuring the usability and practicality of professional development programs is essential. Teachers may be adversely affected by generic content, limited applicability, or mandatory participation in ineffective programs. Machado and Oliveira-Formosinho (2024) discovered that many programs are not adequately connected to teachers' daily classroom practice. Lastly, inconsistency between practice and policy is another factor limiting the effectiveness of professional development. Olsson, Almqvist, and Kultti (2025) reported that the failure to bridge the gap between theoretical knowledge and classroom practice negatively impacts teachers' development. In this context, the findings of this study indicate that for professional development processes to be effective, it is crucial not only to consider the content presented but also how this content is delivered and integrated with the teacher's experience.

Teachers typically engage in one-time or short-term training, but ongoing professional development practices and sustained participation support continuous learning and improvement (Desimone, 2011). Regarding duration, Lee et al. also (2024) highlighted that many professional development programs consist of short-term activities with limited impact, which adversely affects the retention of learning. Participant teachers attend training sessions ranging from one to eighteen hours and typically participate in eight or nine sessions in an academic year. Teachers highlighted the importance of adjusting training durations according to the content and teachers' professional needs. Extensive and in-depth training programs tend to be more effective when they are long-term. A noteworthy finding of the study is that although teachers perceived the duration of the programs as insufficient, they did not express a desire for these durations to be extended. While this may initially appear contradictory, the findings suggest that this hesitation stems from participants' negative perceptions of the training programs they had previously experienced, as well as the lack of implementation of other essential components recognized to enhance program effectiveness (Darling-Hammond et al., 2017). In this regard, the desire to extend the duration only when the professional development program is effective and includes active learning, feedback, brainstorming, collaboration, and varied instructional methods distributed over time (Darling-Hammond et al., 2017; Guskey, 1994) aligns with expectations in the literature. The length of these activities is considered crucial for two main reasons. Firstly, extended sessions are more likely to facilitate thorough discussions on content and teaching methods. Secondly, activities that span a longer period are more likely to enable teachers to experiment with new techniques in the classroom and receive feedback on their instructional methods (Garet et al., 2001; Lindvall et al., 2022).

This study highlights the need for professional development practices in which early childhood teachers actively participate, receive feedback, and engage with content that aligns with the specific needs of their classrooms. When teachers feel their voices are unheard and their context-specific needs are overlooked, the impact of such initiatives diminishes. Therefore, professional development

programs should be designed to foster collaboration, active participation, and reflective practice. Incorporating these elements can not only enhance teacher engagement but also support the sustained implementation of new strategies in the classroom. To be effective, professional development should be aligned with the actual needs of teachers, offer content that is directly applicable to early childhood classroom settings, and ultimately contribute to both teacher learning and student outcomes. A strong emphasis on content is essential for influencing instructional quality and classroom climate. Moreover, programs should be sustained over time to allow for in-depth exploration of pedagogical concepts, integration of feedback, peer learning, and opportunities for reflection on classroom practice. Designing professional development in this way can promote meaningful professional growth among early childhood educators in Türkiye.

While this study reveals the experiences of early childhood teachers regarding professional development, the data is limited to interviews and experience forms. The findings indicate that the effects of different professional development models on teachers' professional development processes should be investigated in more depth. In addition, it is also recommended to conduct research with observation-based data in professional development activities. In this context, the need for longitudinal studies that support teacher learning, including various approaches and models, is clearly evident.

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Validity and Reliability Study of Social Media Sensitivity Scale in Disaster

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Abstract

In disasters that result in loss of life and property, social media plays a significant role in facilitating communication and mitigating the destructive impacts of such events. While fulfilling this role, it is essential that social media users demonstrate verbal and visual sensitivity in their engagement with cooperation, solidarity, and public discourse during disasters. To assess social media sensitivity during the earthquake process, which had a profound impact on a large segment of society, a 27-item draft scale was developed based on interviews with social media users and a review of the relevant literature. Expert opinions were sought from two specialists in the fields of disaster management and social media usage regarding the scale items. Following a pilot study, the items were administered to 279 individuals who actively used social media during the disaster. Exploratory factor analysis resulted in a refined scale comprising 15 items. These items were categorized under four factors: “Contribution to the Process”, “Contribution to Management”, “Awareness of Destructive Effects”, and “Facilitation” of the “Process”. A second round of implementation of the scale was conducted with a sample of 157 social media users to further validate the instrument. As a result of the confirmatory factor analysis, it was observed that the scale demonstrated optimal fit indices (CMIN/DF=1,146; RMSEA=.031; SRMR=.059; NFI=.89,88; IFI=.984; CFI=.984; GFI=.925; AGFI=.895). The Cronbach's Alpha coefficient of the scale was found to be $\alpha=.82$. The AVE and CR values related to the reliability of the scale factors indicated a high level of convergent validity. Based on the findings, a valid and reliable measurement tool has been developed for assessing Social Media Sensitivity in Disasters (SMSSD).

Keywords: Social media sensitivity in disaster, scale development, validity, reliability.

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Gizem Şebnem Beydoğan*

Öz

Can ve mal kaybının yaşandığı afetlerde, sosyal medya, iletişimi kolaylaştırmada ve afetlerin yıkıcı etkilerini azaltmada etkin rol oynamaktadır. Bu rolünü yerine getirirken sosyal medya kullanan bireylerin afetlerde sözel ve görsel, yardımlaşma, iş birliği ve tartışmalarda duyarlı davranmaları oldukça önemlidir. Toplumun büyük bir kesiminin etkilendiği deprem sürecinde sosyal medya duyarlılığını ölçmek amacıyla sosyal medyayı kullanan bireylerle yapılan görüşmeler ve mevcut literatür taramasına dayanarak 27 maddelik bir taslak ölçek geliştirilmiştir. Ölçek maddeleri ile ilgili afet ve sosyal medya kullanımı alanında iki uzmanın görüşüne başvurulmuştur. Ön uygulama sonrası ölçek maddeleri, afette sosyal medya kullanan 279 sosyal medya kullanıcısına uygulanmıştır. Açıklayıcı faktör analizi sonucunda 15 maddeden oluşan bir ölçek elde edilmiştir. Ölçek maddeleri, “Süreçe katkı”, “Yönetime katkı”, “Yıkıcı etkiler farkındalığı”, “Süreci kolaylaştırma” adı altında dört faktörde toplanmıştır. Ölçek için ikinci uygulama 157 sosyal medya kullanıcısına uygulanmıştır. Doğrulayıcı faktör analizi sonucu ölçeğin optimal uyumluluk değerleri gösterdiği (CMIN/DF=1,146; RMSEA=.031; SRMR=.059; NFI=.89,88; IFI=.984; CFI=.984; GFI=.925; AGFI=.895; CFI=.984) gözlenmiştir. Ölçeğin Cronbach Alpha katsayısı $\alpha=.82$ olarak bulunmuştur. Ölçek faktörlerinin güvenilirliği ile ilgili AVE ve CR değerlerinin benzeşme düzeyi belirlenmiştir. Elde edilen bulgulara göre Afetlerde Sosyal Medya Duyarlılığının (SMSSD) ölçümünde kullanılabilecek geçerli ve güvenilir bir ölçme aracı geliştirilmiştir.

Anahtar Sözcükler: Afetlerde sosyal medya duyarlılığı, ölçek geliştirme, geçerlilik, güvenilirlik.

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Introduction

“The concept of “disaster” typically evokes, in the minds of individuals, a situation that “requires urgent intervention, disrupts and devastates daily life, involves significant loss of life and property, overwhelms individual and local efforts, and necessitates regional or international support” (Erkal& Değerliyurt, 2009, p.149). Today, social media has become an indispensable platform for individuals to make their voices heard and to express their needs and demands during disaster situations. With its current functioning, social media “has surpassed traditional media thanks to features such as accessibility, availability, usability, innovation, and permanence” (Mayfield, 2024, p. 232). Moreover, social media facilitates the flow of information and is highly effective and cost-efficient in collecting real-time data (Kavanaugh et al., 2011). It offers individuals and groups the opportunity to instantly communicate with others on both national and global scales without restrictions. In this process, social media sharing networks have become one of the most defining elements of the digital age; applications attract attention from all segments of society, and the virtual world is increasingly taking precedence over real life (Kırık et al., 2015). The practice of sharing user-generated content online for the purpose of information exchange has led to widespread use of the internet. In situations that disrupt normal life, such as disasters, the use of social media requires a more controlled, realistic, and cautious approach. In this context, measuring individuals’ social media sensitivity regarding disasters is anticipated to contribute significantly to the preventive strategies and societal preparedness efforts undertaken before the occurrence of such events.

During disasters, individuals’ increasing needs for communication and solidarity have significantly heightened the importance of social media as a tool. This is particularly evident in areas such as “emergency awareness, communication, information sharing, discussion, and collaboration” (Çanakçı et al., 2022, p.883). Social media users bear a humanitarian responsibility that extends beyond their individual civic duties during such events. It is argued that the shared attitudes and behavioral patterns adopted by individuals in response to extraordinary events like disasters contribute substantially to the effective management of the process and the mitigation of potential damages. In this context, “being collectively prepared in a well-organized manner is essential to overcome the consequences of a disaster with minimal loss and maximum efficiency” (Şahin & Uyan, 2016, p.781).

In disaster situations, the ability to respond digitally is possible within the effective boundaries of social media (Tim, Ractham, Kaewkitipong, 2017). Fundamentally, social media serves multiple functions: facilitating public discourse among individuals, monitoring the current situation, responding to emergencies, coordinating resource utilization, promoting collaboration and social cohesion among the public, raising awareness about the causes of events, providing basic aid, and expanding the scope of research processes.

Disasters, by their nature, “create a high level of uncertainty” among individuals (Mitroff, 2004, p.46), which in turn “drives people to seek more information” (Boyle et al., 2004, p.156). Whether during normal times or disaster situations, this information-seeking behavior is a primary driving force behind social media use. Social media “serve as tools that enable people to interact both within and beyond their spatial boundaries” (Palen et al., 2009, p.468). In other words, social media functions as a support and communication mechanism by facilitating the dissemination of critical information and easing access to information during crises.

A comprehensive analysis of social media content reveals that it includes: 1) event-related news; 2) event updates; 3) personal experiences; 4) personal opinions; 5) jokes; 6) marketing and advertising activities; 7) spam and irrelevant information; 8) humor and sarcasm; 9) expressions of happiness; 10) risk reduction information; 11) anxiety, fear, and/or sadness; 12) despair and anger; 13) misinformation; and 14) questions related to the event or topic (Chew & Gunther, 2010).

While individuals primarily rely on social media as a dominant news source, they use it for purposes such as “volunteering, obtaining information, diverting victims’ attention away from the disaster, gaining in-depth knowledge about rescue operations, identifying ways to assist family, friends, and the community, accessing up-to-date disaster information, and acquiring safety-related information” (Oral, 2018, p. 288). A social media sensitivity analysis related to disaster relief can identify emotional focal points based on quantitative data; such an analysis can also reveal attitudes, behaviors, and opinions concerning events and phenomena (Beigi et al., 2016). Publicly available data

regarding users' emotions, concerns, and panics are collected and analyzed (Brynielsson et al., 2018; Woo et al., 2015). In the context of disaster, risk, and crisis communication, "social media serves as a tool to adhere to best practices and support organizations" (Veil et al., 2011, p.118).

The factors that limit users in the use of social media can be listed as follows: the presence of images frequently associated with disasters that may have harmful effects on individuals; individuals' reluctance to remember disasters and the discomfort caused by being remembered in this way; the desire to exercise the right to be forgotten; concerns about privacy; and children's rights, etc. Twitter is not just a social interaction platform, but also complements traditional media (Yates & Paquette, 2011).

The management of social media during disasters and crises holds great importance for administrators and organizations. This is because of the significance and value that social media carries for company executives in analyzing data waves and strategically applying the insights obtained from these analyses. However, if not managed effectively, social media can become uncontrollable and may lead to more negative outcomes than benefits. The unconscious sharing of content after a disaster increases disappointment and despair among victims, potentially leading to tension and unrest among the public. In addition, "the spread of rumors and provocations on social media following a disaster can lead to secondary crises during the disaster" (Demiröz, 2020, p.298).

Administrators need to adopt a comprehensive and proactive approach to combat the negative effects of misinformation on disaster risk. They are expected to implement monitoring tools aimed at detecting the spread of misinformation in real time. Identifying potential misinformation campaigns before they gain momentum and analyzing trends and patterns can assist in detecting suspicious content and verifying information; in this process, artificial intelligence can be utilized (Diwanji et al., 2020). In disasters, measuring individuals' social media sensitivity and directing individuals toward educational programs becomes increasingly critical.

A review of the literature reveals that there is no existing scale specifically developed to measure social media sensitivity in the context of disasters. Therefore, the development of such a scale is intended to contribute to this field. In the literature, several scales related to social media have been developed or adapted within the fields of social sciences and education. Examples of adaptation studies include the "Social Media Marketing Activities Scale" (Yüksekbilgili, 2018), "the Selfitis Behavior Scale" (Kıraç et al., 2021), "the Social Media Use Disorder Scale" (Erzen & Odacı, 2021). However, a disaster is an extraordinary situation that poses a threat to society and leads to significant destruction.

Social media "consists of web-based applications that can be easily published and include discourses, visuals, messages, collaboration, and critiques" (Safko and Brake, 2009, p.6). When individuals use such social media applications within their communities, they are required to demonstrate awareness of the emotions, thoughts, and situations experienced by others in their society. It encompasses how individuals address social issues, highlight societal problems, and engage in efforts to raise public awareness through their use of social media channels. In extraordinary circumstances, social media emerges as the primary communication tool for individuals. Measuring social media sensitivity during disasters, along with the systematic management and use of social media, can contribute to the reduction of disaster-related damage. The strategic and effective use of social media in the context of disasters and disaster management facilitates timely and effective support and assistance to victims in affected areas. The aim of this study is to develop a scale to determine individuals' perceptions of social media sensitivity in disaster situations.

Method

This study is a scale development research aimed at creating a valid and reliable measurement tool to assess social media sensitivity in disaster contexts, following the appropriate scale development procedures.

Study Group

The study sample consists of 436 voluntary participants who use social media and reside in a third-degree earthquake zone. In preparing the scale items, a literature review on social media sensitivity during disasters was conducted, and interviews were held with individuals affected by disasters. The information obtained was used to draft the scale items. The prepared items were reviewed by three experts one specializing in Turkish language and semantics and two experts in the fields of media use

and disaster studies and necessary revisions were made based on their recommendations. As a result of these revisions, a draft scale comprising 27 items measuring social media sensitivity in disaster contexts was developed. The scale consists of positively worded statements answered on a 5-point Likert scale (1 = Strongly Disagree, 5 = Strongly Agree). The minimum possible score on the scale is 15, and the maximum score is 75.

The first application of the draft 27-item scale for Exploratory Factor Analysis (EFA) was completed with 279 voluntary participants. Of these participants, 52.7% (147) were female, and 47.3% (132) were male. Regarding educational levels, 23.3% had secondary education, 60.6% held a bachelor's degree, and 19.8% had postgraduate education. In terms of age groups, 65.7% were between 18 and 22 years old, 25.7% between 23 and 25, and 0.8% between 26 and 31.

For the second application of the scale, conducted for Confirmatory Factor Analysis (CFA), 157 voluntary participants took part. Among them, 65.6% (103) were female, and 34.5% (54) were male. Regarding educational levels, 9% (14) had secondary education, 83% (130) held a bachelor's degree, and 8% (13) had postgraduate education. The age distribution was as follows: 49.5% (78) were between 18 and 22 years old, 41.5% (65) between 23 and 25, 08% (9) between 26 and 31, and 03% (5) were 32 years old or older.

To determine whether the scale is suitable for factor analysis, the Kaiser-Meyer-Olkin (KMO) Test and Bartlett's Test of Sphericity were conducted. Based on the assumption that the items in the scale are interrelated, the Promax oblique rotation method was preferred for the factor analysis. After the Exploratory Factor Analysis (EFA), a second application of the scale was conducted on a different group of 157 volunteers for Confirmatory Factor Analysis (CFA), and CFA was performed on the obtained data. Özdamar states that EFA should be performed on pilot data, followed by collecting data from a different sample of at least 150 participants for CFA and reliability analyses, and that conducting EFA and CFA on different samples is ideal (Özdamar, 2016). According to Kline (1994), "the initial application of a scale should be conducted with a sample size ten times the number of items" (s.194). Thus, for both the EFA and CFA phases, the target sample size was ten times the number of items in the scale. For the second application to determine the validity of the scale, 157 voluntary participants responded to the scale items.

Evaluation of Scale Scores

The items on the scale were rated between 1 and 5 points, corresponding to "Strongly Disagree = 1," "Partly Agree = 2," "Undecided = 3," "Agree = 4," and "Strongly Agree = 5". Higher scores on the scale indicate higher sensitivity in social media use. In the initial application (EFA), the KMO value for the scale items was calculated, and factors with variances greater than 1 in each dimension were examined. It was found that the scale had a four-factor structure, with more than three items under each factor. Considering that the total variance explained by the items was sufficient to represent the scale variance, it was concluded that the scale items formed a coherent model. Based on the EFA results, a 15-item Likert-type scale with four factors was selected for confirmatory factor analysis.

Data analysis

Confirmatory Factor Analysis (CFA) utilizes multiple fit indices in structural equation modeling. In this analysis, commonly accepted fit indices recommended by (Hair et al., 2025) were used. The goal of Exploratory Factor Analysis is to reach "a meaningful structure defined by a small number of factors with sufficient factor loadings from a large number of variables (items) in the scale" (Büyüköztürk, 2015, p.133). Accordingly, the draft scale with 15 items having factor loadings above .400 was applied to a different sample group of 157 participants. CFA examines the degree to which the structure formed by the combination of items from different dimensions fits the actual data. The fit of the tested model in CFA was assessed using the Chi-square (χ^2) goodness-of-fit test. The Chi-square test evaluates the significance of the difference between observed and predicted values (Bagozzi & Heatherton, 1994). If the Chi-square (χ^2) test is significant, it indicates no significant difference between observed and predicted values, implying that the model fits well.

In the second application of the model defined by EFA, “it is tested whether the results are confirmed by the collected data set” (Çokluk et al., 2010, p.275). Model fit is examined through various indices including “the Chi-square statistic (χ^2)”, “Goodness of Fit Index (GFI)”, “Tucker-Lewis Index (TLI)”, “Root Mean Square Error of Approximation (RMSEA)”, “Adjusted Goodness of Fit Index (AGFI)”, and “Comparative Fit Index (CFI)” (Hooper et al., 2008). The fit indices obtained from CFA were checked to meet criteria of GFI, CFI, NFI, RFI, and IFI $> .90$ and RMSEA and RMR $< .05$. In addition to factor loadings, Average Variance Extracted (AVE), Cronbach’s Alpha, and Composite Reliability (CR) coefficients were calculated to assess the internal consistency and reliability of the scale. Data analyses for reliability and validity were conducted using SPSS 25.01 and AMOS software.

Ethical Procedures

Ethical permission was obtained for the study. Ethical permission was obtained with the decision of Kırşehir Ahi Evran University Social and Human Sciences Scientific Research and Publication Ethics Committee dated 14.06.2023 and numbered 2023 /05/12.

Findings

In the findings section, the demographic characteristics of the participants involved in both the first and second administrations of the scale are presented, followed by a detailed account of the exploratory factor analysis conducted on the data from the initial administration and the confirmatory factor analysis performed on the data obtained from the subsequent administration.

Table 1. *Demographic information regarding the distribution of participants in the first (EFA) and second (CFA) applications of the scale*

		First application (EFA)		Second application (CFA)	
		f	%	f	%
Gender	Female	147	.52,7	103	.65.6
	Male	132	.47,3	54	.34.4
Level of Education	Secondary education	66	.23,3	14	.09
	Bachelor's degree	158	.60.6	130	.83
	Postgraduate degree	55	.19,8	13	.08
Age	18-22 years old	183	.65,5	78	.49,5
	23-25 years old	71	.19,8	65	.41,5
	26-31 years old	22	.08	9	.06
	32 years and above	3	.01	5	.03

Table 1 presents the demographic distribution of the participants who took part in both the first and second administrations of the scale. Examination of Table 1 reveals that the distribution of participants is approximately balanced in terms of gender. Regarding age and education level, it is observed that the majority of participants belong to the 18–22 age group with a bachelor’s degree.

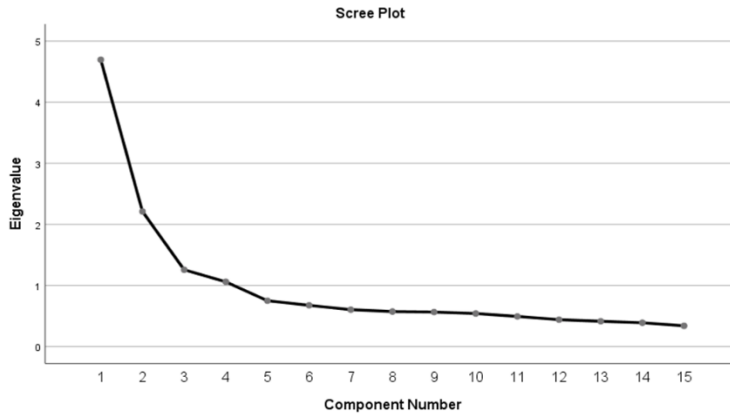
Item Analysis

The arithmetic mean of the items on the scale, the total variance of the items, the adjusted item correlation coefficients, and the adjusted Cronbach’s alpha values of the items are presented in Table 2.

Table 2 shows that the corrected item-total correlation coefficients of the scale range between .202 and .562. The Cronbach’s alpha values for the items exceed the threshold of $\alpha = .70$. To determine the factors of the scale, principal component analysis was conducted using the Promax oblique rotation method. The Kaiser-Meyer-Olkin (KMO) measure was found to be .855, and Bartlett’s test of sphericity yielded $\chi^2 = 1140,179$ (df = 105, $p = 0,000$). These results indicate that the sample size is adequate for factor analysis of the scale. According to Taş, a KMO value above 0,60 is expected for factorability (Taş, 2017). “KMO values between 0.00 and 0.49 are unacceptable, between 0.50 and 0.70 are moderate, between 0.70 and 0.80 are good, between 0.80 and 0.90 are excellent, and values greater than 0.90 are considered perfect” (Karaman, 2023, p.49). The obtained KMO value of .855 is thus classified as very good. The analysis further showed that the scale consists of four factors with eigenvalues greater than 1.00. The scree plot of eigenvalues supports this finding.

Table 2. Total item statistical values

Scale Item no	Scale item average	Total variance of items	Adjusted item correlation	Multiple item correlation	Adjusted item Croanbach alpha α
M1	51.489	57.129	.548	.478	.794
M2	51.429	58.002	.518	.436	.797
M3	51.595	58.006	.522	.417	.797
M4	51.348	59.529	.416	.405	.804
M5	51.182	57.954	.562	.470	.794
M6	51.368	57.990	.558	.435	.794
M7	51.506	58.097	.519	.407	.797
M8	50.599	60.827	.426	.312	.804
M9	51.036	59.921	.420	.340	.804
M10	50,825	59,559	.502	.398	.799
M11	51,202	59,024	.516	.338	.798
M12	52,076	61,559	.202	.361	.823
M13	51,732	61,823	.264	.338	.815
M14	51,619	61,773	.232	.307	.818
M15	51,951	59,990	.349	.291	.809

Scale Eigenvalue (Scree plot) Graph**Figure 1.** Scale eigenvalue (scree plot) graph

Based on the analyses, considering that the slope of the scree plot converges and flattens after the second inflection point, the number of factors for the scale was limited to four. “Sharp drops or breaks in the scree plot determine the number of factors” (Büyüköztürk et al., 2016, p. 179). It is observed that the slope of the scree plot levels off to a flat baseline after the fourth point.

Level of explanation of the total variance of scale items

Another piece of data obtained as a result of exploratory factor analysis is the percentage of variance explained by the factors and the total variance explained. The factor loadings explained by the scale items are given in Table 3.

Table 3. Total Variance Explained on the Scale

Total	Percentage variance	Cumulative percentage	Obtained load value
4.696	31.304	31.304	3.549
2.211	14.740	46.044	3.322
1.257	8.377	54.421	2.340
1.059	7.063	61.484	3.165

As shown in Table 3, the total variance explained by the four factors with eigenvalues greater than 1 accounts for 61.484% of the total variance. The total explained variance exceeding 50% is an

important criterion in factor analysis, indicating that the variance accounted for by these factors represents a large portion of the overall variance of the scale.

Factor Load Values of the Scale and Calculated AVE and CR Values

The AVE and CR values calculated based on the exploratory factor analysis load values of the scale are presented in Table 4.

Table 4 indicates that the Exploratory Factor Analysis (EFA) component analysis reveals a four-factor structure with eigenvalues greater than 1, consisting of 15 items, with factor loadings ranging from a minimum of .570 to a maximum of .826. Based on theoretical considerations and the content coverage of the items within each factor, the items in the first factor were labeled F1 “Facilitation,” those in the second factor F2 “Contribution to Management,” the third factor F3 “Awareness of Destructive Effects,” and the fourth factor F4 “Contribution to the Process”. The items included in the subscales are as follows: items 1, 2, and 3 in F1 “Facilitation”; items 4, 5, 6, and 7 in F2 “Contribution to Management”; items 8, 9, 10, and 11 in F3 “Contribution to the Process”; and items 12, 13, 14, and 15 in F4 “Awareness of Destructive Effects.”

Table 4. *Factors, item load values, AVE, and CR values of the social media usage sensitivity scale in disasters*

Item No	Factor	Item Load value	$(\sum \lambda_{ij})$	$(\sum \lambda_{ij}^2)$	$ei = 1 - (\sum \lambda_{ij}^2)$	AVE and CR
M1	(F1) Facilitation	.782	2.286	1.743	1.241	AVE= 0.58 CR= 0.76
M2		.766				
M3		.736				
M4	(F2) Contribution to management	.826	2.854	2.084	1.920	AVE= 0.52 CR= 0.71
M5		.783				
M6		.675				
M7		.570				
M8	(F3) Awareness of destructive effects	.815	2.393	2.161	1.840	AVE=0.54 CR=0.74
M9		.774				
M10		.668				
M11		.657				
M12	(F4) Contribution to the process	.787	2.931	2.158	1.768	AVE=0.54 CR=0.74
M13		.761				
M14		.708				
M15		.678				

Example items related to the factors include M1 under “Social Media Facilitation”: “In disasters (earthquakes), individuals can tag and share content on social media bookmarking sites.” For the “Contribution to Management” factor, M4 states: “In unpredictable disasters, social media supports institutional practices.” In the “Destructive Effects of Social Media” factor, M14 reads: “Emotional messages related to disasters on social media often deviate from a logical basis.” For the “Disaster Process” factor, M8 states: “Provides analytical criticism and opinions aimed at achieving results in earthquakes.” The Composite Reliability (CR) value is used as an alternative or a complementary measure to Cronbach’s Alpha (CA). Similar to CA, the CR value is expected to be above 0.7. When examining the convergent validity based on the standardized factor loadings obtained from the exploratory factor analysis, the Average Variance Extracted (AVE) values are above .50, and CR values are above .70. These values indicate a high degree of convergent validity and composite reliability for the scale.

Confirmatory Factor Analysis of the Scale

Validity in a measurement tool is defined as “the degree to which the tool can measure the intended variable without confusing it with other variables” (Turgut, 1997, s.114). Regarding Tabachnick’e (2012) the structural validity and theoretical appropriateness of the scale, Tabachnick (2012) states that “confirmatory factor analysis (CFA) verifies the hypothesized theoretical structure of the scale and determines its validity” (s.1024). It is recommended that exploratory factor analysis (EFA) and

confirmatory factor analysis (CFA) be applied on different samples to establish validity. Within this framework, the second application of the 15-item scale was conducted on 157 participants who use social media.

Table 5. CFA fit values of the Social Media Sensitivity Scale

Suitability index	Value	Acceptable suitability indexes (Jöreskog & Sörbom, 1993)
X/sd	1.146	0-5
REMSEA	.031	<0.08
GFI	.925	0.85 ile 1 arası
AGFI	.895	0.85 ile 1 arası
CFI	.984	<0,95
NFI	.898	.90 ile 1 arası
TLI	.977	.90 ile 1 arası
RMR	.053	<0.08
SRMR	.052	<0.08
IFI	.984	.90 ile 1 arası

Examination of the path diagram of the Social Media Sensitivity Scale indicates that the scale has a four-factor structure. Therefore, it can be concluded that the scale possesses structural validity. The path diagram for confirmatory factor analysis is given in Figure 2.

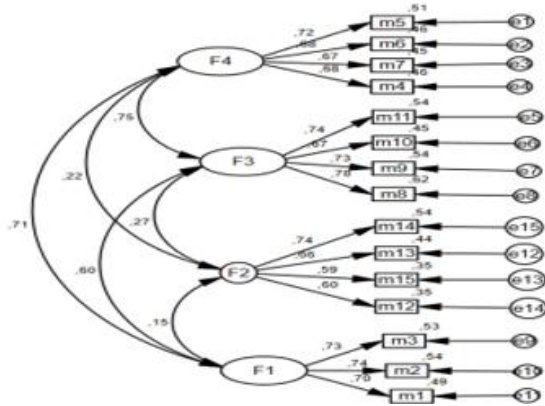


Figure 2. Path diagram of the scale obtained according to CFA results

Values Obtained from Confirmatory Factor Analysis of the Scale

The confirmatory factor analysis results of the scale were calculated as follows: CMIN/DF = 1,146; RMSEA = ,031; SRMR = ,059; NFI = ,89,88; IFI = ,984; CFI = ,984; GFI = ,925; AGFI = ,895; CFI = ,984. The χ^2/df value (chi-square/degrees of freedom) obtained from CFA was 1,146, and the RMSEA value was 0,031, both below the threshold of 08, indicating an acceptable model fit. “CMIN/DF is used to assess whether there is a significant difference between the sample covariance matrix and the model-implied (modeled) covariance matrix” (Hu and Bentler, 1999, s.2). While some sources accept values as high as $\chi^2/df = 5$ (Wheaton et al., 1977), others consider “much lower values such as $\chi^2/df = 2$ as acceptable” (Tabachnick and Fidell, 2007, p.285).

RMSEA is a statistic that “provides information about how well the optimally specified parameters fit the population covariance matrix” (Byrne, 2011, p. 664). RMSEA values below 0.05 indicate good fit, while values below 0.08 are considered reasonable and acceptable.

The model test statistics indicate that the researcher’s model is sufficiently close to the implied covariance matrix of the sample (Hair et al., 2025). The model’s Goodness of Fit Index (GFI) value is 0,93, and the Root Mean Square Residual (RMR) value is 0,05; specifically, the GFI value is 0,925. A GFI value above 0.90 indicates a good model fit. According to Hooper, values above 0,85 are also considered acceptable fit indices. According to (Hooper et al., 2008), values above 0,85 are also considered acceptable fit indices. The GFI is an absolute fit index that indicates the proportion of covariances in the sample data matrix explained by the model. Values above 0,95 indicate excellent fit,

while values above 0,90 indicate good fit. The standardized RMR value is 0,053. An RMR value below 0,050 indicates excellent fit, below 0,080 indicates good fit, and below 1,00 indicates poor fit. In this context, the RMR value of 0,053, being below 0,06, indicates excellent fit. The Adjusted Goodness of Fit Index (AGFI) is 0.895.; The Normed Fit Index (NFI) compares the null model to the sample covariance matrix, taking values between 0 and 1, with values closer to 1 indicating better model fit. The NFI is 0.898; the Comparative Fit Index (CFI) is 0.982; and the Incremental Fit Index (IFI) is 0,984. When examining these fit indices, values above 0.90 indicate good model fit (Bentler and Bonnet, 1980). The NFI value of 0.898 indicates good fit.

The analysis results show adequacy across all fit indices. It can be concluded that the 15-item, four-factor structure of the Social Media Sensitivity in Disasters Scale (SMSSD) is confirmed according to the fit statistics obtained from the Confirmatory Factor Analysis (CFA).

Findings Related to Scale Reliability

Reliability refers to the consistency and stability of measurement results. The Cronbach's alpha reliability coefficient is calculated for measurement instruments, with a value of $\alpha = 0,70$ or higher being expected (Eymen, 2007). The alpha coefficient provides an unbiased estimate of reliability when the measurements are unidimensional and equivalent(tau-equivalent). McDonald (1999) developed a reliability coefficient based on a factor-analytic framework as part of structural equation modeling. The reliability of the overall Social Media Sensitivity in Disasters Scale is presented in a table with Cronbach's alpha coefficients.

Table 6. *Cronbach's alpha coefficients of the social media sensitivity scale in disasters*

Scaling factors	Number of items	Cronbach Alpha
Facilitation	3	.834
Contribution to management	4	.801
Awareness of disruptive impact	4	.746
Contribution to the process	4	.743
For the scale as a whole	15	.845

As seen in Table 6, the Cronbach's alpha values for the entire scale and its subdimensions are high, with Facilitation $\alpha = 0.834$, Contribution to Management $\alpha = 0,801$, Awareness of Destructive Impact $\alpha = .746$, and Contribution to the Process $\alpha = 0,743$. The overall Cronbach's alpha reliability for the scale is $\alpha = 0,845$. It is recommended that each factor of a scale contains at least three items (MacCallum et al., 1999). It is considered that participants' response levels to the items may be influenced by their experience of having lived through a disaster, which in turn could affect the reliability values of the items.

Table 7. *Cronbach alpha values between the sub-dimensions of the social media sensitivity scale and the scale total scores*

Contribution to the process	.680**				
Contribution to management	.746**	.645**			
Awareness of disruptive impact	.367*	.591*	.357*		
Facilitation	.485**	.449**	.400*	.360*	
Total score	.792**	.750**	.714**	.602	.693**

Note =* Significant at the 0.05 level

As shown in Table 7, the correlation values between the overall total score of the scale and its subdimensions were found to be quite high. "The high correlation values among the factors indicate that the items are consistent with each other and measure the relevant construct" (Yıldız and Uzunsakal, 2018, p.19). The Cronbach's alpha coefficients were calculated as $\alpha = .84$ for the entire scale, $\alpha = .83$ for the "Contribution to the Process" dimension, $\alpha = .803$ for the "Contribution to Management" dimension, $\alpha = .074$ for the "Awareness of Destructive Impact" dimension, and $\alpha = .74$ for the "Facilitation" dimension. In the statistical analysis, the correlations between the total score and the factors ranged from .35,7 to .74,6. When the AVE and CR values, which were calculated to verify the results of Cronbach's alpha, are compared, the AVE values were found to be above .50, and the CR values above .70, indicating a high level of convergence.

Discussion and Conclusion

One of the primary responsibilities of social media users is to use social media effectively and efficiently before a disaster, to develop disaster awareness, to support well-organized relief efforts, and to ensure that the voice of the public is heard within disaster management organizations.

Relevant literature reveals that during disasters, individuals tend to become more emotional, making deep thinking and rational decision-making processes more complex and challenging, while increasing panic and impulsive behaviors. Given the critical nature of information sharing and coordination particularly for organizations developing and supporting accurate information flow during disasters necessitates a comprehensive social media communication strategy (Yates and Paquette, 2011). An effective disaster communication strategy has been shown to reduce the negative impact of disasters on victims (Haddow and Haddow, 2014). Establishing an effective communication network among community members has also been shown to decrease disaster risk (Wardyaningrum, 2019). In this context, the effective use of social media depends largely on user awareness.

It is essential for social media users, disaster victims, disaster management organizations, and professionals to follow ongoing developments (Valenzuela et al., 2017). Social media activities have the potential to contribute to the creation of a disaster-resilient society, to enable researchers to focus on more significant and meaningful disaster-related issues, and to ensure that institutions take necessary precautions in disaster management planning and response solely through data-based assessment. The developed scale is expected to contribute to measuring the sensitivity of social media users in disaster process management, supporting decision-makers, facilitating the disaster process, and taking into account the destructive impacts of disasters.

As the scores obtained from the overall scale increase, it can be said that the individual's sensitivity level in the related dimension also increases, whereas lower scores indicate a decrease in sensitivity. The research findings are limited to the data obtained. The group on which the scale study was conducted consists of well-educated young volunteers who use social media but do not have sufficient experience or knowledge about disasters. The external validity of the scale can be verified and improved by comparing it with the results of other scales on the same topic. It is recommended that the Disaster Social Media Sensitivity Scale be tested with data obtained from participants in disaster-affected regions in forthcoming research. Despite the aforementioned limitations, the factor analysis and CFA results of the Disaster Social Media Sensitivity Scale are considered to be at a satisfactory level.

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Factors Influencing Science Achievement in Turkey in TIMSS 2015 and 2019*

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Abstract

This study investigates the factors associated with the level of science competency among eighth-grade students in Turkey in the 2015 and 2019 cycles of the Trends in International Mathematics and Science Study (TIMSS). Using data obtained from TIMSS 2015 and 2019, the study examines relationships between factors such as educational expectations, frequency of science teachers assigning homework, sense of belonging to school, enjoyment of learning science, valuing science, and confidence in science and students' science competency levels. Data from science achievement tests and student questionnaires collected from eighth-grade students in Turkey who participated in TIMSS 2015 and 2019 evaluations were used as research instruments. The sample comprised 6,079 students included within the scope of TIMSS 2015, and 4,077 students included in TIMSS 2019 at the eighth-grade level. Logistic regression analyses were performed for the obtained data with results demonstrating that factors such as educational expectations and confidence in science had strong positive relationships with the students' science competency. In contrast, factors including the frequency of science teachers assigning homework, sense of belonging to school, enjoyment of learning science, and valuing science were found to have negative relationships with science competency levels.

Keywords: TIMSS, homework, belonging, expectations, value, confidence.

* This article was derived from the first author's master's thesis entitled "*Investigation of students' science competency levels and socioeconomic status in TIMSS with regard to some variables*" supervised by the second author.

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TIMSS 2015 ve 2019'da Türkiye'de Fen Başarısını Etkileyen Faktörler *

Makale Türü	Başvuru Tarihi	Kabul Tarihi
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Öz

Bu çalışma, Uluslararası Matematik ve Fen Eğilimleri Araştırması'nın (TIMSS) 2015 ve 2019 döngülerinde Türkiye'deki sekizinci sınıf öğrencilerinin fen yeterlilik düzeyleriyle ilişkili faktörleri araştırmaktadır. Çalışma, TIMSS 2015 ve 2019'dan elde edilen verileri kullanarak, eğitim beklentileri, fen öğretmenlerinin ödev verme sıklığı, okula aidiyet duygusu, fen öğrenmekten keyif alma, fene değer verme ve fene güven gibi faktörler ile öğrencilerin fen yeterlilik düzeyleri arasındaki ilişkileri inceliyor. Araştırma aracı olarak TIMSS 2015 ve 2019 değerlendirmelerine katılan Türkiye'deki sekizinci sınıf öğrencilerinden toplanan fen başarı testleri ve öğrenci anketlerinden elde edilen veriler kullanılmıştır. Örneklem, sekizinci sınıf düzeyinde TIMSS 2015 kapsamında yer alan 6.079 ve TIMSS 2019 kapsamında yer alan 4.077 öğrenciden oluşmaktadır. Elde edilen veriler için lojistik regresyon analizleri yapılmış ve sonuçlar, eğitim beklentileri ve fene duyulan güven gibi faktörlerin öğrencilerin fen yeterlilikleri ile güçlü pozitif ilişkilere sahip olduğunu göstermiştir. Buna karşılık, fen öğretmenlerinin ödev verme sıklığı, okula aidiyet duygusu, fen öğrenmekten keyif alma ve fene değer verme gibi faktörlerin fen yetkinlik düzeyleri ile negatif ilişkiye sahip olduğu bulunmuştur.

Anahtar Sözcükler: TIMSS, ev ödevi, aidiyet, beklenti, değer, güven.

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Introduction

Science achievement is of great significance because of its effects on individuals' future careers and occupational choices. There are various factors that influence science achievement. These factors include students' motivations, educational resources, socioeconomic status, the frequency of homework, the sense of belonging to school, and educational expectations (Fan, Xu, Cai, He, & Fan., 2017; Zhang, Bae, & Broda, 2022; Pongsophon, 2023). Data from Trends in International Mathematics and Science Study (TIMSS) have revealed that countries in which students have a greater sense of belonging to school, enjoy and value science learning, and have confidence in science learning tend to have better science outcomes (Lay & Chandrasegaran, 2016; Lay & Ng, 2021).

Research conducted in the United States has shown that parent-student communication and high parental expectations are associated with student achievement (Martin, Mullis, Foy, & Stanco, 2012). Among different ethnic groups, parents' expectations for higher education were the strongest predictor of students' own expectations, which positively influenced their academic performance (Martin et al., 2012). Consequently, students with high educational expectations scored higher in science than students with low expectations (Chi & Wang, 2023).

According to TIMSS data, the frequency and types of homework vary widely across countries (Martin et al., 2012). For example, in countries such as Kazakhstan, Iran, and Thailand, teachers assign more science homework to eighth-grade students, while teachers in countries such as Norway, Sweden, and Denmark assign less homework (Fensham, 2013). In Latin America, homework frequency has a clearer impact on academic performance than the amount of homework given (Fernández-Alonso et al., 2019). Teachers' homework assignment practices are influenced by various factors such as class size, socioeconomic status, and geographical region (Bowd, Bowles, & McKenzie, 2021).

Another important factor affecting students' science achievement is their sense of belonging to school. Research shows that students' sense of belonging to school is directly related to their academic performance (Abdollahi & Noltemeyer, 2018; Atabey, 2020). Positive relationships between teachers and students have also been observed to increase the student's sense of belonging and, consequently, achievement (Arends & Visser, 2019; Avcı & Çakır, 2021). However, it is emphasized in the literature that the sense of belonging may differ according to demographic factors such as socioeconomic level and gender; therefore, these factors should be considered in education systems (Hughes, Im, & Allee, 2015).

Students' science-related attitudes and self-confidence also have a significant impact on science achievement (Baş, Şentürk, & Cığerci, 2016; Juan, Hannan, & Namome, 2018; Aguilera & Perales-Palacios, 2020). Moreover, possessing self-efficacy in science, valuing science, and enjoying their courses have determining effects on students' academic achievement (Grabau & Ma, 2017; Cohen & Chang, 2018). Self-confidence in science has a positive relationship with students' academic achievement; students with high self-confidence generally achieve better results (Mao, Cai, He, Chen, & Fan, 2021; Çıracı, Akpınar, & Çelik, 2024). In contrast, low self-confidence can cause students to develop negative attitudes towards science courses (Sheldrake, 2016).

Studies on TIMSS applications have examined the variables that affect students' science achievement. They have also explored the components of science literacy and students' performances in relevant sub-areas. The results showed that students performed better with questions about general knowledge and life science, but they had lower levels of success for questions that involved applying that knowledge or physical science (Türkmen & Benzer, 2023). These results suggest that, in addition to individual and contextual factors affecting science proficiency levels, cognitive and subject-area proficiency levels should also be considered (Yılmaz & Sarı, 2023).

Research conducted with TIMSS data has shown that teacher-related factors influence student achievement as well. For example, Aydın Gürler (2023) revealed that most teachers had limited knowledge of the scope and structure of TIMSS assessments, but the increased success in 2019 was attributed to pedagogical and technological transformations in education. These findings suggest that teacher competencies and assessment awareness may be decisive factors in international achievement

levels. In summary, science achievement is a multidimensional concept shaped by not only student characteristics but also teacher qualifications, school climate, and social factors.

Significance of the Study

This study is of importance as it examines the differences between groups of students with lower and higher achievement in science in Turkey, with a particular focus on analyzing data from TIMSS 2015 and 2019 cycles. Understanding whether trends in science achievement remain stable or change over time is critical for developing effective educational policies. This study emphasizes two main dimensions of science achievement. First, it investigates whether the effects of variables that predict students' science achievement, such as expectations for further education, the frequency of homework assignments given by science teachers, and students' sense of belonging to school, have changed over the years. Second, it provides insight into how these factors contribute to gaps in achievement. By examining these factors, the study offers guidance for targeted interventions aimed at improving science education outcomes for all students. The importance of this research therefore lies in its focus on longitudinal trends in science achievement.

Research Questions

This study explores how students' expectations for further education, science teachers' frequency of homework assignments, having a sense of belonging to school, enjoying science learning, valuing science, and being confident in science are related to science competency levels. This study also considers whether levels of science achievement have stayed the same or changed over time, comparing the results from TIMSS 2015 and 2019. Thus, the study aims to answer the following questions:

- 1) Is there a relationship between students' expectations for further education, the frequency of homework assignments given by science teachers, students' sense of belonging to school, whether students enjoy learning science or not, whether students value science, or students' confidence in science and competency groups among students in Turkey according to TIMSS 2015 results?
- 2) Is there a relationship between students' expectations for further education, the frequency of homework assignments given by science teachers, students' sense of belonging to school, whether students enjoy learning science or not, whether students value science, or students' confidence in science and competency groups among students in Turkey according to TIMSS 2019 results?

Method

Research Design

In this study, possible relationships between the science competency groups of eighth-grade students in Turkey and these students' educational expectations, frequency of homework assignments given by science teachers, sense of belonging to school, enjoyment of learning science, valuing of science, and confidence in science were evaluated by logistic regression analysis and the obtained data were compared over time.

Research Sample

The research sample was selected using a two-stage stratified sampling procedure developed by the International Association for the Evaluation of Educational Achievement (IEA). First, schools were randomly selected, followed by a random selection of classes within those schools. The sample included 6,079 students in 238 schools in Turkey for TIMSS 2015 and 4,077 students in 181 schools in Turkey for TIMSS 2019.

Data Collection and Research Instruments

Data were obtained from the official website of the IEA, which collects information from TIMSS student surveys. These surveys include science achievement tests and questionnaires administered to students in the eighth grade in Turkey during TIMSS 2015 and 2019 cycles. Data from TIMSS 2015 and 2019 were used according to the respective methodologies described on the IEA's official website.

TIMSS surveys asked students to specify the level of education they expected to achieve. Students were also asked how often their science teachers gave homework according to a rating scale ranging from 1 to 5 (1: “every day,” 5: “never”). The students’ sense of belonging to school was also studied with their responses grouped into one of three categories: “high sense of belonging,” “sense of belonging,” and “little sense of belonging.” Students also rated their interest in, their valuing of, and their confidence in science in TIMSS 2015 and 2019 surveys on a 4-point scale. High scores from these scales indicated positive attitudes towards science.

Validity and Reliability

The scales used in the present study were checked for reliability and validity. The item factor loadings of the scales for school belonging, enjoyment of science learning, valuing of science, and self-confidence in science were all above 0.32, ranging from 0.52 to 0.86. These scales also had good reliability as reflected by Cronbach alpha values above 0.7. However, for TIMSS 2015 and 2019, the explained variance ratios of the self-confidence and school belonging scales were below 50%. The ratios for enjoying science learning and valuing science were at acceptable levels.

Data Analysis

This study used logistic regression to determine which factors affected the science skills of eighth-grade students in Turkey. To answer the first research question, we conducted multiple regression analysis of different factors potentially affecting students’ science achievement in TIMSS 2015 in Turkey. To control for other factors, we considered students’ expectations for further education, the frequency of homework assignments, students’ sense of belonging to school, whether students enjoyed learning science or not, whether students valued science, and the students’ confidence in science. The model used to address the first question was as follows:

$$\Pr(\text{Competency Groups of Students}_{\text{TIMSS15}} = 1) = \frac{\exp(\beta_0 + \beta_1 \text{Expect}_{\text{TIMSS15}} + \beta_2 \text{Homework}_{\text{TIMSS15}} + \beta_3 \text{Belong}_{\text{TIMSS15}} + \beta_4 \text{Enjoy}_{\text{TIMSS15}} + \beta_5 \text{Value}_{\text{TIMSS15}} + \beta_6 \text{Confident}_{\text{TIMSS15}})}{1 + \exp(\beta_0 + \beta_1 \text{Expect}_{\text{TIMSS15}} + \beta_2 \text{Homework}_{\text{TIMSS15}} + \beta_3 \text{Belong}_{\text{TIMSS15}} + \beta_4 \text{Enjoy}_{\text{TIMSS15}} + \beta_5 \text{Value}_{\text{TIMSS15}} + \beta_6 \text{Confident}_{\text{TIMSS15}})}$$

The second research question addressed how students’ science achievement in TIMSS 2019 in Turkey was affected by a set of factors that included students’ expectations for further education, homework, belonging, enjoying science learning, valuing science, and confidence in science. The model for this second question was as follows:

$$\Pr(\text{Competency Groups of Students}_{\text{TIMSS19}} = 1) = \frac{\exp(\beta_0 + \beta_1 \text{Expect}_{\text{TIMSS19}} + \beta_2 \text{Homework}_{\text{TIMSS19}} + \beta_3 \text{Belong}_{\text{TIMSS19}} + \beta_4 \text{Enjoy}_{\text{TIMSS19}} + \beta_5 \text{Value}_{\text{TIMSS19}} + \beta_6 \text{Confident}_{\text{TIMSS19}})}{1 + \exp(\beta_0 + \beta_1 \text{Expect}_{\text{TIMSS19}} + \beta_2 \text{Homework}_{\text{TIMSS19}} + \beta_3 \text{Belong}_{\text{TIMSS19}} + \beta_4 \text{Enjoy}_{\text{TIMSS19}} + \beta_5 \text{Value}_{\text{TIMSS19}} + \beta_6 \text{Confident}_{\text{TIMSS19}})}$$

Results

The competency groups that served as the dependent variable for the first and second research questions were coded as follows: “very low” and “low” levels were coded as 0, while “high” and “advanced” levels were coded as 1. Competency groups were classified as very low, low, intermediate, high, and advanced based on the cut-off scores determined for international science competency levels with TIMSS 2015 and 2019 data for the respective research questions. The analysis of the present study did not include data from intermediate-level students; the data of students at low and very low levels were combined to form one group and the data of students at advanced and high levels were combined to create the other group. Analysis was performed for the first and second research questions using these two groups obtained with data on competency levels for each year of interest.

Table 1. Eighth-grade students from Turkey participating in TIMSS 2015 and 2019 according to percentages of competency groups

Competency Groups	TIMSS 2015 N = 4,195	TIMSS 2019 N = 2,931
Very low or low competency	60.5	48.8
High or advanced competency	39.5	51.2

Table 1 presents data on the numbers of eighth-grade students from Turkey who participated in TIMSS 2015 and 2019, categorized within “very low or low” and “high or advanced” competency groups. Multiple logistic regression was used to examine the effects of the selected independent variables on students’ science competency according to TIMSS 2015 and 2019 for the respective research questions. Table 2 presents the variables and accompanying odds ratios. For the categorical variable of the frequency of the science teacher assigning homework, “1-2 times a week or less than once a week or never” was coded as 0 and “3-4 times a week or every day” was coded as 1. Among the other categorical variables, educational expectation was coded as 0 for “less than undergraduate” and as 1 for “undergraduate or beyond.”

Table 2. *Estimated odds ratios for competency groups in TIMSS 2015 and 2019*

	TIMSS 2015	TIMSS 2019
Students’ Educational Expectations (1)	17.353* (0.208)	11.566* (0.189)
Frequency of Science Teacher Assigning Homework (1)	0.450* (0.082)	0.454* (0.106)
Sense of Belonging to School	0.835 (0.22)	0.863 (0.028)
Students Enjoy Learning Science	0.908 (0.030)	0.871 (0.039)
Students Value Science	0.924 (0.026)	0.932 (0.033)
Students Are Confident in Science	1.819 (0.028)	2.092 (0.039)
Constant	0.005* (0.344)	0.003* (0.433)

*, $p < 0.05$; standard errors are shown in parentheses

Interpretations of Results for the First Research Question

According to Table 2, at the eighth-grade level for TIMSS 2015, when other variables are controlled, students expecting to obtain education at the undergraduate level or beyond were 17 times more likely to be in the “high or advanced” competency group compared to those expecting to obtain a level of education lower than the undergraduate level in Turkey (OR: 17.353; CI: 11.548-26.077; $p < 0.05$). Students whose science teachers assigned homework 3-4 times or every day per week were 55% less likely to be in the “high or advanced” competency group than students whose science teachers assigned homework 1-2 times or less than once per week or never (OR: 0.450; CI: 0.383-0.527; $p < 0.05$). Students who felt more belonging to school were 16.5% less likely to be in the “high or advanced” competency group than students who felt less belonging to school (OR: 0.835; CI: 0.800-0.872; $p < 0.05$). Students who enjoyed learning science were 9.2% less likely to be in the “high or advanced” competency group than students who did not enjoy learning science (OR: 0.908; CI: 0.855-0.963; $p < 0.05$). Students who valued science highly were 7.6% less likely to be in the “high or advanced” competency group than students who valued science less (OR: 0.924; CI: 0.878-0.972; $p < 0.05$). Students with high science self-confidence were 1.8 times more likely to be in the “high or advanced” competency group than students with low science self-confidence (OR: 1.819; CI: 1.724-1.920; $p < 0.05$).

Interpretations of Results for the Second Research Question

As seen in Table 2, at the eighth-grade level for the 2019 TIMSS, when other variables are controlled, students expecting to obtain education at the undergraduate level or beyond were 11 times more likely to be in the “high or advanced” competency group compared to those expecting to obtain a level of education lower than the undergraduate level in Turkey (OR: 11.566; CI: 7.986-16.752; $p < 0.05$). Students whose science teachers assigned homework 3-4 times or every day per week were

54.6% less likely to be in the “high or advanced” competency group than students whose science teachers assigned homework 1-2 times or less than once per week or never (OR: 0.454; CI: 0.369-0.559; $p < 0.05$). Students with a high sense of belonging to school were 13.7% less likely to be in the “high or advanced” competency group than students who felt less belonging to school (OR: 0.863; CI: 0.817-0.911; $p < 0.05$). Students who enjoyed learning science were 12.9% less likely to be in the “high or advanced” competency group than students who enjoyed science less (OR: 0.871; CI: 0.807-0.940; $p < 0.05$). Students who valued science highly were 6.8% less likely to be in the “high or advanced” competency group than students who valued science less (OR: 0.932; CI: 0.873-0.995; $p < 0.05$). Students with high science self-confidence were 2 times more likely to be in the “high or advanced” competency group than students with low science self-confidence (OR: 2.092; CI: 1.937-2.259; $p < 0.05$).

Model fit was tested to evaluate the generalizability of the model. In the logistic regression model created with data from 2019, the Nagelkerke R^2 value was .475, indicating that the model’s explanatory power was moderate to high for the dependent variable. The overall classification accuracy of the model was found to be 77.4% and there was no uneven distribution of success across groups. These findings suggested that the model does not show overfitting. Similarly, using 2015 data, the Nagelkerke R^2 value was .434 and the overall accuracy rate was 77.1%. Although there are relatively significant differences between groups, it can be said that the model does not have a risk of overfitting.

To assess the risk of multicollinearity in the logistic regression model, linear regression-based collinearity analysis was performed to test whether there was multicollinearity among the independent variables and the variance inflation factor (VIF) values were examined. The VIF values of all independent variables were found to be below 5, indicating that there was no significant multicollinearity among the variables.

Discussion, Conclusion and Recommendations

In TIMSS 2015 and 2019, Turkish students in the “high or advanced” science competency group were influenced by factors including educational expectations, homework frequency, sense of belonging to school, enjoying science learning, and confidence in science. In TIMSS 2015 and 2019, educational expectation was the most predictive variable for eighth-grade students having high or advanced competency in Turkey. Self-confidence in science was also linked to better science results. Other factors including science homework frequency, sense of belonging to school, enjoying science learning, and valuing science were negatively related to students having high or advanced competency in Turkey in TIMSS 2015 and 2019.

When the literature was examined, it was seen that similar results were obtained in previous studies on the relationship between educational expectations and academic achievement. Educational expectations are associated with educational achievement, which indicates that expectations have a positive effect on achievement (Dochow & Neumeyer, 2021; Khattab, Madeeha, Samara, Modood, & Barham, 2021). International data from TIMSS also show that there is a positive relationship between students’ educational expectations and average science achievement at the eighth-grade level (Martin et al., 2012). Yıldırım, Yıldırım and Ceylan (2021) reported that educational expectations were associated with the academic achievement of Turkish students participating in TIMSS 2019. Yeung (2024) found that educational expectations and science performance were mutually predictive of each other throughout middle school. Collectively, these studies suggest that fostering positive educational expectations and aspirations can increase science achievement and future academic outcomes (Awang, Salleh, & Yoong, 2023). The higher achievement of students with higher educational expectations may be related to their career expectations related to science (Kim, 2019; Chavira, Cooper, & Vasquez-Salgado, 2016; Schneider, Kim, & Klager, 2017). Parental expectations also support students’ expectations and indirectly influence their academic achievement and goals (Froiland & Worrell, 2017). The 2015 PISA report for Turkey emphasizes that students’ science achievement increases as their future academic expectations increase. In this regard, the trend in Turkey is similar to that of other OECD countries (Ministry of National Education [MoNE], 2016).

In studies from Turkey and in the international literature, research on the effect of homework on academic achievement has yielded varying results. Some studies have shown that the relationship

between science homework and achievement is positive or is weak but statistically significant and positive (Baş, Şentürk, & Cığerci, 2017; Burriss & Snead, 2017; Fan et al., 2017; Chin, Lin, & Chen, 2020; McJames, Parnell, & O'Shea, 2024). In a modeling study using 1999 TIMSS data from Turkey, a negative relationship was found between student-centered activities and science achievement, while a positive relationship was found for teacher-centered activities (Ceylan & Berberoğlu, 2007). Data from the 2019 TIMSS showed no clear relationship between the time students spent on homework and TIMSS achievement (Mullis & Martin, 2017). Yıldırım et al. (2021) reported a negative relationship between homework frequency and the science achievement of Turkish students participating in the TIMSS in 2019. Kaya and Kaya (2018) found that students who did homework less than once a week and those who did homework for 31-60 minutes had the highest science achievement levels. The results of this study are consistent with the findings reported by Al-Bahrani, Apostolova-Mihaylova, and Marshall (2022), as the frequency of homework assignments given by science teachers had a significant negative relationship with student achievement. The negative effect of homework frequency on science achievement is often associated with the quality of the homework content and the students' individual characteristics, including motivation and time management skills (Burriss & Snead, 2017; Chin et al., 2020). Assignments should be organized in accordance with students' individual levels of understanding and their personal interests, and they should also be organized in meaningful and methodical ways (Cooper, Robinson, & Patall, 2006). Research in Turkey has also shown that factors such as students' levels of preparation and teachers' classroom approaches can influence the negative relationship between homework frequency and achievement (Yıldırım et al., 2021).

Studies in the literature generally report a positive relationship between academic achievement and school belonging (Allen, Kern, Vella-Brodrick, Hattie, & Waters, 2018; Korpershoek, Canrinus, Fokkens-Bruinsma, & de Boer, 2019). A report from the OECD (2017) also showed that a sense of belonging can increase students' academic achievement and motivation to learn. Some studies conducted in Turkey have similarly indicated that a sense of school belonging has positive effects on students' academic achievement (Yıldırım, 2017; Kalkan & Dağlı, 2021). However, the present study found that students with a high sense of school belonging had lower academic achievement in science. Demir and Yıldırım (2022) found that students' sense of belonging to school was not a significant predictor of achievement, while Yıldırım et al. (2021) reported a negative relationship between sense of belonging to school and academic achievement in Turkey in their study based on 2019 TIMSS data. These findings indicate that this relationship, which is mostly described as positive in the international literature, may differ in the Turkish context. The negative relationship observed in the present study is a remarkable finding contrary to the general trend in the literature. Some studies have suggested that the sense of belonging of students with high academic achievement may decrease over time (Pedler, Willis, & Nieuwoudt, 2022; Yıldırım et al., 2021), which may be attributed to students with higher standards being disappointed with the school's climate or social relations. In exam-oriented education systems such as that of Turkey, students' sense of belonging may weaken over time under academic pressure (Erten & Burden, 2014). The findings of this study show both similarities and differences with previous studies, suggesting that the relationship between school belonging and academic achievement is complex in Turkey. Data from the 2022 PISA confirm that students in Turkey have a weaker sense of belonging to school than the OECD average. Approximately 70% of students stated that they "belonged" at school, while 30% felt excluded (MoNE, 2023). In Turkey, students' weekly learning time is close to the OECD average, but durations of up to only 27 hours of learning time per week support academic achievement (MoNE, 2023).

Studies in the literature have demonstrated that valuing science and enjoying science learning have a positive and significant effect on students' levels of science achievement (Martin et al., 2016; Burns, Martin, Kennett, Pearson, & Munro-Smith, 2020; Lay & Rajoo, 2020). Data from the 2019 TIMSS similarly showed that valuing and enjoying science had a strong relationship with students' achievement (Mullis & Martin, 2017). In the present study, a negative correlation was observed between the value that Turkish students attribute to science and their enjoyment of learning science and their TIMSS science achievement in both 2015 and 2019. Several studies using TIMSS 1999, 2007, 2011, 2015, and 2019 data investigated the factors affecting Turkish students' science achievement. In these studies, a negative or insignificant relationship was found between students' attitudes toward science and their science achievement (Ceylan & Berberoğlu, 2007; Sarier, 2020; Yıldırım et al., 2021). In other studies

conducted in Turkey, no significant relationship was found between students' attitudes toward science and their achievement (Altınok, 2005; Külçe, 2011). According to the Ministry of National Education's General Directorate of Measurement, Evaluation, and Examination Services (2024) report, students' attitudes toward science were found to be negatively related to their science achievement in Singapore, Japan, and South Korea. According to 1999 and 2007 TIMSS data, the discrepancy between South Korean students' high achievement in science and their negative attitudes toward this subject could be explained by cultural factors. In addition, international assessments may not fully capture the unique educational and cultural structures of countries (Han & Shim, 2023). In Turkey, this situation may be caused by factors such as students' high perceptions of failure, low self-efficacy, insufficiently effective student-centered activities, and incompatibility between the measurement methods of international tests and classroom learning environments (Ceylan & Berberoğlu, 2007). In the 2015 PISA report, there are detailed comparisons of the differences between Turkey and other OECD countries in terms of students' affective characteristics such as enjoyment of learning science, valuing science, and self-efficacy in science. This points to complex relationships between motivation and enjoyment (MoNE, 2016). Taken together, these findings suggest that despite students' positive affective attitudes toward science learning in Turkey, other factors affecting achievement may differ internationally.

Results from TIMSS 1999 and 2011 showed that students with higher self-confidence generally performed better in science (Martin et al., 2012; Mullis et al., 2000). A study conducted with TIMSS 2019 data in Turkey also reported a positive relationship between confidence in science and science achievement (Yıldırım et al., 2021). According to TIMSS 2019 data, students' science self-confidence had a positive effect on their achievement (Demir & Yıldırım, 2022). A study of Taiwanese high school students found a significant relationship between science achievement and confidence in science; students with high confidence outperformed their peers with low confidence (Chang & Cheng, 2008). Similarly, an analysis of TIMSS 2011 results of fourth-grade students in South Korea revealed that confidence in science was a significant predictor of science achievement (House & Telese, 2017). A study of tenth-grade chemistry students in the United Kingdom found that confidence-based learning assessments significantly increased students' science confidence, but their achievement levels remained similar (Charnley, 2021). These findings highlight the importance of increasing students' confidence in science to improve academic outcomes. Consistent with the literature, the present study found that as confidence in science increased, so did science achievement.

In countries such as Singapore and South Korea, enjoyment of science is positively correlated with high achievement. In these countries, enjoyment is accompanied by the ability to cope with cognitive challenges and continue learning with interest (Martin et al., 2020).

In countries such as Japan and Taiwan, valuing science is supported by both motivational and behavioral components (OECD, 2020). While success declines as homework frequency increases in Turkey, high-quality homework practices contribute positively to success in Singapore (Mullis et al., 2020). This may be related to the structure and quality of homework and the burden it places on students. On the other hand, in high-achieving countries, homework is more focused on problem solving, research, and application. In Singapore, homework is designed to develop students' higher-order thinking skills, which is a factor that supports success (Mullis et al., 2020).

In countries such as Georgia and Kazakhstan, the effect of a sense of belonging on success has been found to be neutral or negative. In contrast, in some other countries such as Finland, a positive relationship between belonging and academic success has been identified (OECD, 2020).

Schools should encourage students to plan for higher education through careers advice, mentoring programmes in scientific fields and discussions. Parents should be involved in their children's education. Assignments should help students understand, not just memorise. Teachers should set homework that matches abilities and interests. Schools should create an inclusive, supportive environment where students feel they belong without losing sight of their academic goals. We need to understand why high-achieving students in Turkey feel disconnected. Programmes to address this could include counselling and activities that make students proud of their schools. Schools should encourage confidence in science through activities that build skills, e.g., feedback. Encouraging students to solve problems with each other can also help them feel more confident and understand more.

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