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Hacettepe Üniversitesi Eğitim Fakültesi Dergisi'nin 2025 yılı 40. cilt 3. sayısını heyecanla sizlerle paylaşıyoruz. Bu sayıda emeği geçen baş editör, alan editörü, hakem ve yazarlarımıza alanyazına sağladıkları değerli katkılar için teşekkür ediyorum. Yeni sayımızın ulusal ve uluslararası bağlamda eğitim alanyazınında bilimsel bilgi birikimine katkı sağlayacağını umuyorum.

Bir sonraki sayımıza kadar sevgi ve sağlıkla kalmanızı dilerim.

Prof. Dr. Şefika Şule Erçetin

Dear readers,

We are excitedly sharing the 40th volume (2025), 3rd issue of the Hacettepe University Journal of Education. I would like to thank our Editor-in-Chief, field editors, reviewers and authors for their valuable contributions to the literature in this issue. I hope that our new issue will contribute to the scientific knowledge in the educational literature both in national and international contexts.

I wish you to stay with love and health until our next issue.

Prof. Dr. Şefika Şule Erçetin

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An Action Research to Improve 5th-Grade Students' Reading Habits*

Cafer ÇARKIT**

Article Information	ABSTRACT
Received: 25.05.2025	Reading habit is an important skill that should be acquired from early ages and developed and strengthened throughout students' education. However, there is a noticeable gap in the literature on the use of effective strategies to develop this skill. The present study aims to implement an intervention designed to enhance the reading habits of students identified as having weak reading habits. The research adopted an action research design and was conducted with 26 fifth-grade students and their parents at a public secondary school in Kayseri, Türkiye. The data collection instruments included a personal information form, a reading habit attitude scale, student diaries, a researcher diary, interview forms, and letters written by both students and parents. The data obtained through these multiple sources were analyzed using both qualitative and quantitative analysis techniques. The findings of the study revealed a significant improvement in students' attitudes toward reading as a result of the intervention. Moreover, the process contributed positively to the development of students' reading skills and their use of reading strategies. Feedback from both students and parents indicated that the activities implemented were well-received and that there was a desire for their continuation throughout the academic year. Based on the results, it is recommended that teachers design and implement reading activities that encourage the active participation of students in order to foster the development of reading habits. Furthermore, establishing strong collaboration among teachers, parents, and students is essential for supporting the development of sustainable reading habits.
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1. INTRODUCTION

Reading is widely recognized as one of the essential skills for success in contemporary societies. It is a multifaceted language skill that involves conceptual, developmental, and methodological dimensions, and typically begins with the desire to learn and enjoy the process (Paris, 2005). Reading plays a fundamental role in an individual's lifelong learning journey. Beyond addressing daily life challenges, individuals use reading to foster their cultural growth and awareness (Gee, 2018). Accordingly, reading is a crucial skill across various domains such as healthcare, commerce, economics, technology, and most significantly, education (Çarkit & Sur, 2023). In this context, both the ability and the habit of reading are considered valuable indicators of a society's socio-economic development (Aras, 2017). A strong link is often drawn between a nation's reading proficiency and its developmental level and global competitiveness, with studies highlighting that the most advanced societies consist of individuals with high reading competence (Krashen, 2004). This underscores the critical importance of fostering reading habits.

The effective application of reading skills largely depends on the development of reading habits. Individuals who integrate reading into their daily routines tend to cultivate such habits naturally (Baba & Affendi, 2020). Consequently, one of the primaries aims of modern education systems is to instill consistent reading habits in students (Ahmed, 2016). Students who develop reading habits generally achieve higher academic success, express themselves more effectively, and navigate social life challenges with greater ease. On the other hand, those who lack reading habits often struggle with communication in everyday life. Research also shows that individuals with limited reading practice tend to underutilize higher-order thinking skills (Karatay, 2015; Kırmızı et al., 2014).

* Ethical permission was obtained from Social and Human Sciences Ethics Committee of Gaziantep University (18.02.2021-E.19727).

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It is particularly vital for students to acquire strong reading habits during their school years, as achieving a proficient reading level is only possible through sustained and meaningful reading practices. Individuals who develop such habits become more aware of their reading abilities and responsibilities, and they embrace reading as an integral part of life. Conversely, those who do not acquire reading habits are often careless in selecting what they read and typically derive little enjoyment from the activity (Nuttal, 1996). This lack of engagement results in reduced reading frequency and insufficient time spent reading—factors that present serious obstacles to becoming independent readers (Florence et al., 2017). Effective readers, in contrast, are deliberate in their choice of reading materials, which enhances their enjoyment and motivates them to read more—ultimately facilitating their transition into independent readers (Cole, 2009). Therefore, the most crucial role for teachers and parents in helping children develop reading habits is to create environments where they can genuinely enjoy reading.

1.1. Statement of the Problem

Reading habits are most effectively cultivated during early childhood and school years. Once formed, these habits tend to persist throughout an individual's life (Greene, 2002). The development of reading habits plays a crucial role in enabling students to access information efficiently and engage in meaningful learning. Numerous studies have demonstrated a strong correlation between reading habits and academic achievement (Bhan & Gupta, 2010; Camp, 2007; Daniel, 2017; Kaur & Pathania, 2015; Owusu-Acheaw & Larson, 2014; Rabia et al., 2017). Furthermore, cultivating a reading habit contributes significantly to alleviating reading-related anxiety (Aygün, 2021). Research also indicates a strong association between students' reading habits and their reading motivation (Akbabaoğlu & Duban, 2020), as well as their curiosity and desire for exploration (Kapıkıran & Susar-Kırmızı, 2019). In this regard, strong reading habits serve as a key factor in helping students achieve success in both their academic and personal lives (Bashir & Mattoo, 2012). Moreover, a well-established reading culture is a cornerstone in fostering a literate and informed society (Palani, 2012). Therefore, in addition to primary school educators, native language teachers play a vital role in instilling and nurturing reading habits in students.

Reading habits are among the most effective tools in shaping individuals' personalities and fostering sound, critical thinking (Issa et al., 2012). While primary school teachers are responsible for equipping students with fundamental literacy skills, they must also actively support the formation of strong reading habits through targeted strategies and instructional practices (Karakullukcu & Çelik, 2020; Taş, 2018). As students' progress through the education system, native language and literature teachers are expected to reinforce these habits, especially by identifying learners who develop negative attitudes toward reading and implementing interventions to shift these attitudes in a positive direction. It is important to raise students' awareness of the fact that developing strong reading habits is one of the key prerequisites for becoming individuals who can respond to the needs of the modern age—individuals who think independently, critically, and creatively (Tanju, 2010).

In Turkey, a significant number of studies have been conducted to assess the reading habits of students at all levels of education, from primary school to university (Balci, 2009; Balci et al., 2012; Bayat & Çetinkaya, 2018; Can et al., 2010; Deniz & Çeçen, 2015; Odabaş et al., 2008; Taşkesenlioğlu, 2013; Yılmaz et al., 2009; Yurtbakan & Erdoğan, 2020). Findings from these studies reveal that students generally exhibit moderate or insufficient reading habits. According to the 2018 PISA results, Turkey ranked 40th out of 79 countries in reading proficiency (MoNE, 2019), while in the 2022 PISA assessment, the country ranked 36th among 81 nations (MoNE, 2023). These rankings show that Turkey lagged behind 39 countries in 2018 and 35 in 2022 in terms of reading comprehension performance. Such findings clearly illustrate that reading has not yet become a firmly rooted habit among students, making it difficult to claim that learners across all educational levels—from primary to university—possess well-developed reading habits.

In addition to these findings, a substantial body of national and international research has explored the relationship between reading habits and various influencing factors (Aksaçlıoğlu & Yılmaz, 2007; Aksoy, 2017; Bozkurt & Memit, 2013; Eminoğlu & Özkan, 2019; McGeown et al., 2015; Pürsün, 2024; Şahin, 2019; Yıldız & Akyol, 2011). These studies examine the connections between students' reading habits and factors such as academic performance, attitudes toward reading, motivation, spelling accuracy, reading comprehension awareness, and family attitudes toward reading. The results consistently suggest that reading habits are significantly associated with these variables. However, despite the breadth of existing research, action-oriented studies that seek to actively improve students' reading habits remain quite limited in the Turkish context (Şeref & Şahin, 2022). This gap points to the need for practical research that can guide classroom teachers—especially at the secondary school level—in promoting and enhancing students' reading habits.

1.2. Purpose of the Study

The aim of this study is to offer a model implementation for classroom teachers who serve as field practitioners, with the goal of enhancing students' reading habits. In doing so, the study seeks to address a gap frequently noted in the literature concerning practical approaches to fostering reading habits among students. Within this context, the research problem and sub-questions guiding the study are as follows:

Main Research Question

- How can the reading habits of 5th-grade students be improved?

Sub-questions

- What is the impact of the implemented action plan on students' attitudes toward reading habits?
- What are students' perceptions of the action plan designed to improve their reading habits?
- What are parents' views on the action plan implemented to support the development of their children's reading habits?

2. METHODOLOGY

This study was conducted using the action research design, a qualitative approach that enables practitioners to investigate and improve practices within real-world settings. Action research is defined as a systematic inquiry undertaken by educators with the aim of enhancing their own teaching practices and addressing context-specific problems (Johnson, 2015; Swann, 2002). In this model, theory and practice are intertwined, and the process is structured around the identification of a problem, the implementation of an intervention, and reflective analysis to guide subsequent actions (Avison et al., 1999; Elliott, 1991). In the field of education, action research is widely used to develop solutions to issues observed in school or classroom settings (Köklü, 1993). Often referred to as “teacher research,” this approach empowers educators to take an active and informed role in responding to students' needs through continuous and systematic engagement (Swann, 2002). Considering these characteristics, the current study was designed within the framework of action research, as it aimed to investigate and enhance the reading habits of secondary school students through a planned intervention.

The study was carried out over a 12-week period within a single academic semester. At the outset, the researcher conducted preliminary assessments to understand the students' reading profiles. To evaluate reading levels, students were asked to perform reading tasks, and their performances were recorded using structured observation forms. Additionally, their reading habits were assessed through informal interviews in which students provided information about how often they read and what types of books they typically chose.

The initial findings indicated that students had underdeveloped reading habits. This was further supported by observations shared by parents during a meeting held at the beginning of the semester. Parents reported that their children did not engage in regular reading and expressed concerns about the lack of motivation toward reading. They also requested that the teacher implement a systematic effort to address this issue and pledged their support for such an initiative. Based on these needs, the research problem was clearly defined as the improvement of students' reading habits. To design an effective intervention, the researcher consulted with two field experts, and an action plan was developed in light of their recommendations. In order to ensure the validity and reliability of the process, a Validity Committee composed of experienced educators and researchers in the field was established. This committee played a consultative and supervisory role throughout the implementation by providing feedback on key stages of the research.

The action research process followed a cyclical model consisting of planning, implementation, analysis, and revision, as suggested by Sagor (2005) and Johnson (2015). During the planning phase, the overall timeline of the study was determined, and a week-by-week schedule was created. Upon the committee's recommendation, the research duration was set at 12 weeks. Taking into account the age and developmental level of the students, it was decided that one book would be read every two weeks, followed by a two-hour classroom session dedicated to literary discussion and critique. In coordination with the teachers' council, it was agreed that one lesson hour each week would be officially devoted to in-class reading activities. However, to foster a more positive and engaging reading experience, the action plan also included reading sessions conducted in diverse settings outside the classroom—such as the school library, canteen, garden, and theater hall. To increase student ownership of the reading process, it was proposed that the students themselves select the books they would read during the intervention. Accordingly, the researcher brought 35 books to the classroom, representing a range of genres and difficulty levels appropriate for fifth-grade students. The students reviewed these books and collaboratively chose six titles to read and analyze over the course of the semester. They also determined the sequence in which the selected books would be read. This student-led selection process was integrated into the final action plan. The weekly structure of the reading intervention, including the schedule and selected books, is presented in Table 1, which outlines the detailed planning of the 12-week action research implementation.

Table 1.
Research Action Plan

Item no	Weeks	Actions	Data Collection Tools
1.	Week 1	1. Validity Committee Meeting	Discussion Notes
2.	Week 1	Pre-test (Reading habit attitude)	Reading Habit Attitude Scale
3.	1-2. Week	1. Reading the book	Diary, Interviews
4.	Week 2	1. Criticizing the book	Observation, Researcher's Diary
5.	3-4. Week	2. Reading the book	Diary, Interviews
6.	Week 4	2. Criticizing the book	Observation, Researcher's Diary
7.	Week 4	2. Validity Committee Meeting	Discussion Notes
8.	5-6 Week	3. Reading the book	Diary, Interviews
9.	Week 6	3. Criticizing the book	Observation, Researcher's Diary

10.	7-8 Week	4. Reading the book	Diary, Interviews
11.	8th Week	4. Criticizing the book	Observation, Researcher's Diary
12.	8th Week	3. Validity Committee Meeting	Discussion Notes
13.	9-10 Week	5. Reading the book	Diary, Interviews
14.	Week 10	5. Criticizing the book	Observation, Researcher's Diary
15.	11-12 Week	6. Reading the book	Diary, Interviews
16.	Week 12	6. Criticizing the book	Observation, Researcher's Diary
17.	Week 12	4. Validity Committee Meeting	Discussion Notes
18.	Week 12	Post-test (Reading habit attitude)	Reading Habit Attitude Scale
19.	Week 12	Taking student opinions	Student Letters, Interview
20.	Week 12	Receiving parents' opinions	Parent's Letters

In the sessions labeled “Criticizing the book,” students participated in structured group discussions guided by the teacher, focusing on elements such as plot, characters, and themes. They engaged in critical questioning, peer dialogues, and short written reflections. Some sessions also included creative activities like role-playing or drawing, aimed at deepening their engagement with the texts and supporting the development of lasting reading habits.

2.1. Participants of the Research

The study was conducted in a single 5th-grade classroom at a secondary school located in Kayseri. A total of 26 students participated in the research. Additionally, data were gathered from the students' parents during the study. Through this, parents shared their observations and feedback about the process by writing letters to the researcher at the conclusion of the study. By the end of the research, letters were received from the fathers of 8 students and the mothers of 18 students. Since the study was designed as action research, a purposeful sampling method was used to select the participants. Detailed information about the participants is provided in Table 2.

Table 2.
The Information of the Research Participants

Participant	Features	(f)
Students	Age	10 3
		11 21
		12 2
	Gender	Female 11
		Male 15
Parents	Age	30-35 6
		36-40 8
		41-45 5
		45+ 7
	Gender	Female 18
		Male 8
	Occupation	Housewife 13
		Worker 7
		Civil Servant 4
		Self-employment 2

2.2. Data Collection Tools

The data collection instruments used in this study included a personal information form created by the researcher, the book reading habits attitude scale originally developed by Gömleksiz (2004) and later adapted by Balcı (2009) for elementary students, as well as student diaries, the researcher's reflective diary, interview forms, and letters written by both students and their parents.

2.2.1. Personal information form and attitude scale regarding reading habits

In this study, a personal information form was created by the researcher to gather demographic details about the participating students and their parents. To assess students' attitudes toward reading habits, a scale originally developed by Gömleksiz (2004) and later adapted for elementary school students by Balcı (2009) was utilized. Gömleksiz initially designed the scale for university-level students, with item factor loadings ranging from .36 to .63 and a Cronbach's alpha reliability coefficient of .88. To make the scale suitable for use with elementary school students, Balcı (2009) revised it based on expert feedback and conducted a new factor analysis using data from 150 students. As a result of this adaptation, the factor loadings were found to range between .40 and .71, and the internal consistency reliability coefficient (Cronbach's alpha) increased to .92. These

findings confirmed that the revised scale is a valid and reliable instrument for measuring the attitudes of elementary students toward reading habits. The scale consists of 30 items grouped under six sub-factors and is structured as a 5-point Likert-type scale, with response options scored from 1 to 5. Among the items, 9 are negatively worded and require reverse scoring. The sub-dimensions of the scale are titled Love, Habit, Necessity, Desire, Effect, and Benefit. Necessary permissions were obtained for the use of this measurement tool in the current study.

2.2.2. Student diaries

Participant diaries serve as valuable data sources that document all stages of the research process (Johnson, 2015; Yıldırım & Şimşek, 2016). Their sincere, personal, and straightforward nature enhances their significance as data collection tools in qualitative studies (Altun, 2017). During the implementation phase of this study, six volunteer students-maintained diaries to record their daily experiences.

These students were purposefully selected based on specific criteria: (1) regular attendance throughout the intervention process, (2) active participation in writing activities, and (3) willingness and ability to reflect on their learning experiences in writing. These diaries aimed to capture students' reflections and impressions of the process, thereby offering insight into how the intervention was perceived and internalized by participants.

2.2.3. Researcher's diary

During the action process, a researcher diary was maintained to document detailed observations and critical reflections related to the implementation. The diary served as an essential tool for recording field notes, contextual observations, and interpretive insights regarding the course of the intervention. The entries captured the researcher's perspective as an external observer, including emotional reactions, evaluative judgments, and analytical comments on the instructional practices and classroom dynamics. Particular attention was paid to students' engagement, responses to the book critique activities, and the overall classroom atmosphere. This diary contributed to the triangulation of qualitative data by complementing student reflections and interview findings, thus enhancing the depth and trustworthiness of the research.

2.2.4. Interview form

In action research, interviews serve as a valuable data collection method to gather information that cannot be directly observed (Creswell, 2015; Johnson, 2015). This method was employed in the study to capture students' perspectives on the action process and to enhance data variety. To this end, the researcher prepared a draft of a semi-structured interview guide containing 10 questions. Feedback was sought from three subject matter experts, who reviewed the items for content validity. Based on their consensus, seven questions were selected for the final interview form. A pilot test was carried out with four students, and following their feedback, the experts approved the use of the form in the main study. Interviews were then conducted with 10 volunteer students during and after the research period. These students were purposefully selected to reflect diversity in gender, academic achievement, and engagement in classroom activities. This strategy ensured the inclusion of varied perspectives and contributed to the credibility and richness of the data collected.

2.2.5. Letters

At the start of the study, parents were informed about the research process and it was agreed that they would share their observations and feedback by writing letters at the conclusion of the study. Accordingly, by the end of the process, letters were received from the fathers of 8 students and the mothers of 18 students. Additionally, during the final week, 18 students volunteered to anonymously write letters expressing their thoughts, feelings, and suggestions about the action research process.

2.3. Data Collection

Prior to the commencement of the action research, a meeting was convened to inform the parents about the research objectives and the proposed action plan. All necessary permissions were duly obtained, and parents were requested to complete a voluntary participation consent form. By signing this form, parents confirmed their voluntary consent, as well as that of their children, to participate in the study. Data collection was carried out in accordance with the action plan, utilizing instruments such as the reading habits attitude scale, interview forms, student diaries, the researcher's reflective diary, and letters. Ethical approval for the study was sought from the Social and Human Sciences Ethics Committee at Gaziantep University. The application was reviewed and placed on the agenda of the committee meeting held on February 18, 2021, under item number 4. Following the review, approval was granted under protocol number 19727, confirming that no ethical violations were identified in the study. The data were collected systematically according to the action research plan.

2.4. Data Analysis

Throughout the action research process, the data collected through various instruments were analyzed using both qualitative and quantitative methods. To evaluate the pre-test and post-test results obtained from the Reading Habit Attitude Scale, a dependent samples t-test was conducted via the SPSS 26.00 statistical software. Since the t-test for dependent samples requires that the difference scores between the paired measurements follow a normal distribution, the assumption of normality was assessed using the Shapiro-Wilk test. The outcomes of this analysis are presented in Table 3.

Table 3.

Shapiro-Wilk Test Significance Level Results of Pre-Test Post-Test Difference Scores

Factors	n	S	p
Love	26	.969	.599*
Habit	26	.944	.166*
Necessity	26	.932	.086*
Desire	26	.979	.855*
Effect	26	.967	.545*
Benefit	26	.964	.478*
General	26	.965	.506*

*p>.05

The Shapiro-Wilk test results, conducted to assess the normality of the difference scores between the pre-test and post-test measurements of students' reading self-efficacy, indicated that all p-values for the overall scale and its subscales were greater than .05. This finding suggests that the distribution of the difference scores does not significantly deviate from normality, thereby justifying the use of parametric statistical methods. Accordingly, the paired samples t-test was employed to analyze the pre-test and post-test scores on the Reading Habit Attitude Scale, and the observed changes were evaluated within the framework of the relevant subscales.

In addition to the quantitative findings, qualitative data were gathered through interviews, student and parent letters and reflective diaries throughout the research process. These qualitative data were examined using content analysis, a commonly used technique in qualitative research. As Creswell (2015) points out, integrating quantitative and qualitative data can offer a more comprehensive understanding and can be jointly interpreted in the discussion section. In line with this approach, both types of data collected during the study were synthesized and interpreted together in the discussion section.

2.5. Validity and Reliability

Scientific research quality is fundamentally evaluated through its validity and reliability. In the context of action research, these concepts encompass internal validity, external validity, internal reliability, and external reliability, as emphasized in the literature (Guba & Lincoln, 1994; Yıldırım & Şimşek, 2016). To strengthen internal validity in this study, prolonged engagement with participants, comprehensive and focused data collection methods, methodological triangulation, and consultation with field experts were implemented. External validity was addressed by objectively presenting both qualitative and quantitative findings without interpretation, alongside limiting the sample to fifth-grade students to define the scope. Internal reliability was supported by gathering data through multiple forms, including written reflections and practical observations, with direct participant quotations systematically coded (e.g., Student 1, Student 2) and organized thematically. Additionally, external reliability was enhanced by providing thorough descriptions of participant characteristics, the research process, data collection instruments, and analytical procedures, thereby allowing for transparency and reproducibility.

3. FINDINGS

In this section, the findings regarding the quantitative and qualitative dimensions of the research are presented.

3.1. Findings on the Quantitative Dimension of the Study

The results of the paired samples t-test for the pre-test and post-test application conducted with the analysis of the quantitative data obtained in the research process are presented in Table 4 in the context of the scale and sub-scales.

Table 4.

The Paired Samples t-Test Results of Pre-Test and Post-Test Mean Scores for Sub-scales and Overall Scale

Measurement		N	$\bar{X}$	S	SD	t	p
(I. Subscale / Love)	Pre-test	26	2.98	.53	25	-12.28	.000*
	Post-test	26	4.49	.39			
(II. Subscale / Habit)	Pre-test	26	2.87	.57	25	-11.36	.000*
	Post-test	26	4.52	.43			
(III. Subscale / Necessity)	Pre-test	26	2.93	.58	25	-6.48	.000*
	Post-test	26	4.24	.71			
(IV. Subscale / Desire)	Pre-test	26	3.14	.78	25	-7.19	.000*
	Post-test	26	4.55	.52			
(V. Subscale / Effect)	Pre-test	26	3.22	.76	26	-7.26	.000*
	Post-test	26	4.52	.49			
(VI. Subscale / Benefit)	Pre-test	26	3.45	.72	25	-6.35	.000*
	Post-test	26	4.56	.50			
(Scale Overall)	Pre-test	26	3.13	.53	25	-9.68	.000*
	Post-test	26	4.49	.41			

*P < .01

As shown in Table 4, a statistically significant difference was observed between the pre-test and post-test mean scores for the first subscale, Love [$t_{(25)} = -12.28$, $p < .01$]. The mean score for this subscale increased from $\bar{X} = 2.98$ prior to the implementation of the action plan to $\bar{X} = 4.49$ afterward. This result suggests that the action plan contributed to enhancing students' affection and appreciation for reading.

Similarly, the paired samples t-test revealed a significant difference in the second subscale, Habit [$t_{(25)} = -11.36$, $p < .01$]. The mean score for this subscale rose from $\bar{X} = 2.87$ before the intervention to $\bar{X} = 4.52$ post-intervention. This indicates a substantial improvement in students' reading habits following the action plan.

For the third subscale, Necessity, the t-test results also demonstrated a statistically significant difference [$t_{(25)} = -6.48$, $p < .01$]. The pre-test mean score of $\bar{X} = 2.93$ increased to $\bar{X} = 4.24$ in the post-test, implying a heightened perception among students of reading as a necessary and valuable activity.

The results further indicate a meaningful change in the fourth subscale, Desire [$t_{(25)} = -7.19$, $p < .01$], where the mean score improved from $\bar{X} = 3.14$ to $\bar{X} = 4.55$. This finding reflects a notable increase in students' intrinsic motivation and eagerness to read as a result of the action plan.

With regard to the fifth subscale, Effect, a statistically significant improvement was also found [$t_{(25)} = -7.26$, $p < .01$], with mean scores increasing from $\bar{X} = 3.22$ to $\bar{X} = 4.52$. This outcome suggests that students developed a more positive outlook on the influence and outcomes of reading.

Finally, in the sixth subscale, Benefit, the paired samples t-test revealed a significant difference [$t_{(25)} = -6.35$, $p < .01$]. The average score rose from $\bar{X} = 3.45$ to $\bar{X} = 4.56$, indicating that students became more aware of and valued the benefits associated with regular reading.

When evaluating the overall results from the reading habit attitude scale, a statistically significant difference was found between the pre-test and post-test total scores [$t_{(25)} = -9.68$, $p < .01$]. The overall mean score increased from $\bar{X} = 3.13$ before the action plan to $\bar{X} = 4.49$ after its implementation. This comprehensive finding provides strong evidence that the action plan was effective in positively shaping students' attitudes toward reading and cultivating more favorable reading behaviors.

3.2. Findings on the Qualitative Dimension of the Study

In this part of the research, the findings obtained as a result of analyzing the data obtained by qualitative data collection tools with content analysis are presented in tables within the framework of the research questions.

Table 5.
Findings on Students' Perceptions and Opinions on the Research Process

Item no	Theme	Sub-Theme	(f)
1.	Reading Skills and Strategies	Improvement in ability to read aloud	18
		Improvement in silent reading skills	18
		Improvement in speed reading	14
		Highlight important points	14
		Abstracting	13
		Taking notes	12
		Search for unfamiliar words	10
2.	Like	Reading books in different places	20
		Application of bring your apple and book and join	20
		Discussion lessons	14
		Determining the books to read lesson	13
		Students starting to create their own library	10
3.	Dislike	Book criticism courses are found to be insufficient	8
		Insufficient reading lessons at school	6
		Inability to go to libraries as a class	6
		Application of bring your apple and book and join	1
4.	Effects and Benefits	More reading	21
		Read with love	20
		Effective communication	18
		Watching less TV	18
		Spending less time on the internet	17
		Enriching imagination	15
		Enrich the vocabulary	15
		Learning new information	14
		Creating a book friendship	6

According to Table 5, it can be stated that action research contributes significantly to students' reading skills and use of strategies. In this sense, the students stated that the activities carried out during the action research process contributed to the development of their reading aloud, silent reading, and speed reading. It was stated in the data obtained from the students that the action plan applied was also effective in determining the important sections in the book, highlighting these sections or gaining the habit of underlining these sections during reading process. Summarizing the book read and taking notes for the parts that are considered important or liked during the reading process were determined as the acquisitions made by the students in the research process. In addition to these, some of the students expressed their views on the point that they gained the habit of searching for unfamiliar words that they encountered in the book they read. Some of the findings obtained based on the theme of "Reading Skills and Strategies" are given below.

"I was afraid of reading books aloud in class because I was reading slowly. This application has improved both my reading aloud and my reading silently." (Student 9, Interview form).

"We read two books every month. Now I think I have started reading faster." (Student 12, Letter).

"Our vocabulary was not well developed before we started this activity. Now I am searching for words that I do not know while reading a book. Thus, our vocabulary gets richer." (Student 6, Interview form).

"While reading the book, I started to highlight the sentences I liked. I use these sentences in discussion lessons." (Student 5, Diary).

In the theme of "Like", there are features and aspects of the research process that are liked by the students. In this context, the students stated that, during the research process, they liked reading books in different places and bring your apple and book and join the most. In addition to these, discussion lessons in which the books read were criticized and the book review lesson, which was conducted to determine the books to be read, were determined as other aspects of the process that were liked by the students. Also, the students' obtaining the books they determined at the beginning of the research process and starting to create a library of their own are seen as favourite features. Some of the findings obtained depending on the theme of "Like" are given below.

"I loved reading books while eating apples outside. In our school, such activities should be done more, I think this would be enjoyed by everyone." (Student 1, Interview form).

"My favourite activity was the "get your apple and book and come" activity. Because cushions were laid in the garden, we both ate our apples and read books. I liked this very much." (Student 8, Letter).

"I and my friends liked to read books outside, in nature the most." (Student 1, Diary).

Under the theme of "Dislike", there are features and aspects of the research process that are not liked and criticized by the students. In this sense, students criticized the action research process mostly in terms of finding the book criticism lessons insufficient. At the end of the two-week reading sessions, two course hours of book criticism lessons were held. In these lessons, the students presented their opinions about the book read and asked questions about the book to their friends. Likewise, in these lectures, the favourite and disliked aspects of the book read were discussed. The students wanted these lessons to be longer and this request was reflected in 2. Validity Committee Meeting, but it was deemed appropriate to limit these lessons to two lesson hours at the end of the two-week reading sessions in order not to interrupt the annual planning prepared within the framework of the general outputs of the course, and it was recommended that the practice continues in this way. Another point those students criticized during the process was that the reading lessons were found to be insufficient in the school, which was conducted for 1 lesson per week. Since this decision was taken by the Turkish Department Teachers' Meeting during the planning of the teaching process at the beginning of the year, no new regulation has been made on this issue. The inability to go to public libraries as a classroom during the research process has been another criticism. Due to the fact that public libraries are outside the boundaries of the district, the necessary transportation facilities and permits could not be provided, so the relevant activity could not be carried out. In the 3. Validity Committee Meeting, it was mentioned that the relevant activity should be carried out in the school library and the activity was carried out in the school library. Along with these, a student said that he/she did not like the practice of 'bring your apple and book and join', and stated that he/she did not like the apple as a reason for this and suggested that the activity be held with another fruit. Some of the findings obtained depending on the theme of "Dislike" are given below.

"What I didn't like was that the book discussion lessons were insufficient. Because not everyone had enough time to speak." (Student 9, Interview form).

"I did not like that the reading time with our friends at school is only one hour a week." (Student 4, Letter).

"Book discussion lessons could have been longer." (Student 7, Letter).

"I did not like the practice of take your apple and your book and come because I do not like apples. It could have been another fruit instead of an apple." (Student 2, Diary).

Under the theme of "Effects and Benefits", there are findings of the research process regarding the effects and benefits of the students' reading habits. Accordingly, most of the students stated that the action plan implemented enabled them to read books more and fondly. A significant portion of the students stated that their communication skills improved and they could express themselves better and they spent less time in front of the television and on the internet. It was determined that the action research carried out together with them contributed to the enrichment of students' imagination and vocabulary and learning new information. In the interviews, some of the students stated that they formed a friendship through books among themselves during the action research process. This situation is considered very important in terms of both effective communication and creating a positive classroom atmosphere. Some of the findings obtained depending on the theme of "Effects and Benefits" are given below.

"I used to read very few books, now I finish a book every two weeks. And now I read books without my parents warn me. In other words, I can read more books than before and without getting bored." (Student 2, Interview form).

"Before, I did not read many books. Either I did not have time or I found an excuse not to read. I did not like to read books very much. Now we are reading as a class and my reading has progressed a lot." (Student 4, Letter).

"Teacher, my sincere idea is that while I was reading 2 or 3 books a year, now I read two books a month." (Student 7, Letter).

"Since we read books, I no longer play games on the computer for a long time." (Student 6, Interview form).

Table 6.

Findings on Parent's Opinions on the Research Process

Item no	Theme	Sub-Theme	(f)
1.	Effects and Benefits	Spending more time for reading	26
		Reading willingly and fondly	20
		Quality leisure time	19
		Decrease in TV watching habit	14
		Decrease in the habit of spending time on the Internet	14
		To be able to express themselves better	12
		The development of the imaginative world	12
		Improving vocabulary	12
		Increased reading speed	10
2.	Recommendations	Continuation of the application	26
		Organizing reading activities to include parents	11
		Studying for unknown words	2
		Increasing the number of books	2
		Keeping a dictionary book	3

According to Table 6, under the theme of "Effects and Benefits", the effects and benefits of the research process on students' reading habits are included in the context of the parents' observations and determinations. In the letters they wrote within this framework, all of the parents of the students stated that the students spent more time to read within the framework of the action plan applied. Again, a significant portion of the parents stated that the students read the books that were decided to be read in the process voluntarily and fondly, they spent their free time in a higher quality compared to before, they observed a significant decrease in their habits of watching television and spending leisure time on the internet, and they are satisfied with this result. Along with these, some of the parents stated that their children started to express themselves better, their imagination and vocabulary improved and their reading speed increased. Some of the findings obtained depending on the theme of "Effects and Benefits" are given below.

"My daughter didn't use to read a lot of books in the past, but this year she started to read more." (Parent 1, Letter).

"My daughter used to get excited and stutter, especially when talking to a foreigner. With the contribution of the books, she read and the work you did throughout the semester, she started to express herself comfortably and without hesitation." (Parent 22, Letter).

Under the "Suggestions" theme, the suggestions included in the letters of the parents regarding the research process and thought to contribute to future practices are included. In this sense, it was stated that they were satisfied with the application carried out in all of the parents' letters and it was requested to continue the application in the future semesters and years. In addition to this, in a significant part of the parents' letters, it was recommended to organize reading activities in which the parents of the students would be included. Again, in two parents' letters, it was stated that conducting in-class studies on words whose meaning are unknown during the book reading process will contribute to students' understanding of the books read. In two parents' letters, it was stated that the number of books read was insufficient and that reading one book every week would be more efficient. Some of the findings obtained in the context of the "Recommendations" theme are given below.

"I hope you will continue this activity in the future, and thank you for your interest." (Parent 9, Letter).

"I think that having a reading activity that we will also attend will motivate our children more." (Parent 25, Letter).

"There were a lot of words he didn't know. He learned these by asking me. I think it would be useful to study new vocabulary in your lesson." (Parent 5, Letter).

Table 7.

Findings on the Researcher's Opinions on the Research Process

Item no	Theme	Sub-Theme	(f)
1.	Effects and Benefits	Increased time allocated to reading	4
		Enjoying reading books	4
		Increased reading speed	3
		Enriching the imagination	2
		Development of vocabulary	2
2	Process	Identifying interesting books	3
		Creating a comfortable reading environment	3
		Planning book evaluation courses	2
		Organizing interactive book review courses	2
		Preparing a book dictionary list	2
3.	Recommendations	Continuation of the implementation	3
		Disseminating the application at different grade levels	2
		Organizing reading activities that involve parents	2
		Preparing a dictionary notebook	2

According to Table 7, the “Effects and Benefits” theme includes the observations and determinations of the researcher regarding the effects and benefits of the implemented action plan on students' reading habits. Accordingly, the researcher found that the students allocated more time for reading within the framework of the action plan. Similarly, the researcher stated that students liked the books that were decided to be read, students' reading speed increased, and students' imagination and vocabulary improved. Some of the findings obtained under the theme of “Effects and Benefits” are presented below.

In order to make the study of unfamiliar vocabulary in the action research process more effective, I think it would be more useful to provide students with a dictionary notebook at the beginning of the process and have them do their vocabulary studies in this dictionary notebook (Researcher Diary, Week 6).

It would be appropriate to say that the studies have led to an increase in the students' reading speed (Researcher Diary, Week 8).

The “Process” theme includes the findings of the researcher for the action research process applied. Accordingly, the researcher determined that it is important to carry out the process of developing students' reading habits with interesting books, to create a comfortable reading environment in the process, to plan book evaluation lessons, to organize interactive book evaluation lessons, and to create a book dictionary list. Some of the findings related to the “Process” theme are presented below.

It would be useful to prepare book dictionary lists in the process to support students' concept and vocabulary learning through the books read (Researcher Diary, Week 5).

I think one of the most useful aspects of the process is the book evaluation lessons that we realized interactively (Researcher Diary, Week 2).

The “Recommendations” theme consists of the suggestions in the researcher's diary that are thought to contribute to future implementations. The researcher stated that the action plan was useful and that the implementation should be continued in the next process. The researcher's suggestions for the implementation included extending the implementation at different grade levels, organizing reading activities that include parents, and preparing a dictionary notebook for the implementation process. Some of the findings obtained under the theme of “Recommendations” are presented below.

In order to make the study of unfamiliar vocabulary more effective in the action research process, it would be more useful to provide students with a dictionary notebook at the beginning of the process and to have them do their vocabulary studies on this dictionary notebook (Researcher's Diary, Week 5).

The practice should be extended to different grade levels. I can state that there was a significant improvement in students' reading habits (Researcher Diary, Week 12).

4. RESULTS, DISCUSSION AND RECOMMENDATIONS

This study implemented an action research approach aimed at enhancing the reading habits of 5th-grade students. Initially, the investigation focused on assessing the impact of a specifically designed action plan and its associated activities on students' attitudes toward reading habits. To this end, pre-test and post-test measurements of students' attitudes were conducted using the book reading habit attitude scale, and the resulting data were analyzed via paired-sample t-tests. The

findings revealed a statistically significant improvement across all sub-dimensions of the scale—namely love, necessity, desire, habit, effect, and benefit—indicating that the intervention positively influenced students' perceptions of reading. This outcome aligns with existing literature emphasizing the role of perceiving reading as a pleasurable activity in the formation of habitual reading behaviors (Bayat & Çetinkaya, 2018; Cole, 2009; Çağ, 2023; Florence et al., 2017; Gallik, 1999; Huang et al., 2014; Tanju, 2010). Accordingly, various activities were implemented throughout the research process to foster students' enjoyment of reading. Key interventions included book review lessons to assist students in selecting reading materials, the 'bring your apple and book' initiative, reading sessions conducted in diverse locations outside the traditional classroom setting, and structured discussions on the books read. Qualitative data analysis supported the quantitative results, demonstrating these activities' substantial effect on enhancing students' love and desire for reading.

The literature also supports the notion that regular reading practices contribute not only to transforming reading into a habit but also to perceiving it as an essential part of daily life (Arslan et al., 2009). Moreover, consistent engagement with reading activities is known to significantly benefit readers' linguistic, cognitive, personal, and social development (Merga, 2017; Pizzi & Rius-Ulledemolins, 2024). Within this context, the weekly reading activities conducted at both school and home are believed to have played a crucial role in reinforcing students' perception of reading as a necessity. Additionally, findings derived from qualitative data underscored the importance of interactive book discussion lessons in fostering students' awareness of the developmental contributions of reading. These results corroborate the conclusions drawn by Şeref and Şahin (2022), who highlighted the significance of interactive book evaluation courses. Collectively, these findings affirm that the action research positively influenced students' overall attitudes toward reading habits.

Secondly, the study examined students' perspectives regarding the strengths and limitations of the action research process to provide an in-depth understanding of its effects. The data indicated that the intervention significantly supported the enhancement of students' reading skills and strategy utilization. According to interviews and student diaries, the activities improved students' abilities in oral reading, silent reading, and reading speed. The book review lessons contributed to cultivating habits such as selecting meaningful passages, highlighting, and annotating. Furthermore, students employed foundational reading strategies including summarizing texts, noting favorite excerpts, and searching for unfamiliar vocabulary encountered during reading. These observations align with the literature, which emphasizes that effective reading involves the acquisition of various physical, cognitive, and affective skills and strategies, typically developed through active practice (Afflerbach et al., 2008; Akyol & Kodan, 2016; Baydik, 2011; Carrell, 1998; Yang, 2006). Accordingly, this study appears to have supported students in gaining valuable experiential knowledge of reading strategies and skills.

One of the objectives of this research was to identify features of the implemented practices that students favored or criticized, thereby providing detailed feedback for future researchers and practitioners. Throughout the study, students expressed a preference for reading in diverse environments outside the classroom and for the 'bring your apple and book' initiative. Additional favored activities included book discussion lessons, book selection lessons, and the opportunity to establish personal libraries. These preferences support prior research findings emphasizing the importance of cultivating a love for books and reading during the development of reading habits (Arslan et al., 2009; Baba & Affendi, 2020; Huang et al., 2014; Merga, 2017). Fostering positive attitudes toward reading through engaging activities is widely recognized as essential in this developmental process (Cole, 2009), and this principle was consciously integrated into the research design.

Conversely, identifying elements of the program that students found unsatisfactory is equally important for enhancing future implementations. The primary critique pertained to the perceived insufficiency of book criticism lessons, which were held biweekly for two class hours. In these sessions, students presented their opinions and discussed aspects they liked or disliked about the books. Students expressed a desire for extended durations for these lessons. Another notable criticism concerned the limited frequency of reading lessons at school, which occurred once weekly due to pre-existing departmental decisions established prior to the research. Furthermore, the absence of a public library visit as part of the program was mentioned as a shortcoming. A singular student also voiced dislike for the 'bring your apple and book' activity due to a personal aversion to apples, suggesting the inclusion of alternative fruits. Overall, the majority of criticisms related to scheduling and logistical constraints, underscoring the importance of accommodating student feedback during the planning and implementation stages of action research (Creswell, 2015; Johnson, 2015; Köklü, 1993). Due to limitations concerning time, school resources, and curricular demands, no modifications could be enacted during the study in response to these concerns.

Thirdly, the study evaluated changes in students' reading habits based on parental feedback and researcher observations to enhance data triangulation and involve families as key stakeholders. Parents reported that their children dedicated more time to reading within the framework of the intervention, engaged with the selected books voluntarily and with enthusiasm, and exhibited a notable reduction in television viewing and internet use during leisure time, which they welcomed. Parents also observed significant improvements in their children's self-expression, imagination, vocabulary, and reading speed. These parental observations were consistent with data gathered from student interviews and the researcher's diary, which noted enhanced verbal expression in Turkish classes and increased reading speed throughout the intervention period. Students themselves reported increased reading frequency and enjoyment, improved communication skills, and reduced screen time. This aligns with existing research underscoring the pivotal role of families in nurturing reading habits (Aksoy, 2014; OECD, 2002; Tanju, 2010; Yıldız, 2016; Yusof, 2010). Accordingly, family involvement was purposefully integrated into the research process, both as observers and contributors.

At the conclusion of the study, both parents and the researcher offered recommendations based on their observations of changes in students' reading habits and reflections on the research process. Parents expressed satisfaction with the intervention and advocated for its continuation in future terms and academic years. Suggestions included organizing reading activities that actively involve parents and increasing the frequency of book reading sessions from biweekly to weekly. Parents also noted that when children encountered unfamiliar words during reading, they sought their meanings from parents, highlighting the need for classroom activities focused on vocabulary development related to these words. In response, the researcher recommended initiating a dictionary of unfamiliar words at the outset of future interventions, as recorded in the researcher's diary. Furthermore, expanding the program to include multiple grade levels and increasing parental engagement in reading activities were proposed. Considering these recommendations is expected to enhance the quality and effectiveness of subsequent research and practice.

4.1. Limitations and Recommendations for Future Research

While this action research provides meaningful insights into enhancing 5th-grade students' reading habits, certain limitations should be acknowledged to contextualize the findings. One important constraint relates to the limited sample size and setting. The study was conducted with a small group of students from a single public school, which restricts the transferability of the results to broader or more diverse educational environments.

Additionally, the relatively short duration of the implementation may have limited the depth of observed changes in students' reading behaviors. Longer-term interventions could offer greater insight into the sustainability and long-term impact of efforts to foster reading habits. The absence of a control group also presents a methodological limitation. Although action research prioritizes reflection and responsiveness within a real-world context, the lack of a comparison group makes it difficult to attribute observed outcomes solely to the intervention.

Furthermore, the study relied primarily on self-reported data sources, including student diaries and interviews. While these tools provide valuable qualitative insights, they are subject to potential biases such as social desirability or limited self-awareness, especially given the developmental stage of the participants. Acknowledging these limitations not only promotes transparency but also highlights directions for future research, such as studies with larger and more diverse samples, extended intervention periods, and the integration of mixed-method designs to provide a more comprehensive picture of how to support lasting reading habits in young learners. In light of these findings and limitations, several recommendations can be made to guide future studies and educational practices aimed at fostering reading habits in middle school students:

- Studies can be conducted to determine the factors affecting students' reading habits.
- The research can be repeated at different grade levels.
- Experimental studies can be conducted in which methods and techniques that support the development of reading habits are applied.
- Qualitative studies can be conducted to examine students' opinions about their reading habits.
- Studies examining teachers' opinions on students' reading habits can be performed.

Research and Publication Ethics Statement

Ethical permission was obtained from Social and Human Sciences Ethics Committee of Gaziantep University (18.02.2021-E.19727).

Contribution Rates of Authors to the Article

The research was prepared by a single author.

Statement of Interest

There is no conflict of interest.

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Reliability Generalization Meta-Analysis of the Self-Efficacy Scale for Geometry*

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Article Information	ABSTRACT
Received: 25.05.2025	This study was conducted to estimate the average reliability coefficient of the Geometry Self-Efficacy Scale (GSES) developed by Cantürk-Günhan and Başer (2007), which is frequently used in the literature, based on the reliability findings in different studies and to examine the sources of variation of the reliability coefficients reported in the studies. In the study in which reliability generalization meta-analysis design was used, 24 studies that met the criteria were included in the study. The transformed coefficient values obtained by using Bonett transformation of 26 Cronbach's alpha coefficients obtained from these studies were combined and analyzed under the random effects model. As a result of the analysis, the mean Cronbach's alpha value of the GSES was estimated as .878 (95% CI: [.85 - .90]) and this value was found to be statistically significant (p<.01). In addition, as a result of the heterogeneity analysis, it was determined that there was a high level of heterogeneity between the studies in terms of Cronbach's alpha. Moderator analyses were conducted to determine the possible reasons for the heterogeneity and the findings of the analysis revealed that Cronbach's alpha estimates were not affected by the moderator variables considered in this study. In addition, no evidence of publication bias was found in the study. As a result, the findings of this study suggest that the GSES is a scale with good reliability values on average and may help researchers in future studies to decide to use this scale to measure students' self-efficacy perceptions towards geometry.
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1. INTRODUCTION

Mathematical knowledge can be shaped cognitively and affectively in the minds of individuals. For this reason, it can be said that in the learning process of mathematical concepts, affective features as well as cognitive features have effects on learning processes (Ma & Kishor, 1997). At this point, one of these affective characteristics is self-efficacy (Afgani et al., 2019). This concept, which is considered to be important in terms of learning processes, has a special value in mathematics and geometry education as well as in general. When the literature is examined, it was first defined by Bandura (1986) as an individual's self-belief about his/her capacity to bring together the activities required for a certain performance in any subject and to do them successfully. This affective characteristic, which is extremely important for learning processes, has a determinant position in different aspects on the individual's goal orientations, efforts to learn, perspectives on geometry and academic achievements (Bandura, 1997; Schunk, 2011; Usher, 2009). In short, it can be said that self-efficacy is an affective concept that has an effect on the individual in many aspects and is essentially about trusting and believing in oneself to perform the given task successfully.

1.1. Geometry Self-Efficacy

When self-efficacy concept is examined in geometry, it is thought that one of the first possible concepts that may come to mind may be self-efficacy in geometry. Geometric self-efficacy can be expressed as confidence in one's ability to understand and solve geometry problems or tasks (Özkan & Yıldırım, 2013). This concept is a special form of self-efficacy. Geometry self-efficacy is important because it affects an individual's motivation, performance, problem solving skills and spatial reasoning development (Cantürk-Günhan & Başer, 2007). In other words, the importance of geometry self-efficacy stems from its effect on learning and performance. As a matter of fact, studies have shown that individuals with high geometry self-efficacy participate more in geometry-related activities, have a higher level of understanding of geometry and exhibit high performance (Özkan & Yıldırım, 2013). Therefore, developing and strengthening geometry self-efficacy can lead to more participation in geometry and related

* Since the study did not involve human practices, there was no need to obtain an ethics committee.

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fields, increase academic achievement, and most importantly, learning (Çontay & Duatepe-Paksu, 2018; Deringöl, 2020; Erkek & Işıksal-Bostan, 2015).

Many researchers have developed scales to determine students' self-efficacy level towards mathematics or geometry course (Baş & Katrancı, 2020; Cantürk-Günhan & Başer, 2007; Işıksal & Aşkar, 2003; Mumcu, 2019). When the studies reached in the literature review were examined, it was seen that one of the scales frequently used to determine students' self-efficacy levels towards geometry belongs to Cantürk-Günhan and Başer (2007). Consisting of 25 items, this scale consists of 3 sub-dimensions in 5-point Likert type. In the first stage of the development of the scale, a draft form consisting of 29 items and graded as "1. Never, 2. Occasionally, 3. Undecided, 4. Most of the time, 5. Always" was created. In the next stage, the draft form was submitted to expert opinion and necessary corrections were made according to the feedback. In the next stage, validity and reliability studies were conducted and as a result of the necessary analyzes, four items in the scale were removed from the scale because they did not meet the necessary conditions. The remaining 25 items were grouped under three factors (positive self-efficacy towards geometry, use of geometry knowledge, negative self-efficacy towards geometry). After the validity studies, GSES was applied to a total of 385 students studying in the 6th, 7th and 8th grades for reliability analysis and as a result of the analysis of the collected data, Cronbach's alpha reliability coefficient for the overall scale was calculated as .90.

1.2. Test Reliability Generalization Meta-Analysis

Reliability is a property of scores, not an inherent property of a test or scale (Thompson & Vacha-Haase, 2000). Therefore, in studies using scales, the author(s) are expected to report a reliability estimate for the data they collected. Unfortunately, this is sometimes ignored in the literature. Researchers often refer to the reliability obtained in the original test validation study rather than reporting reliability estimates based on their participants' scores in their own studies, as they erroneously assume that their data will provide the same reliability as the original scale (Sandoval-Lentisco et al., 2023). Reliability provides information about the reliability of information specific to the conditions under which the data collection instrument is administered, not the instrument itself (Lee et al., 2023). For example, the reliability coefficient value may change when the scale is applied to a different sample group (Crocker & Algina, 1986; Irwing et al., 2018; Streiner & Norman, 2008). Therefore, reliability coefficients fluctuate between test administrations and these fluctuations are suitable for meta-analytic analysis (Sandoval-Lentisco et al., 2023). Meta-analytic methods can be used to combine reliability values such as Cronbach's alpha from multiple independent studies to arrive at a more accurate reliability estimate for a particular scale, just as correlation values are collected from individual studies (Şen & Yıldırım, 2023).

Meta-analytic methods were named "Reliability Generalization (RG)" by Vacha-Haase (1998) as a type of meta-analysis. RG is used to understand which factors affect the variability of reliability scores in the results by managing the means of reliability values in independent studies where the scale or test is used (Vacha-Haase & Thompson, 2011). Moreover, when there is heterogeneity among reliability estimates, RG meta-analysis allows to examine whether some characteristics of the studies (i.e., moderators) explain the variability of reliability coefficients (Sánchez-Meca et al., 2013). It should be noted that RG research focuses on the reliability of the target test/scale across different studies and samples, which is considered a more robust basis for reliable induction than that obtained from a single study (Şen, 2022). Considering the fluctuations in the reliability coefficients reported in the national literature for the GSES, which is frequently preferred by researchers to determine students' self-efficacy levels towards geometry, it is thought that a meta-analysis study with the reliability generalization method is needed to reveal an average reliability value and that generalizing the reliability of this measurement tool will be important. At the same time, it is foreseen that the results of this study will provide information to future research on the range of reliability estimates that can be expected for the GSES. In the national literature, there are many studies (e.g., Kaba et al., 2017; Yayla, 2021) that report Cronbach's alpha internal consistency reliability values obtained from their own sample groups in the studies for the GSES, which is frequently preferred by researchers to determine the self-efficacy of middle school, high school and university level students towards geometry. These reported reliability values show fluctuations between 0.7 (Taş & Yavuz, 2023; Yenilmez & Korkmaz, 2013) and 0.981 (Demir, 2019). Considering these fluctuations in the reported reliability coefficients, it is estimated that there is a need for a meta-analysis research with the reliability generalization method to reveal an average reliability value and that the reliability generalization of this measurement tool will be important. A RG analysis using data from multiple studies using the same measurement tool can provide more precise estimates of score reliability (Şen, 2022). Therefore, it is predicted that the results to be obtained from this RG meta-analysis study will provide more precise information to future studies on the range of reliability estimates that can be expected for the GSES and will provide ideas to researchers and practitioners who will consider using this scale. On the other hand, no RG meta-analysis study was found in the literature review.

1.3. Purpose and Sub-Problems of the Study

The aim of the study was to estimate the overall (average) reliability value of the GSES, which was developed by Cantürk-Günhan and Başer (2007) to determine students' self-efficacy perceptions towards geometry, and to examine the sources of variation (change) of the reliability coefficients reported in the studies using this scale, in other words, to examine the moderator variables that may cause variability between studies. In this direction, answers to the following sub-problems were sought:

1. "What is the average reliability coefficient of the GSES?"

2. “Do the values of the reliability coefficient of the GSES differ according to the moderator variables (teaching level, publication status of the studies, region, research design, publication year, sample size and male percentage)?”

2. METHODOLOGY

Meta-analysis can be defined as a quantitative method that provides summary information by statistically combining the findings of individual studies on a specific topic (Şen & Yıldırım, 2023). RG is a meta-analytic approach that aims to characterize how reliability estimates obtained from the same measurement tool vary between different administrations of the tool (Sánchez-Meca et al., 2021). Since the main purpose of RG meta-analyses is to estimate the average effect size value, that is, the average reliability coefficient (Şen & Yıldırım, 2023), the RG meta-analysis method was preferred in this study and the research was conducted in accordance with the guidelines developed by the PRISMA group (2009).

2.1. Data Collection Process

The inclusion and exclusion criteria for the studies to be used in the data collection process were determined by the researchers in accordance with the purpose of the study after examining similar studies before the literature review. These criteria can be expressed as follows: using the geometry self-efficacy scale developed by Cantürk-Günhan and Başer (2007) as the data collection tool, reporting an internal consistency coefficient such as Cronbach's alpha coefficient reported for the geometry self-efficacy scale or having calculable values, presenting the sample size, and the language of publication being Turkish or English. The exclusion criteria were that no reliability value and sample size for the scale could be reached in any way and that this scale was not used as a data collection tool in the study. Afterwards, searches were conducted in ProQuest, YÖK Thesis Center, İnönü University library database, Google Academy, ULAKBİM, Web of Science and ERIC databases or indexes with the keywords “Geometry self-efficacy scale” in Turkish and English. No restriction was made for the year range, and all studies published from the date of the original publication (2007) to December 2023 were included in the search. The first search was conducted on 19.11.2023 and the last search was conducted on 29.12.2023 on all publications (articles, papers, book chapters and thesis texts or abstracts) that could be accessed in accordance with the specified criteria. All quantitative empirical studies were taken into consideration. The number of studies found in the searches is 83. A total of 42 studies were excluded because 37 of these studies were duplicate studies ($n=37$) and 5 studies used different scales ($n=5$). In addition, although an e-mail was sent to the authors of the 18 studies that did not provide Cronbach's alpha coefficient values and this value was requested, only the author(s) of one study responded positively. Therefore, the other 17 studies could not be included in this study. Since Cronbach's alpha value was used as the reliability coefficient in all of the studies included in the study, only these values were used in this study. The PRISMA flow diagram showing how the 24 studies included in this RG meta-analysis study for the reliability generalization of the self-efficacy scale for geometry were reached is given in Figure 1.

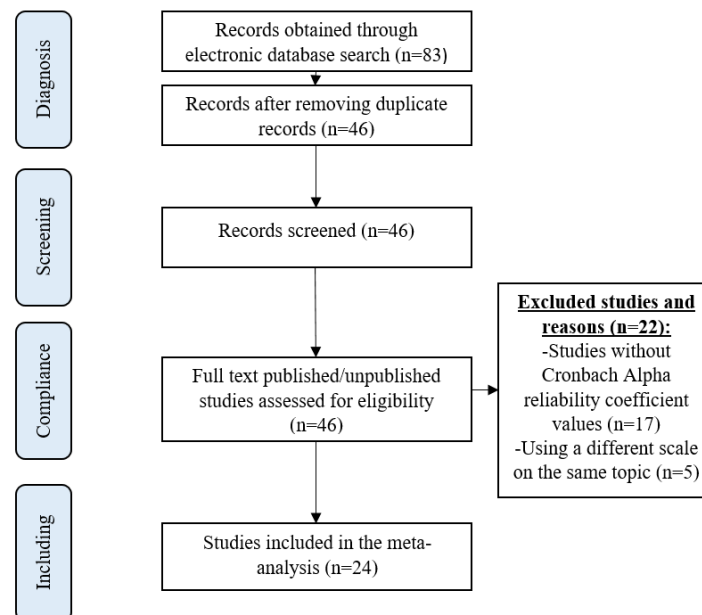


Figure 1. PRISMA flowchart of the screening process

As seen in Figure 1, 24 studies were included in the study and coding and analysis were carried out on the data obtained from these studies.

2.2. Coding of the Studies

In line with the purpose of the current study, some previous RG studies (Çelik, 2023; Eser & Doğan, 2023; Şen, 2022, Vacha-Haase & Thompson, 2011; Yörük & Şen, 2022) were examined in order to both code the studies reached through a comprehensive search and to identify possible moderators to be used in determining the sources of change in reliability values

in the studies. As a result of the examinations, the variables of publication year, sample size, publication status, level of education, research method used in the studies, region and male percentage were determined as moderator variables by the researchers because they were both used in previous RG studies and frequently reported in the studies in which the GTLSS was used. Then, these moderator variables and the variable titles of the studies such as author(s), Cronbach's alpha reliability coefficient and number of items were created in an Excel file. Then, the raw data obtained from the studies within the scope of the research were coded independently by the researchers on two separate forms. In cases where more than one Cronbach's alpha value was reported in the same study, coding was done by duplicating author information (e.g. Demir, 2019_1; Demir, 2019_2). The data of the recorded variables are presented in Table 1.

Table 1.

Coding Table

Variable	Type	Coding Method
Author(s)	Categorical	Author(s) surname and year of publication
Year of publication	Continuous	Year of publication reported
Publication status	Categorical	1: Published, 2: Unpublished
Sample Size	Continuous	Sample size reported in studies
Cronbach Alpha Value	Continuous	Reliability value reported in studies
Number of items	Continuous	Number of scale items reported in studies
Education level	Categorical	1: Middle School, 2: High School, 3: University
Research design	Categorical	1: Experimental, 2: Not experimental
Percentage of men	Continuous	Proportion of men in total sample size
Region	Categorical	Region where the study was conducted

In order to ensure coding reliability, these data were compared one by one for each study and the coding agreement between the two authors was examined. For this, Miles and Huberman's (1994) percentage of agreement method [$\text{Reliability} = (\text{Agreement} / (\text{Agreement} + \text{Disagreement})) \cdot 100$] was used. As a result of the calculations, it was seen that the percentage of agreement between the coders was approximately 91%. For the percentage of agreement, values of 70% and above are considered sufficient for reliability (Yıldırım & Şimşek, 2011). Therefore, it can be said that the coding is reliable. In the studies where there was a difference of opinion, the points where there were differences of opinion were discussed and resolved and the next step was taken.

2.3. Statistical Analysis

In line with the aims of the research, the average reliability estimate (i.e. effect size) of each study within the scope of the research was estimated and interpreted at 95% Confidence Interval (CI). In all analyses, the “meta” package (Balduzzi et al., 2019) in the R statistical software (R Core Team, 2021) was used. When reporting the average reliability value of a scale, it is recommended to calculate the weighted average value by choosing a meta-analysis model based on inverse-variance weighting that takes into account the sample size instead of taking the direct arithmetic mean due to the unequal sample size in all studies (Şen & Yıldırım, 2023). However, since the distributions of reported alpha, etc. reliability measurement values are skewed to the left and therefore the average value obtained from the raw data may be biased (Feldt & Charter, 2006; Sandoval-Lentisco et al., 2022; Sawilowsky, 2000), it is recommended to transform the reliability coefficients before performing the analyses in order to normalize the distributions and/or balance the variances while conducting reliability generalization studies (Sánchez-Meca et al., 2021; Şen, 2022). For this reason, the Cronbach alpha value of each study within the scope of the research was normalized using Bonett (2002) transformation formula $(\ln|1-\alpha|)$. The overall (average) reliability coefficients obtained by combining the values obtained as a result of Bonett transformations should be transformed back into Cronbach's alpha coefficients in order to facilitate the interpretation of the results (Badenes-Ribera et al., 2023; Şen & Yıldırım, 2023). Therefore, analyses were made using the values obtained after the transformation, and the obtained value was reconverted back to Cronbach's alpha coefficient to estimate (calculate) the overall alpha value and comments were made on this final value. Within the scope of the current research, the Random Effects Model (REM) was preferred for reasons such as being a more accurate approach for studies in the field of social sciences (Borenstein et al., 2009; Field & Gillett, 2010), providing more precise confidence intervals compared to other models (Şen, 2022), reflecting the real world view more accurately (Field, 2003), and the desire to generalize the results to the population (Sánchez-Meca et al., 2013; Schmid et al., 2021), and the overall effect size was calculated using this model. In addition, the Sidik-Jonkman method (Eser et al., 2020), which is claimed to have better properties than other estimators and produces more accurate results, was used to estimate the variance between studies under REM.

Publication bias poses a significant threat to meta-analysis studies and negatively affects the accurate estimation of overall effect size (Borenstein et al., 2009). Within the scope of the study, funnel plot, Egger regression (Egger et al., 1997), Kendall's Tau (Begg & Mazumdar, 1994) tests and the trim-and-fill method (Duval & Tweedie, 2000), which can be used both for the detection and correction of publication bias, were used to examine whether there is publication bias. In addition, publication bias was examined according to the formula $N/(5k+10)$ proposed by Mullen et al. (2001) with the safe N (Rosenthal, 1979) statistic, which provides information about the number of studies with an effect size value of zero to render the meta-analysis result meaningless. A value greater than 1 in this formula is interpreted as the meta-analysis study does not carry publication bias.

In the present study, Higgins' (2003) I^2 statistic was first used to assess heterogeneity. An I^2 value of $\geq 75\%$ means high heterogeneity, $\geq 50\%$ means moderate heterogeneity and $\geq 25\%$ means low heterogeneity (Higgins et al. 2003). Afterwards, Q statistic values were examined. Statistically significant Q statistics indicate heterogeneity between studies (Yörük & Şen, 2022). If there is a significant and high level of heterogeneity between the reliability coefficients obtained from the studies as a result of heterogeneity analysis, subgroup analysis (analog ANOVA) or meta-regression analysis can be performed by taking into account possible moderator variables that can explain this heterogeneity (Şen & Yıldırım, 2023). In the current study, moderator analyses (Analog ANOVA and meta-regression) were conducted to examine the source of heterogeneity between studies. In this study, moderator analyses for the continuous variables determined as sample size, publication year and male percentage were tested by meta-regression, and the categorical variables of teaching level, region, publication status and research type were tested by Analog ANOVA. In the present study, moderator variables were considered as independent variables and Cronbach's alpha coefficient values were considered as dependent variables (Reig-Aleixandre et al., 2023).

3. FINDINGS

3.1. Characteristic Features of Individual Studies

In the current RG meta-analysis study, 24 individual studies that met the criteria for the purpose of the study were included and the characteristics of these studies are presented in Table 2.

Table 2.

Characteristics of the Studies Included in the Study

Author(s)	Year	α	N	Men(%)	Publication Status	Stage	Research Type	Region
Özkeleş-Çağlayan (2010)	2010	.920	553	54.25	Unpublished	High School	Not Experimental	Marmara
Çontay (2012)	2012	.860	40	37.5	Unpublished	Middle School	Experimental	Aegean
Özdemir (2023)	2023	.914	46	50	Unpublished	Middle School	Experimental	Eastern Anatolia
Yenilmez & Korkmaz (2013)	2013	.700	110	41.82	Published	Middle School	Not Experimental	Marmara
Duatepe-Paksu (2013)	2013	.760	387	54.78	Published	University	Not Experimental	---
Erkek & Işıksal-Bostan (2015)	2015	.800	1043	49.19	Published	Middle School	Not Experimental	Central Anatolia
Kaba et al. (2016)	2016	.922	439	51.25	Published	Middle School	Not Experimental	Marmara
Kaba et al. (2017)	2017	.926	47	46.81	Published	Middle School	Experimental	Marmara
Anıkaydın (2017)	2017	.840	142	40.85	Unpublished	Middle School	Not Experimental	Aegean
Çontay & Duatepe-Paksu (2018)	2018	.860	40	37.5	Published	Middle School	Experimental	Aegean
Demir (2019)	2019	.870	60	---	Unpublished	Middle School	Experimental	Central Anatolia
Atasoy (2019)	2019	.850	85	34.12	Published	University	Not Experimental	Black Sea
Çadırılı (2017)	2017	.890	505	45.74	Unpublished	Middle School	Not Experimental	Mediterranean
Bostancı (2019)	2019	.782	346	45.66	Unpublished	Middle School	Not Experimental	Central Anatolia
Özdişi (2019)	2019	.905	420	45.24	Unpublished	Middle School	Not Experimental	Aegean
Geçici (2018)	2018	.900	151	47.02	Unpublished	Middle School	Not Experimental	Southeast Anatolia
Orhan (2013)	2013	.770	111	---	Unpublished	Middle School	Not Experimental	Central Anatolia
Dursun (2010)	2010	.930	1007	22.24	Unpublished	University	Not Experimental	Central Anatolia
Kandil (2016)	2016	.868	48	37.5	Unpublished	Middle School	Experimental	Central Anatolia
Şahin (2015)	2015	.886	294	---	Unpublished	Middle School	Experimental	Aegean
Kurt (2019)	2019	.830	69	55.07	Unpublished	Middle School	Experimental	Mediterranean
Yayla (2021)	2021	.900	28	53.57	Unpublished	Middle School	Experimental	Central Anatolia
Korkmaz-Serbest (2023)	2023	.920	771	47.34	Unpublished	Middle School	Not Experimental	Marmara
Demir (2019_2)	2019	.981	30	---	Unpublished	Middle School	Experimental	Central Anatolia
Demir (2019_3)	2019	.910	30	---	Unpublished	Middle School	Experimental	Central Anatolia
Taş & Yavuz (2023)	2023	.705	47	51.06	Published	Middle School	Experimental	Central Anatolia

α : Cronbach Alpha; N: Sample size. Note: Since it was reported that the scale was used as it existed in all the studies within the scope of the research, that is, no items were added or removed from the scale in the studies in which it was used, the column on the number of items in the scale in the coding form was not added to Table 2.

When Table 2 is examined, it is seen that the 24 studies included in the study were published between 2010 and 2023, the sample size varies between 30 and 1043, the study with the largest sample belongs to Erkek and Işıksal-Bostan (2015) and the study with the smallest sample belongs to Yayla (2021). Table 2 shows that Cronbach's alpha value was given as the reliability coefficient in all of the studies, and these values ranged between .700 and .981, and since more than one alpha value was reported in the study conducted by Demir (2019), a total of 26 Cronbach's alpha values were reached in this study. When the percentage of males is examined, it is noteworthy that these values vary between 22% and 55%, and in some studies (Demir, 2019; Orhan, 2013; Şahin, 2015), this value was not calculated due to missing data. According to the publication status, it is seen that most of the studies were not published ($n=18$), according to the level of education, this information was missing in one study, most of the remaining studies ($n=22$) were conducted at the middle school level and only one study (Özkeleş-Çağlayan, 2010) was conducted at the high school level. When the data under the last two headings are examined, it is observed that the number of experimental and non-experimental studies are very close to each other and most of the studies were conducted in Central Anatolia. In the study conducted by Duatepe-Paksu (2013), this value was left blank because the sample group consisted of more than one region.

3.2. Broadcast bias

Within the scope of the research, it was examined whether there was any publication bias. Funnel plot, Egger linear regression, Begg and Mazlumder rank correlations, Duval and Tweedie's trim-and-fill method and Safe N statistic were used to assess publication bias. First, the funnel plot for the transformed alpha coefficients was analyzed (Figure 2).

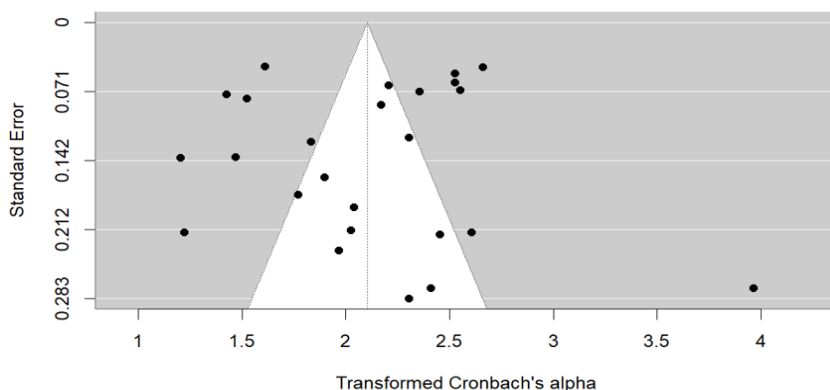


Figure 2. Funnel plot

Looking at the funnel plot given in Figure 2, it can be said that the transformed alpha coefficient values show a distribution close to symmetry, although not completely symmetrical. For a more objective interpretation, Egger's linear regression test and Begg and Mazlumder rank correlations (Kendall's tau) statistics were used. As a result of the analysis, Kendall's tau b statistic was found to be insignificant compared to Begg and Mazlumder's rank correlations (Tau b=-.031; p=.8254). Similarly, the result of Egger's linear regression test showed that the t-value was not statistically significant ($t(24)=-.293$, $p=.7721$). In addition, Duval and Tweedie's (2000) trim-and-fill method was applied. As a result of the application, it was seen that no study was missing for the right and left sides, and it was determined that there was no difference between the observed value of the reliability coefficients and the actual effect size values. Finally, Rosenthal's safe N method, which shows the number of studies required to obtain a statistically insignificant result, was applied. According to this method, the number of studies required at .05 confidence level was found to be 2046. This value shows that 2046 additional studies are needed to invalidate the RG meta-analysis result. The 24 studies included in the study are the studies included in the literature as a result of the purposeful search in different databases. It is considered as a very weak possibility to reach 2046 more studies other than these. In addition, the publication bias of the study was analyzed according to Mullen et al. (2001)'s $N/(5k+10)$ formula. As a result of the relevant calculations, a value greater than 1 is reached as $[2046/(5*24+10)=15.74]$. All these results obtained from the funnel plot and statistical analyses provide important evidence that there is no publication bias in this RG meta-analysis study and that the study is free from the risk of publication bias.

3.3. Reliability Generalization and Heterogeneity

The average of the 26 raw Cronbach's alpha reliability coefficient values reported in 24 studies was calculated as .868. The root and leaf graph of the distribution of these values is given in Figure 3.

.70	05
.76	00
.78	2
.80	0
.82	0
.84	00
.86	0080
.88	60
.90	00504
.92	00260
.98	1

Figure 3. Root-leaf plot of the distribution of raw Cronbach's alpha values

As seen in Figure 3, the raw reliability coefficient values reported in the studies vary between .700 and .981. According to these values, it can be said that the reliability coefficients are at an adequate level. As stated in the methodology section, it is known that these values cannot be used directly in reliability generalization studies due to the skewed distribution of reliability coefficients; instead, Bonett transformation should be used to normalize the distribution and balance the variance. Therefore, the raw reliability coefficient values obtained from 24 studies were transformed using Bonett (2002) transformation method and then analyzed with REM (random effects model). As a result of the analysis, the transformed reliability coefficient value was calculated as .878 (95% CI [.85 - .90]) and was found to be statistically significant ($p<.001$). This average reliability coefficient value is quite close to the published reliability coefficient value (.90) of the GSES.

The result of the Q test ($Q_{(25)} = 723.387$; $p < .0001$), which was conducted to determine heterogeneity in the current study, shows that there is a statistically significant difference between the alpha coefficients. In addition, the I^2 value of 97.05% indicates a high degree of heterogeneity among the studies in terms of alpha coefficient in reliability estimates. Since the variability in reliability coefficients can be observed in the forest plot, the forest plot of Cronbach's alpha reliability coefficients reported in the studies is given in Figure 4.

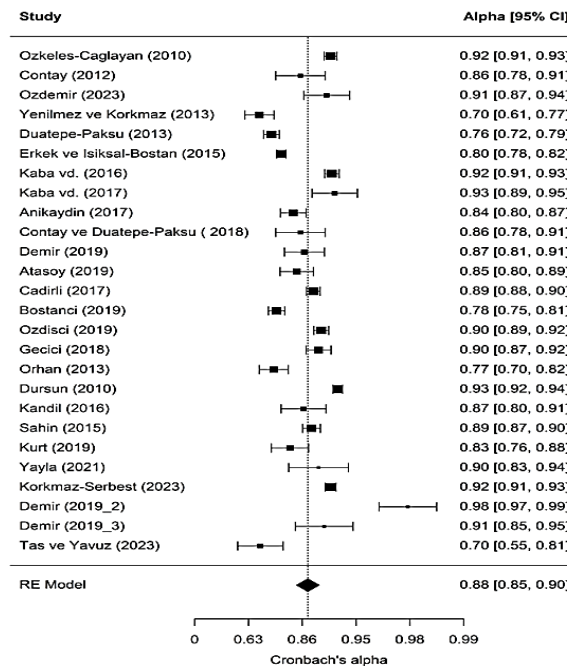


Figure 4. Forest plot

When the forest plot given in Figure 4 is examined, it is seen that the reliability coefficient value of the GSES reported in any study within the scope of the research is not below the acceptable level ($>.70$) and these values exhibit an irregular distribution between 0.7 (Taş & Yavuz, 2023; Yenilmez & Korkmaz, 2013) and 0.981 (Demir, 2019). This supports the finding that there is heterogeneity among studies. The forest plot also presents the study weights and the size of the square representing each study indicates the weight of the study. When the study weights within the scope of the research are analyzed in Figure 4, it can be said that the study conducted by Erkek and Işıksal-Bostan (2015) has the highest weight.

3.4. Moderator Analyses

After the average reliability value of the study was found, moderator analyses were conducted to explain the possible source or sources of heterogeneity. For this purpose, first Analog ANOVA for categorical variables and then meta-regression, i.e. subgroup analyses, were conducted for continuous variables. The results of the Analog ANOVA analysis are presented in Table 3 and the results of the meta-regression analysis are presented in Table 4.

Table 3.

Analog ANOVA Results

Variable	Category	k	α	%95 RG	Q_B	df	p
Stage	Middle School	22	.877	[.844; .904]	.0828	1	.7735
	University	3	.864	[.743; .929]			
Publication Status	Unpublished	18	.893	[.863; .917]	3.5514	1	.0595
	Published	8	.836	[.762; .887]			
Region	Mediterranean	2	.864	[.681; .942]	.4888	3	.9213
	Aegean	5	.873	[.781; .927]			
	Central Anatolia	10	.877	[.818; .917]			
	Marmara	5	.898	[.825; .941]			
Research Type	Experimental	12	.892	[.850; .922]	.9195	1	.3376
	Not Experimental	14	.866	[.822; .900]			

k=number of Alpha coefficients; α =mean alpha coefficient; CI=Confidence Interval; df=degrees of freedom.

Note: If there were less than two studies in the groups, the relevant studies were excluded from the analysis.

The findings in Table 3 show that categorical variables do not have a statistically significant effect on the estimation of the reliability of the GSES ($p > .001$). Therefore, it can be said that there is no heterogeneity in reliability estimates between subgroups of categorical variables.

Table 4.

Meta-Regression Results

Variable	<i>k</i>	<i>b_j</i>	<i>SE</i>	<i>z</i>	<i>p</i>	<i>R</i> ²	<i>Q_E</i>
Publication Year	26	.0156	.0311	.5029	.6150	0	720.395
Sample Size	26	.0002	.0004	.4188	.6753	0	705.513
Men (%)	21	-0.0077	.0128	-0.579	.5503	0	541.289

b_j=regression coefficient of each predictor; *Q_E*=heterogeneity statistic; *R*²=variance explained by the predictor.

When Table 4 is examined, none of the continuous variables (year of publication, sample size, and percentage of males) are statistically significant predictors of the mean reliability coefficient of the GSES according to the random effects model ($p > .05$). It is also seen in Table 4 that they do not contribute to the explained variance ($R^2_{year}=R^2_{sample_size}=R^2_{percentage_of_males}=0$).

4. RESULTS, DISCUSSION AND RECOMMENDATIONS

4.1. Results and Discussion

The purpose of this RG meta-analysis study was to estimate the average reliability coefficient of the self-efficacy scale for geometry (GSES) developed by Cantürk-Günhan and Başer (2007) based on the reliability findings in different studies and to determine the sources of variation of the reliability coefficients reported in the studies, in other words, the moderator variables that may cause variability between studies. For this purpose, 24 individual studies in which the GSES was used were included in the study and Bonett's (2002) transformation was applied to the 26 Cronbach's alpha coefficients reported in these studies and analyses were performed according to the random effects model over the values obtained. Since Cronbach's alpha coefficient was reported as the reliability value in all of the studies, the analyses were conducted on these coefficient values. First, statistical and graphical findings regarding publication bias were analyzed and it was observed that there was no evidence of publication bias. As a result of the analysis, it was seen that the average reliability coefficient was .878 (95% CI [.85 - .90]) and this result was very close to the Cronbach's alpha coefficient value (.90) at GSES reported by Cantürk-Günhan and Başer (2007). In the light of this result, it is possible to say that the reliability of the scale has been proven when the use and development processes are taken into consideration. In other words, the reliability obtained during the development process was confirmed when used in subsequent studies. Based on this result, it can be said that the general estimated value of Cronbach's alpha is within the desired values ($>.70$) (Nunnally & Bernstein, 1994). Similarly, Cicchetti (1994) states that a Cronbach's alpha coefficient value between .80-.90 is a good indicator of reliability. Therefore, researchers and practitioners can use this scale to assess students' geometry self-efficacy.

Based on the findings of the heterogeneity analysis conducted within the scope of the current research, it is concluded that the heterogeneity between the studies is statistically significant and at a high level. This situation can be said that the reliability of the GSES developed for middle school students varies according to different samples and contexts, so it would not be appropriate to generalize the GSES to different populations (Aslan et al., 2022; Çelik, 2023; Eser & Doğan, 2023; Şen, 2022). Afterwards, possible moderator variables that may cause heterogeneity, that is, explain the variability in reliability coefficients, were analyzed. In these moderator analyses conducted through four categorical variables (teaching level, publication status, region, research design) and three continuous variables (year of publication, sample size and male percentage), it was concluded that none of the variables explained the heterogeneity in the reliability coefficient. Botella et al. (2010) state that in cases where moderator variables do not significantly affect the reliability coefficient of the measurement tool, the reliability of the scores obtained from the scale against the possible effects of these variables is robust to different applications. Therefore, these results can be accepted and evaluated as an indication of the consistency of the values obtained from the GSES. Therefore, these results can be accepted and evaluated as an indicator of the consistency of the values obtained from the GSES. Similar results have also been obtained in some RG studies in the literature. For example, Şen (2022) concluded that there was a high level of heterogeneity among the reliability coefficients in his study and that year, sample size and male percentage were not predictors of heterogeneity as a result of the moderator analysis. On the other hand, although there is a statistically significant heterogeneity in the reliability coefficients in the literature, it is not seen as a desirable situation that all moderator variables considered within the scope of the research do not explain this situation (Yörük & Şen, 2022). One of the possible reasons for the emergence of this situation is thought to be the studies that were not included in this study due to missing data. As mentioned in the introduction, researchers often refer to the reliability obtained in the original test validation study instead of reporting reliability estimates based on participants' scores in their own studies, as they erroneously think that their own data will provide the same reliability as the original scale (Sandoval-Lentisco et al., 2023). Researchers lack an understanding of the importance of reporting the reliability coefficients of the sample group of the measurement tool they use in their studies, and the misconception that reliability is a property of the scale, not the scores on the scale, continues to spread through incomplete reporting (Şen, 2022). As in this study, the situation of not being included in the study due to missing data is also found in many studies in the literature on RG (e.g. Çelik, 2023; Çelik, 2023; Lee et al., 2023; Sánchez-Meca et al., 2021; Yörük & Şen, 2022). Another possible reason is that it may be due to other possible moderator variables such as average age, average score values

obtained from the scales and standard deviation, which are not reported in most of the studies within the scope of the research. Explaining the reliability values for the research sample in which a scale is used is considered important in terms of increasing the validity, generalizability and quality of research findings (Onwuegbuzie & Daniel, 2002). Accepting reliability as an invariant feature of the scale is called "reliability induction" (Vacha-Haase et al., 2000). Therefore, researchers are generally advised not to use reliability induction in their studies except in special cases (Şen, 2002).

4.2. Limitations and Recommendations

It is thought that the possible reasons for heterogeneity in the research are the studies that were not included in the research due to incomplete reporting and other moderator variables such as mean age and standard deviation. These possible reasons can also be considered as the limitations of the study. Because, as a result of the literature review, it is seen that some researchers do not report the reliability coefficients of the GSES in their studies, instead they define and report the Cronbach's alpha value provided by the authors of the scale. This situation was considered as a limitation in the current study and these studies were not included in the study. In this regard, it is recommended that researchers calculate and present the reliability coefficient values of the scales/tests that they will use as data collection tools in their studies. In addition, helping the researchers to share data about the scale/test with each other will contribute to the validity and reliability of the results to be obtained in the RG research. It should be noted that the purpose of reliability generalization is not to question the reliability or validity of the findings of a previous study, but rather to examine whether the average reliability coefficient estimate of the scale is compatible with the original, that is, the first calculated value, whether it can be used at different levels, and how it will affect samples of different sizes. Another limitation of this study is that the generalization of reliability is based only on Cronbach's alpha coefficient. The reason for this is that, as mentioned before, the reliability values in all of the studies included in the study were reported in the form of Cronbach's alpha. It should be noted that Cronbach's alpha consistency reliability is the most widely used measurement statistic, but it is not the only reliability coefficient (Lee et al., 2023). On the other hand, although there are alternatives to Cronbach's alpha in many studies, only Cronbach's alpha value is reported without explaining the reason for selection (Sijtsma, 2009). Therefore, researchers are recommended to report different internal consistency reliability values such as Omega, maximum reliability, combined reliability, maximum lower bound, KR-20, KR-21 and H-coefficient instead of Cronbach's alpha or together with Cronbach's alpha in order to obtain better results in future studies (Sandoval-Lentisco et al., 2023; Şen & Yıldırım, 2023). Another limitation of the study is that other possible moderators such as the average age of the sample group, mean scores and standard deviation of the scale could not be analyzed due to missing data. Therefore, it is important for researchers to report these values in future studies. Another limitation, which is considered to be important, is the fact that this RG meta-analysis study examined the Cronbach's alpha coefficients of the GSES among different samples, but did not analyze its construct validity. Therefore, the current study does not provide complete information about whether the included studies measure students' self-efficacy towards geometry across different populations. For this reason, it is recommended that researchers who want to reach more comprehensive results about the same test/scale used in different studies as a data collection tool should conduct a meta-analytic structural equation model (Metasem) study that allows them to examine their structural validity as well as reliability generalization. Despite all these limitations, it is thought that the results of the current RG meta-analysis research can help researchers to decide whether to use this scale to measure students' self-efficacy perceptions towards geometry, as the GSES has good reliability values on average.

Research and Publication Ethics Statement

Since the study did not involve human practices, there was no need to obtain an ethics committee.

Contribution Rates of Authors to the Article

All authors contributed equally to the study.

Statement of Interest

There was no conflict of interest in the study.

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Investigation of Science Teachers' Understanding of Flexible Inquiry*

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Article Information	ABSTRACT
Received: 01.06.2025	Effective implementation of inquiry-based curriculums requires identifying and developing science teachers' understanding of flexible inquiry. The current study aims to investigate science teachers' understanding of flexible inquiry. To this end, the study employed the case study design, one of the qualitative research methods. The study group consists of eight science teachers conducting activities to foster flexible inquiry-based teaching. The data were collected from the teachers by using the explication interview method. The collected data were analyzed by using the descriptive analysis technique. According to the analysis results, teachers' understandings of flexible inquiry were classified into three categories: those who possess a flexible inquiry understanding, those who are close to this understanding, and those who are distant from it. By presenting these understandings on a spectrum, the categorization aims to promote a more flexible and comprehensive perspective on the concept. The factors considered in forming these categories were evaluated, by the end of the study, as the key criteria of flexible inquiry understanding. As a result of the study, a descriptive definition of flexible inquiry understanding in the context of science education was developed. Furthermore, the study emphasizes that the effective implementation of inquiry based teaching programs requires identifying and supporting teachers' understandings of flexible inquiry. Keywords: Science teachers, inquiry based learning, flexible inquiry based science teaching, flexible inquiry understanding
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1. INTRODUCTION

The rapid scientific, technological, and social transformations experienced today increasingly emphasize the importance of equipping individuals with 21st-century skills; individuals who can think critically, make decisions based on scientific evidence, access, evaluate, and produce information, and adopt lifelong learning as a principle. In this context, it has become a fundamental goal to educate students—under the guidance of teachers—as individuals who inquire, question, and are able to effectively use ways to access reliable information. In this regard, the science education curricula have been structured by taking these fundamental goals into consideration.

The 2013 and 2018 Ministry of National Education Science Curriculums explicitly state that an inquiry-based learning approach, using a clear interdisciplinary perspective, is adopted (Ministry of National Education; 2013, 2018). In the curriculums, within the framework of this student-centred approach, the teacher's role is defined as encouraging, guiding and mentoring the student. In the curriculum (MONE, 2018), students are expected to become individuals who can research the sources of information, question them, explain and discuss the data they obtain, and produce outcomes as a result. Teachers should also be equipped with the "flexible inquiry understanding" in line with the 2018 Science Curriculum. This is because an informed understanding of inquiry contributes to science teachers' ability to implement the inquiry based approach effectively. In addition to the previous curricula, the 2024 Science Curriculum aims to equip students with the skills required by the age; to this end, it emphasizes the development of competencies such as active participation in learning processes, self-regulation, research, inquiry and critical thinking (MONE, 2024). While aiming to cultivate students as individuals who exhibit scientific attitudes and behaviours and are environmentally conscious, the curriculum also emphasizes the importance of

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understanding the nature of science, accessing scientific information and questioning the reliability of this information. This curriculum, based on a holistic approach, is structured to foster active student participation in scientific reasoning and decision-making processes.

Teachers should create a democratic classroom environment where students can express their own thoughts and discuss their ideas. Moreover, it should be aimed to train individuals having 21st century skills such as scientific process skills, life skills, engineering and design skills, and to ensure that these individuals possess a scientific culture. One of the most effective ways to achieve this is through the adoption of the inquiry-based learning approach, which is a fundamental component of the 2018 Ministry of National Education Science Curriculum, by our teachers (MONE, 2018, p.10). Various models have been proposed in the field to deliver this approach to students, such as Dewey's Inquiry-Based Learning Model (Çepni, 2005), the 3E Model, and the 5E Model (Bybee, 2014; Eisenkraft, 2003). One of these models is the Flexible Inquiry-Based Teaching (FIBT) model proposed by Bayram (2020).

1.1. Statement of the Problem

When the inquiry based learning (IBL) approach in general, and the flexible inquiry based science teaching (FIBST) in particular, are examined, the concept of scientific inquiry gains significant importance alongside the inquiry-based approach. The inquiry based approach encompasses "scientific inquiry" within it. Inquiry based learning is a process in which students engage in their own learning, formulate questions, conduct research across a wide range of topics and then create new understandings, meanings and knowledge. This knowledge is new for students and can be used to answer a question, develop a solution, or support a position or perspective. Information is often made available to others and may result in some form of action (Alberta Learning, 2004). The inquiry-based approach is an approach in which questions are asked to students in the science teaching process, research is done and information is analyzed and converted into useful knowledge (Sarı & Güven, 2013). With this approach, students generate questions and make observations and research to find answers to these questions (Karamustafaoğlu & Havuz, 2016). It is a need for students to be able to think critically and reflectively, to conduct investigations and to work collaboratively. This need can be met through inquiry-based learning (Gholam, 2019). The Next Generation Science Education Standards (NGSS, 2013) also emphasize that students should have an understanding of scientific inquiry. "Scientific inquiry" is the process of gathering information about a problem, studying and understanding the relevant topic through the application of scientific methods used by scientists to solve the problem (Bayram, 2020). Another definition of scientific inquiry is that it is the process of examining the natural world by asking questions based on evidence and data, and providing explanations for those questions. Inquiry contributes to the development of scientific knowledge and understanding in students about research and scientific processes (DiBiase & McDonald, 2015).

The nature of scientific knowledge is a fundamental term used to describe the characteristics of scientific knowledge, which is necessarily generated through the process of scientific inquiry (Lederman, 2019). It has been suggested that the most effective approach, in this context, is to emphasize the nature of science and the significance of scientific inquiry by initiating a problem-based learning process, while ensuring that students acquire fundamental science concepts (N. G. Lederman, J. S. Lederman & Antink, 2013). However, although the concepts of scientific inquiry and the nature of science are often associated, there are distinct conceptual differences between these terms. The nature of science is a broad concept that encompasses the processes and methodologies involved in scientific inquiry, its evolutionary development, and its distinctive characteristics when compared to other disciplines. Scientific investigation is a process. It includes how scientists work and how they produce and accept scientific knowledge (Lederman et al., 2014). Lederman et al. (2014) stated that scientific inquiry has eight characteristics. These are: (i) All scientific investigations begin with a question and do not always test a hypothesis, (ii) There is no single scientific method followed in all research, (iii) The question asked guides the inquiry process, (iv) Scientists conducting the same procedure may not reach the same conclusions, (v) The inquiry process affects the results, (vi) Research findings must be consistent with the data collected, (vii) Scientific data and scientific evidence are not the same, (viii) Inferences are made based on the data collected and prior knowledge. The nature of science typically refers to how knowledge is developed, that is, the characteristics of scientific knowledge obtained through scientific inquiry. It has been stated that much more research is needed comparing individuals' views on the nature of science and scientific inquiry (Lederman, 2006). In light of all this information, it has become important to understand how the understanding of flexible inquiry has been shaped in the context of science teachers.

1.2. Purpose of the Study

Flexible inquiry based teaching (FIBT) is defined as an instructional approach in which knowledge, skills, attitudes, values and scientific reasoning are used and applied within the flexible inquiry process through an interdisciplinary perspective. There are some key concepts that form the foundation of the flexible inquiry-based teaching model. These concepts include: the purpose of flexible inquiry, expression level (verbal/written and behavioural expressions), concept network, tasks and task sequence, and flexible inquiry stages (FISs): The FIBT sequence includes the transfer of responsibility and taking responsibility, task-responsibility alternatives and possible answers. The flexible inquiry stages (FISs) consist of six stages. These stages are: FIS1: Research question or instruction, FIS2: Prediction, forecast, or hypothesis, FIS3: Suggestions for verifying the prediction or hypothesis, FIS4: Execution of the method, FIS5: Data collection, FIS6: Drawing conclusions. In order for students to acquire inquiry skills, including scientific process skills and critical thinking skills, they need to be guided

by the teacher through the FIBT sequence. By completing the FIBT sequence during the lesson, students go through the same processes that scientists have undergone (Bayram, 2020).

In the curriculum (MONE, 2018), students are expected to become individuals who can research the sources of information, question them, explain and discuss the data they obtain, and produce outcomes as a result. Teachers should also be equipped with the “flexible inquiry understanding” in line with the 2018 Science Curriculum. This is because science teachers need to have an understanding of inquiry in order to effectively use the inquiry based approach in their lessons. Therefore, the purpose of this study is to determine science teachers' understanding of flexible inquiry.

1.3. Problem of the Study

When national and international literature is reviewed, it is seen that some scales are used to measure the understanding of inquiry: These scales include the Views on Scientific Inquiry Scale (VASI) developed by Lederman et al. (2014), the Guided Inquiry Scale (GIS) developed by Cheung (2011) (Şen & Yılmaz, 2017), the Science-Oriented Inquiry-Based Learning Skills Perception Scale (SOIBLSPS) developed by Balım and Taşköyan (2007), the Competence in Science Inquiry Scale (CSIS) including the scientific inquiry sub-dimension and developed Chang et al. (2011) and adapted to Turkish by Şenler (2014), the Beliefs About Inquiry-Based Science Teaching Scale developed by Dockers (2010) and adapted to Turkish by Kocagül Sağlam and Şahin (2016), the eight-item Beliefs About Science and School Science Questionnaire developed by Aldridge, Taylor and Chen (1997) to measure beliefs about scientific inquiry, the Inquiry Skills Scale developed by Aldan Karademir and Saracaloğlu (2013) and the Scale of Attitudes towards Inquiry for Middle School Students developed by Ebrin Ozan, Korkmaz and Karamustafaoğlu (2016).

The Views on Scientific Inquiry Questionnaire (VASI), developed by Lederman et al. (2014) and adapted into Turkish by Karışan, Bilican and Şenler (2017), is grounded on the eight characteristics of scientific inquiry. Students' views on scientific inquiry are categorized as “naive” for inadequate understanding, “informed” for knowledgeable understanding, “mixed” to refer to views that include both inadequate and knowledgeable views and “uncertain” for those showing no association with a specific dimension. It has been observed that these scales, which have been examined in the field, do not fully capture the flexible inquiry understanding of science teachers and are not solely designed for teachers. While the Views on Scientific Inquiry Questionnaire (VASI) focuses on students' and teachers' views about the nature of scientific inquiry and scientific knowledge, the current study aims to specifically assess science teachers' understanding of flexible inquiry. Lederman et al. (2019) used the Views on Scientific Inquiry Questionnaire (VASI) to assess the understandings of scientific inquiry among 2,634 seventh-grade students from 18 countries, including Turkey. Results indicated that most Turkish students held naive views about various aspects of scientific inquiry. Mesci and Erdaş-Kartal (2021) also suggested that teachers' views about the nature of scientific inquiry can influence their implementation of scientific research. They also emphasized that for the scientific inquiry approach, expected to be adopted in science teaching programs, to be effectively implemented, it is essential to assess science teachers' understanding of the nature of scientific inquiry. For these reasons, there is a need to define the flexible inquiry understanding that science teachers have. Therefore, within the context of the current study, the research question focused on is: “How is the science teachers' understanding of the “flexible inquiry approach” within the context of Flexible Inquiry-Based Teaching (FIBT)?”

2. METHODOLOGY

The aim of this study is to identify science teachers' understandings of the flexible inquiry approach. In line with this aim, a case study design, one of the qualitative research methods was adopted to examine teachers' understandings in depth. In this way, it is intended to obtain a comprehensive and detailed understanding of teachers' perspectives on flexible inquiry.

2.1. Participants

The study group consists of eight science teachers working in schools affiliated to the Ministry of National Education in the 2022-2023 school year. In the selection of the participants, purposive sampling was used. The reason for using purposive sampling was to select science teachers who were involved in flexible inquiry-based teaching activities. The participants have diverse academic backgrounds: five graduate from science education, one from biology education, one from chemistry education, and one from physics education programs. Their professional experience ranges from 10 to 25 years. Among them, three are pursuing doctoral degrees and one holds a master's degree. Six participants have received training related to Inquiry Based Learning (IBL). Although this sampling method includes the possibility that participants may have been previously acquainted with the researchers, such familiarity has not compromised the objectivity of the study. The names of the participating science teachers were changed to protect their identities and were listed in alphabetical order. Accordingly, the names of the teachers were changed into the following: Ayhan (A), Beyhan (B), Cihan (C), Deniz (D), Erol (E), Ferhan (F), Güner (G) and Hazar (H).

2.2. Data Collection Tools

In the data collection process, the aim was to elicit the science teachers' understanding of flexible inquiry. Explication interviews were conducted to elicit the teachers' understanding of flexible inquiry. An explication interview is a listening technique that involves asking an individual a series of questions about their various experiences, with the aim of obtaining a detailed description of the completion process of actions within those experiences as perceived by the individual (Vermersch, 1994). The uniqueness of the explication interview lies in its ability to allow individuals to directly express, verbally, the concrete actions they themselves have performed and the specific activities they have engaged in. In addition, this interview technique allows individuals to express actions in detail and in sequence. The purpose of employing this method is to identify teachers' understandings of flexible inquiry through the activities and processes they implement in their own classrooms. Through this technique, teachers were asked whether they implemented inquiry-based practices; if so, how they carried them out, and if not, why they chose not to incorporate such practices.

2.3. Data Analysis

In the current study, the qualitative data collected through explication interviews were analyzed by using a descriptive analysis. In a descriptive analysis, the findings obtained in the interview are summarized and interpreted with the subjective knowledge of the researcher. The opinions of the individuals interviewed are frequently stated in the descriptive analysis. The aim here is to systematically organize the data and provide meaningful interpretations of them. The findings obtained in the interview are summarized and interpreted with the subjective knowledge of the researcher (Baltacı, 2019).

3. FINDINGS

Interviews were conducted to identify science teachers' understanding of flexible inquiry. The interviewees were first asked warm-up and background questions. The warm-up and background questions were given to the teachers to look at before the interview. Then, the interview was initiated. During the interview, the science teachers were asked questions about the inquiry approach after the warm-up questions, and they were encouraged to answer these questions based on their own concrete experiences. When the data obtained from the interview with Ayhan (A), a teacher with an understanding of flexible inquiry, were examined, it was found that he emphasized the importance of collaborative learning in inquiry-based instruction and that students worked in groups, and these groups, as well as the distribution of tasks within them, were determined by the students themselves. In addition, he stated that he paid attention to the heterogeneity of the groups formed by the students.

A.2: Inquiry-based teaching is a model that enables and prioritizes collaborative learning, placing importance on it. Therefore, we conduct and conducted it in the form of group work. I didn't form the groups myself. Instead, I let them choose friends they thought they could work with, and for a few students, I suggested, "You can join this group, you can join that group". In the formation of the groups, I paid attention to certain things. I tried to create heterogeneous groups, and then I told group members to assign roles such as group recorder, group leader, group spokesperson, and materials manager. They determined who would take which role themselves.

Teacher Ayhan said that after the student groups were formed and the roles of the students were distributed within the groups, he directed a research question to the class. He stated that he asked the student groups for their predictions regarding the research question as a result of the intra-group discussions and then the predictions were shared between the groups. Teacher Ayhan also said that students' interactions between groups were very good and that they asked questions about each other's ideas.

A.5: Then, after the groups were determined, I posed a research question. And then I asked the students for their predictions regarding the question. First they worked in groups and then after working in groups they discussed between groups. The group spokespeople came to the board. And there was such a great interaction, it was really amazing... For example, one of the group spokespersons says, "I think it should be like this" and they express their opinions. Then, someone from another group responds, saying, "Actually, I hadn't thought of it that way, but could it be like this, based on what you said?" It was really great to see how they passed ideas between groups, and new questions came up in their minds. They discovered points they hadn't considered before.

Teacher Ayhan mentioned that after the student groups presented various suggestions for validation, when he allowed the students to support their suggestions, the students began conducting research. As a result of their research, the students gathered data. Afterward, Teacher Ayhan asked his students to present the data they had collected. He also mentioned that the student groups chose different ways to present their findings.

A.8: I said, "Now let's move into the research process using the methods you mentioned, to find an answer to our research question." We moved into the research process. By using that method, and as a result, I can even share those with you. Great things came out of it. And then, some wrote down the data they had collected. Then I said, "Now, I want you to present the data you have collected." I told them, "You can present it by preparing a magazine,

or as a newspaper article, or you can prepare a PowerPoint presentation and show it on the smartboard.” They were able to use many different methods. And each group determined their own method of presentation; we had five groups in total. Each group did different things. It was really great!

Teacher Ayhan was asked whether he believes that scientific process skills can be taught to students through the inquiry-based teaching approach. The teacher stated that students acquire scientific process skills with this approach.

A.14: Yes, I think so because this allows the student to, if not in every activity, at least in most cases, observe, measure, classify his/her knowledge, and subsequently develop his/her experiment skills. I definitely believe it has a positive contribution.

Teacher Ayhan was asked about his definition of the inquiry-based teaching approach in his mind. He defined this process as the teaching of how to find the correct answers to a set of questions present in students’ minds. In addition, he emphasized that with this model and approach, students feel like scientists, and the approach helps students maintain their sense of curiosity.

A.20: Right now, our students have questions in their heads. In fact, they are truly like scientists.

A.22: The point where children struggle is that they don’t know the process. In other words, they don’t know what they can do or how they can follow a process to find answers to the questions in their minds. They don’t know the process. I think that with this model, students can easily grasp how to find answers to the questions in their minds; they are learning and will continue to learn. This is very important. We will not stifle our children who are born as natural scientists. As I mentioned at the beginning, they come with such beautiful minds, full of curiosity, asking questions with great interest. Towards the eighth grade, this seems to decrease. We don’t want it to decrease. I believe this model will prevent that from happening.

The reason why Teacher Beyhan (B), who is close to a flexible inquiry-based approach, comes after Teacher Ayhan (A) in terms of adopting a flexible inquiry-based approach is that during the interview, when asked whether students work individually or in groups while carrying out inquiry-based activities, Beyhan Teacher said that they work individually. She explained the reason for this by saying that when students work in groups, there is a lot of noise in the classroom, and the need to manage such a classroom causes time loss.

B.24: They work individually because I have them work individually. I mean, when they come together in groups, it becomes very noisy. Students say things like “I will work with him/her” or “I will not work with him/her”, so the first activity I did this year was individual, I usually prefer individual activities. When I give more group work, they try to combine the classroom desks. There’s a lot of effort and confusion, and we lose time rearranging the seating, with arguments like “No, you sit here, I’ll sit there.” Sometimes we also do group work. The end of the term is approaching now, especially regarding electricity and circuits. We do more group work in the subject of electricity, though. I have them work in groups there. It depends on the topic.

The reason why Teacher Deniz (D) is considered more distant from a flexible inquiry approach compared to Teachers Beyhan (B) and Cihan (C) is that, during the interview, she mentioned that she was able to implement flexible inquiry activities with seventh-grade students, but she expressed that she couldn’t apply these activities as much with eighth-grade students. She explained why she can’t apply the activities at the eighth-grade level by saying that her eighth-grade students will be taking the high school entrance exam, and as a result, she experiences anxiety about time management as a teacher. Moreover, she mentioned that during flexible inquiry activities with eighth-grade students, even solving just one question is considered a waste of time. Even if this isn’t the case, the fact that these students are in the exam process can prevent the implementation of flexible inquiry activities.

D.46: There, the thinking process is always centred around questions, so we are constantly solving questions. The questions that students typically work on already involve experimental setups and similar elements. When they encounter a question, what do they know? How can they reflect what they know onto the question? Can they reflect it, or can they not? I can observe all together. But, you know, the rush of time can be a bit intimidating. Maybe one class hour could be spent on a single question. But solving just one question in a whole lesson seems like a big loss. But actually, it’s not a loss. However, if the exam system were different, we could apply the inquiry-based approach in a more flexible way. I think we would be able to apply it more comfortably. Then, analyzing a question and providing the necessary guidance to the student based on that question might be easier and more comfortable, I think.

Teacher Erol’s flexible inquiry approach is considered more distant compared to those of Teachers Deniz (D), Beyhan (B) and Cihan (C) because, during the interviews, Teacher Erol mentioned that he could apply inquiry-based learning in certain topics in science lessons, and that he was able to implement it better in lessons with verbal topics in the field of biology. In addition to this, he mentioned that he received more positive feedback from students during the Inquiry-Based Teaching activities they

conducted on these topics. In addition to this, Teacher Erol's not consistently applying inquiry-based activities, and his explanation that he sometimes applies them based on the topics and due to time constraints, is the reason why, as shown in Table 1, his approach to flexible inquiry is considered more distant compared to the teachers before him.

E.3: It's not in every topic, but depending on the nature of the lesson, I do apply it occasionally in some topics, where there are no time constraints or in topics where I can explain more comfortably and where students can do research.

E.4: It's easier to do this in more verbal-oriented topics because it's much easier for students to research and reach information, or to obtain it and communicate it to us.

E.6: But in subjects like biology, or topics such as climate and weather events, where there are physical and chemical changes in different areas, I can apply it more easily, especially in topics that are more relevant to daily life and current issues because, in those cases, the information the student finds through research already supports their hypothesis. First, they make a guess, and then they form a hypothesis based on that guess. When the information from the research aligns with the hypothesis, the student receives even more positive feedback, which is very rewarding.

The reason why Teacher Ferhan's approach to flexible inquiry is considered more distant compared to Teachers Erol (E), Deniz (D), Beyhan (B), Cihan (C) and Ayhan (A) is that when asked whether she uses the inquiry-based learning approach in her lessons, she said that some of the topics in the textbooks are prepared in alignment with this approach and therefore she proceeds with these topics using inquiry-based methods, but in some cases, she finds it difficult to apply the model underlying this approach and thus resorts to a more traditional, presentation-based method.

F.4: Some topics in textbooks are already prepared with this inquiry approach in mind. As I cover those topics, I try to apply it. But in some topics, I struggle with applicability. In those cases, I tend to use more of a presentation-based approach, using my own methods, and I rely more on the question-and-answer and explanation method. It changes from topic to topic.

Teacher Ferhan's flexible inquiry approach is expressed as closer compared to Teachers Güner (G) and Hazar (H) due to her ability to explain the entire Inquiry-Based Teaching process during the interview. However, another reason why her approach is considered more distant compared to the teachers before her is that she mentioned she doesn't always prefer to use FIBT and instead conducts lessons using her own methods. In her methods, she stated that she uses slides, first directs questions to the students, takes their answers, then has their peers question the accuracy of those answers, and finally explains the topic herself.

F.76: No, aside from the implementation, I've only taught two or three lessons using FIBT so far. Right now, I'm not using FIBT. I use my own method. My method is like this: I prepare my own slides, loading all the objectives I want to teach onto them. But I don't open the slides right away. First, I ask my questions. I ask about the key terms. I have their friends confirm or challenge the answers. Some students are very well-prepared beforehand and say, "No, teacher, that's wrong." At that point, I don't intervene at all. I want them to figure it out on their own. After that, I take over and explain the topic myself.

For Teachers Güner (G) and Hazar, it can be said that they are distant from the flexible inquiry approach. This is because, during the interviews, there were no statements regarding the inquiry-based teaching approach, the implementation of activities related to it, or the FIBT process. The reason why Teacher Güner (G) comes before Teacher Hazar (H) is that Güner mentioned that activities within the inquiry-based teaching approach can be conducted without experiments.

G.31: It's possible. How can I put it? Experiments make things easier. I can talk as much as I want and say, "Water boils at 100 degrees" but after a while, that can be forgotten. However, experiments provide a concrete way to observe. They allow students to draw conclusions and spark their imagination. Right now, we're covering topics like atoms. Am I conducting experiments for that? Am I showing the kids an atom? No. Or, for example, when something heats up and expands, can I show the students the spaces between atoms increasing? No.

H.33: Can it be done without experiments? Observation and experimentation are absolutely necessary. At the very least, there needs to be observation.

Table 1 was created based on the findings obtained from the explication interviews conducted with the science teachers and the interpretations of these findings. The items related to the flexible inquiry understanding included in the table are those identified both theoretically and through the interviews. In the table, the teachers' understandings are defined in three categories. These are categorized as those who possess a flexible inquiry approach, those who are close to it, and those who are distant from it. The abbreviations formed from the initials of the code names given to the teachers are listed under each category. For each item in the table, the symbols "+++", "++", "+", and "-" were added to the category corresponding to the

teachers who comply with the relevant statement. Teachers who exhibit the highest level of alignment with the flexible inquiry understanding are represented by “+++”, while those with lower levels are indicated by “++” and “+”, respectively. This ranking, from the highest to the lowest alignment with the flexible inquiry understanding, is organized as “+++”, “++”, and “+”. In cases where the teachers’ responses were not related to the flexible inquiry approach, the symbol “-” was used. The purpose of this classification is to present science teachers on a spectrum, from those who have the highest level of flexible inquiry to those who have none, in order to contribute to the development of a flexible perspective.

Table 1.

Teachers’ Understanding of Flexible Inquiry

Items Related to Flexible Inquiry Understanding	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)
1. Completion of the FIBT sequence	+++	+++	+++	+++	+++	+++	-	-
2. Deciding who (teacher or student) will be responsible for the tasks and duties in the FIBT process	+++	+++	+++	+++	++	++	-	-
3. Being able to create task-responsibility alternatives	+++	+++	++	++	+	+	-	-
4. Determining whether FIBT activities can be implemented for every topic in science classes	+++	+++	+++	++	+	+	-	-
5. Feasibility of conducting FIBT activities without the use of experiments	+++	+++	+++	+++	+++	+++	+	-
6. Prioritizing collaborative learning in FIBT applications in science classes	+++	+	+++	+++	+++	+	-	-
7. Continuously implementing FIBT activities in science classes	+++	+++	++	++	+	+	-	-
8. Enabling students to acquire scientific process skills through FIBT activities	+++	+++	+++	+++	+++	+++	-	-

Figure 1 presents a pie chart displaying the levels of science teachers’ alignment with the flexible inquiry approach. The graph categorizes teachers into three groups: “Those Who Possess It” (group A, 14%), “Those Who Are Close to It” (groups B, C, D, E, 57%), and “Those Who Are Distant from It” (groups F, G, 29%). This chart highlights a comparative representation of teachers’ alignment with the flexible inquiry approach, visually illustrating the proportion of each group.

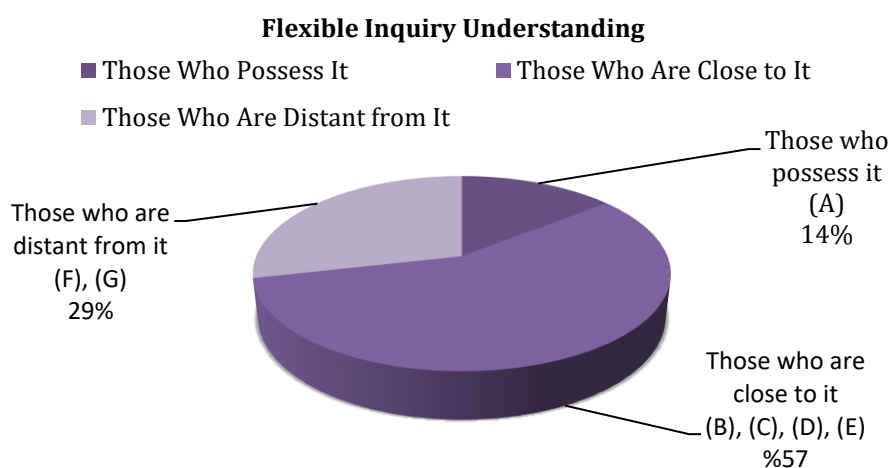


Figure 1. Flexible Inquiry Understanding

Table 2 contains the statements of science teachers regarding their understanding of flexible inquiry. The table presents examples of how the teachers implement Flexible Inquiry-Based Teaching (FIBT) processes, making a comparison based on their levels of understanding. The table clearly presents the different understandings and implementation levels of the teachers regarding these processes. The empty spaces are a result of the teachers not providing any statements on the respective topic.

Table 2.

Some Excerpts from Science Teachers’ Statements on their Understanding of Flexible Inquiry

Items Related to Flexible Inquiry Understanding	Those Who Possess and Are Close to It	Those Who Are Distant from It
Completion of the FIBT sequence	<i>Then, after the groups were determined, I posed a research question. And then I asked the students for their predictions regarding the question. First they worked in groups and then after working in groups they discussed between groups. (A.5)</i>	<i>For inquiry-based learning, I provide scenarios to the children, and then I show real-life events. After that, I create a scenario for both the child and myself, adapting the classroom and school environment into the scenario. For instance, if I’m in Urfa, or if I’m in Kars or here, I would adapt the events of</i>

		<i>the local area into the scenario, turning them into stories. (H.22)</i>
Deciding who (teacher or student) will be responsible for the tasks and duties in the FIBT process	<i>You write the question on the board and leave it to the students, but here's the thing: I also brought a notebook and reference books. I placed them on my desk to make the students notice the reference materials. (B.12)</i>	<i>Right now, I'm not fully in control of some of the criteria in the inquiry process. Sometimes, the content of the lesson or topic leads in different directions, meaning that the scenario or plan I had in mind might go beyond what I initially wrote. (H.44)</i>
Being able to create task-responsibility alternatives	<i>I told them, "You can present it by preparing a magazine, or as a newspaper article, or you can prepare a PowerPoint presentation and show it on the smartboard." They were able to use many different methods. And each group determined their own method of presentation; we had five groups in total. Each group did different things. (A.8)</i>	<i>Inquiry-based learning, in the true sense, doesn't always feel fully satisfying to me. Here's the thing: based on my experience, I always focus on helping children make connections. I don't really plan a lesson by saying, "today I'm going to teach inquiry-based learning, or research-based, or whatever type of teaching." That's not my approach. But I always make sure to relate the topic to the students' everyday lives and to connect it with things that happened before or after. For instance, I try to associate the topic with current events. So, in the introduction, I might ask if there's a recent news story related to the topic, or maybe it's something from my own news, or I might directly ask the students, "Did you hear about this? Why do you think this is happening? What's the reason for this?" (G.3)</i>
Determining whether FIBT activities can be implemented for every topic in science classes	<i>It can be conducted on every topic and for every learning outcome. (A.17)</i>	<i>When they come to school and enter the classroom, at least for 30-40% of the science lesson, we can create an environment where they can work independently in the lab. Sometimes, material availability can be an issue, but we can manage by applying certain techniques. We can do this in physics and chemistry. In biology, it might be harder. For example, we can't do it when explaining the food pyramid or energy relationships. However, before the topic, we can make simple machines. (H.26)</i>
Feasibility of conducting FIBT activities without the use of experiments	<i>No, for example, the scenario I gave wasn't an experimental activity, and it was highly effective. What I noticed was that the students understood it very well, and we were able to achieve all the learning outcomes. (A.15)</i>	<i>Now, when explaining the food pyramid, for example, as you move from the lower to the upper levels, the energy transferred decreases. I think the only way I can explain this is through storytelling. To be able to measure the amount of waste in a grasshopper's body or in any living organism, I would need technology. This time, I would need to explain how we could measure it. (H.73) I can't make them prove it. (H.74)</i>
Prioritizing collaborative learning in FIBT applications in science classes	<i>I tried to create heterogeneous groups, and within each group, I assigned roles such as group recorder, group leader, spokesperson, and material manager. They were responsible for determining these roles themselves. (A.2)</i>	
Continuously implementing FIBT activities in science classes	<i>Yes, that was the case last year. I applied it many times, but I can't say it was consistent throughout the entire year. However, this year my goal is to apply it throughout the whole year. We've already started that way, and I plan to continue in the same manner. (A.26)</i>	<i>Because when I plan the lesson and the curriculum, I don't directly think, "Let's use inquiry techniques" or "I'll do this and prepare these materials." I don't create a detailed plan like that. Also, I had previously received training related to international science education. My experience there was</i>

that it felt very difficult and detailed — the inquiry part made us feel like students. Honestly, I didn't enjoy it. By "didn't enjoy," I mean that I found the process boring. I felt it was tedious, and because of that, I never felt the need to specifically prepare content in that way. (G.23)

Enabling students to acquire scientific process skills through FIBT activities	<i>I believe that they have made progress both in terms of scientific process skills and life skills. (A.12)</i>
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Table 3 classifies the science teachers' understanding of flexible inquiry into two main categories and provides a comparative analysis to better understand the teachers' perspectives on flexible inquiry.

Table 3.
Teachers' Understanding of Flexible Inquiry

Items Related to Flexible Inquiry Understanding	Those who possess it	Those who are distant from it
Completion of the FIBT sequence	✓	
Deciding who (teacher or student) will be responsible for the tasks and duties in the FIBT process	✓	
Being able to create task-responsibility alternatives	✓	
Determining whether FIBT activities can be implemented for every topic in science classes	✓	
Feasibility of conducting FIBT activities without the use of experiments	✓	
Prioritizing collaborative learning in FIBT applications in science classes	✓	
Continuously implementing FIBT activities in science classes	✓	
Enabling students to acquire scientific process skills through FIBT activities	✓	✓

The science teachers' understandings of the flexible inquiry approach are presented in Figure 2, categorized as "those who possess it", "those who are close to it" and "those who are distant from it". Each category is represented in different patterns. Detailed representations for each of these categories are provided in Figures 3, 4, 5, 6, 7, 8, 9 and 10. The representations are provided below:

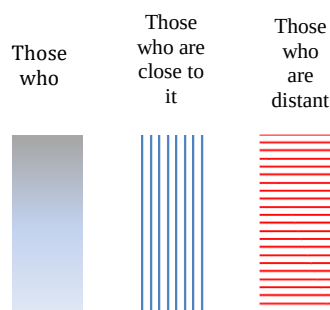


Figure 2. The science teachers' understandings of the flexible inquiry approach

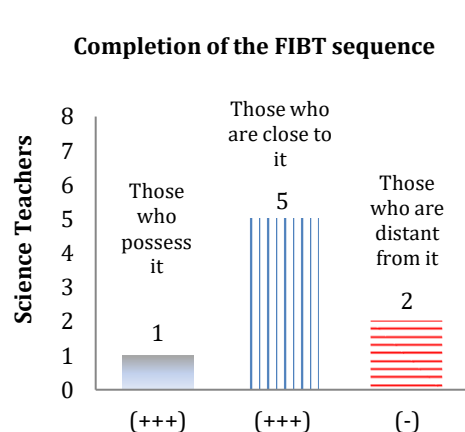


Figure 3. Completion of the FIBT sequence

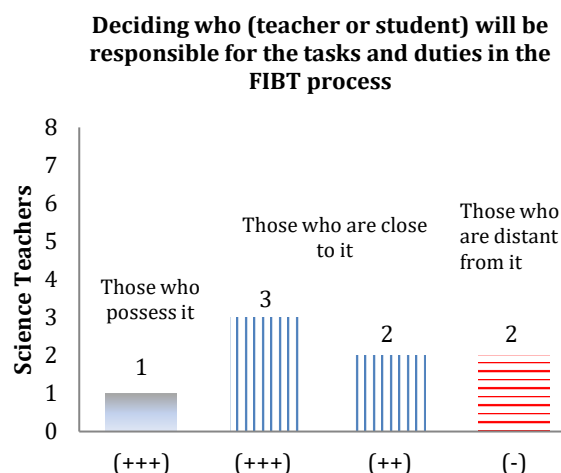


Figure 4. Deciding who (teacher or student) will be responsible for the tasks and duties in the FIBT process

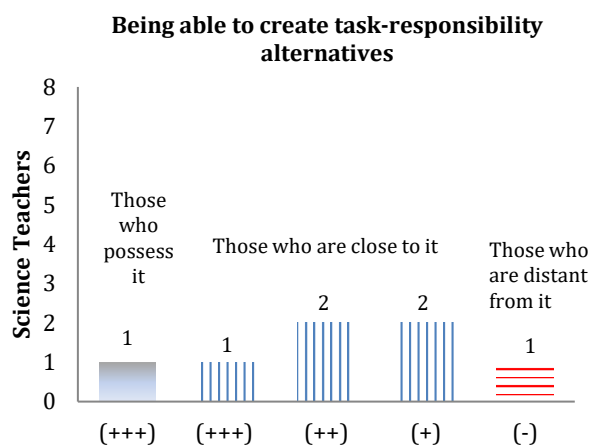


Figure 5. Being able to create task-responsibility alternatives

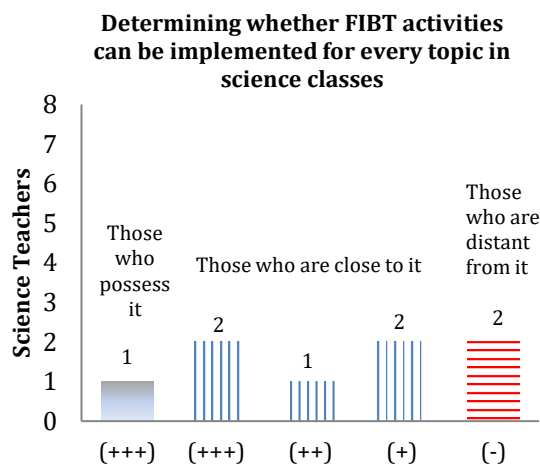


Figure 6. Determining whether FIBT activities can be implemented for every topic in science classes

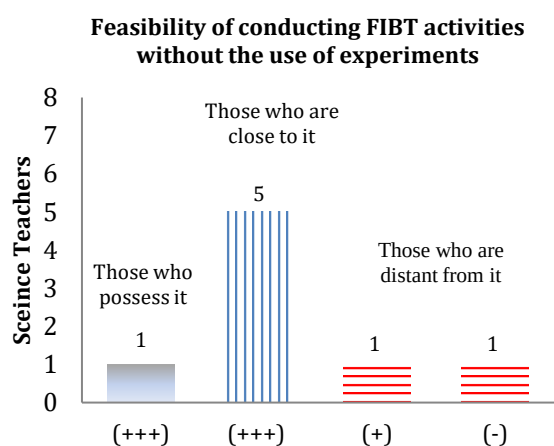


Figure 7. Feasibility of conducting FIBT activities without the use of experiments

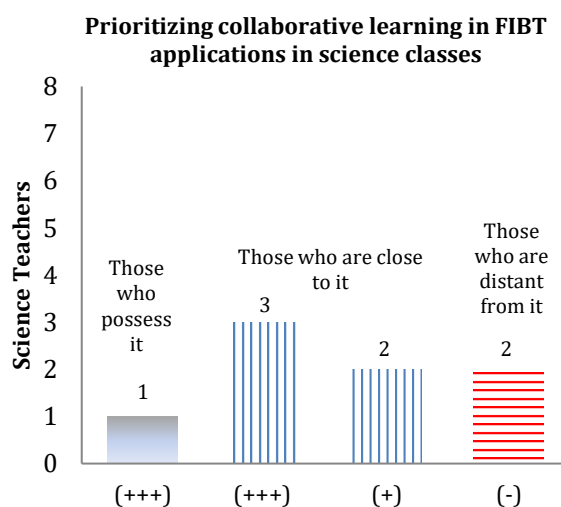


Figure 8. Prioritizing collaborative learning in FIBT applications in science classes

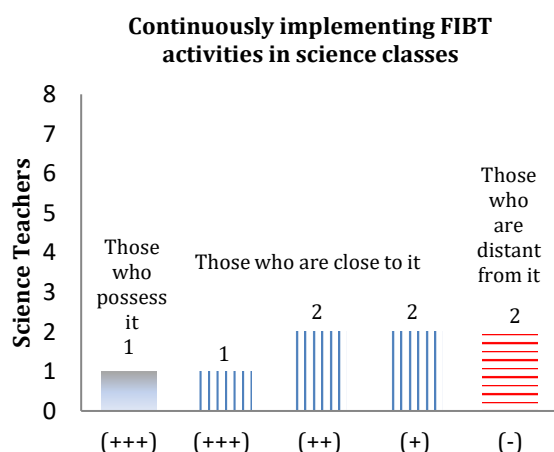


Figure 9. Continuously implementing FIBT activities in science classes

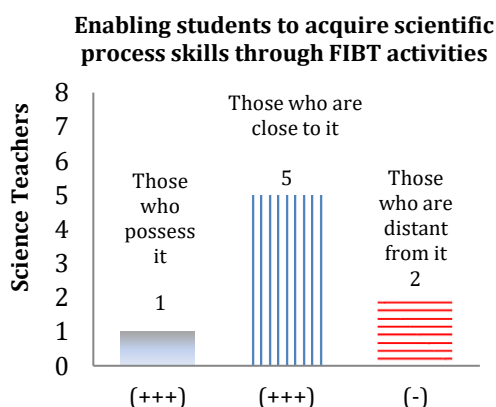


Figure 10. Enabling students to acquire scientific process skills through FIBT activities

4. RESULTS, DISCUSSION AND RECOMMENDATIONS

The current study aimed to identify science teachers' understanding of flexible inquiry. To this end, interviews were conducted with teachers, and their understanding of flexible inquiry was identified. Subsequently, a ranking was created from the teacher closest to this understanding to the one more distant from it (Table 1). The teachers' understanding of flexible inquiry was characterized based on specific criteria. These criteria include the completion of the FIBT sequence, determining the responsibilities (teacher/student) in the FIBT process, the ability to create task-responsibility alternatives, the feasibility of FIBT activities for every topic in science classes, the possibility of conducting FIBT activities without experiments, prioritizing collaborative learning in FIBT activities in science classes, the continuous implementation of FIBT activities, and fostering students' acquisition of scientific process skills through FIBT activities. These factors, considered during the ranking process, can be regarded as the "criteria for the understanding of flexible inquiry" and are among the significant outcomes of the study. The explication interviews conducted with the teachers to identify their understanding of flexible inquiry allowed them to elaborate on the activities they directly implemented. This contributed to deeper insights into their understanding of flexible inquiry. As a result of the interviews, the science teachers' understanding of flexible inquiry was classified into two main categories as shown in Table 3. This table provides a comparative analysis to better understand the teachers' understanding of flexible inquiry. Teachers who have an understanding of flexible inquiry excelled in criteria such as completing the entire FIBT sequence, defining roles and responsibilities, creating alternative tasks, applying FIBT activities to each content area, and conducting FIBT activities without experiments. These teachers created collaborative learning environments, enabling students to acquire scientific process skills during the flexible inquiry process. On the other hand, teachers who are distant from this understanding are unable to explain or implement the FIBT process. However, they do express that scientific process skills can be acquired through the inquiry process. These teachers are also unable to fulfil important criteria such as completing the FIBT sequence, defining responsibilities, and creating collaborative learning environments. They also fell short in carrying out activities without experiments and ensuring the continuity of these activities. Teachers with an understanding of flexible inquiry were able to express the activities and lesson processes in detail, while those without this understanding were unable to define the flexible inquiry activities and lesson processes. The criteria determined in the current study were developed to serve the purpose of defining science teachers' understanding of flexible inquiry. However, these criteria may change over time depending on teaching practices, pedagogical approaches, and scientific advancements. In this regard, the criteria presented in the study were evaluated solely within the framework of this study and additions may be made to them in future studies. Given the dynamic and variable nature of the flexible inquiry approach, these criteria should not be considered as fixed and permanent. Parallel to developments in educational and instructional approaches, these criteria may need to be reviewed and updated.

Based on the theoretical framework and the results of the current study, the flexible inquiry understanding is a pedagogical framework in science education aimed at helping students acquire scientific process skills and where knowledge, skills, attitudes, and values are addressed from an interdisciplinary perspective. This understanding combines core elements such as the nature of science, scientific inquiry and scientific reasoning into a collaborative and democratic learning setting, ensuring a holistic and interconnected learning experience. The flexible inquiry understanding is based on a flexible structure that goes beyond traditional teaching methods, ensuring active student participation in the learning process and allowing for the delegation of responsibilities at different stages of the process. This understanding provides teachers and students with task-responsibility alternatives, positioning teachers not as direct providers of information, but as guides in the process of discovering knowledge. In this way, it allows students to explore and discover their own learning processes. This approach offers flexibility that can be adapted to any topic, with the awareness that inquiry-based teaching is possible even without conducting experiments. In addition, this understanding aims not only for students to access scientific knowledge, but also to question, analyze that knowledge, and experience the knowledge production processes of scientists. In this regard, the completion of all the stages of the FIBT sequence is important. Teachers are expected to diversify lesson content and teaching methods within this flexibility understanding.

The theoretical foundation of flexible inquiry is shaped by the core principles of inquiry based learning, as defined by international science education standards. Inquiry based learning is a teaching that aims to help students understand scientific processes through experience. This approach centers on the fundamental stages of scientific inquiry and encourages students to adopt scientific ways of thinking. According to the Next Generation Science Standards (NGSS, 2013), students are expected to develop skills such as asking questions, making observations, designing and conducting investigations, collecting and analyzing data, and constructing explanations. These skills form the foundation for developing high-level thinking abilities required in the 21st century, including critical thinking, problem-solving, and creativity. Similarly, the National Research Council (2000) highlights that students should be able to use scientific tools effectively, make evidence-based inferences, formulate predictions, and share their conclusions. In this regard, Flexible Inquiry Based Teaching (FIBT) offers an interdisciplinary perspective and structural flexibility, providing students with opportunities to engage in the knowledge production processes of scientists and internalize scientific inquiry more effectively.

When the inquiry understandings in the literature are examined, it is seen that while there are some common points with the flexible inquiry approach, there are also notable differences. According to Huber (2009), the main features that distinguish it from similar teaching approaches such as inquiry-based learning, student-centred learning, independent work, discovery and problem-based learning or project-based studies are that social learning is at the centre and students are provided with new

understandings. The inquiry-based learning defined by Pasternack (2019) includes the following characteristics: (i) independent selection of the topic, (ii) independent strategies to process the topic and find a solution, (iii) working on the topic with related risks, errors, deviations, and serendipitous discoveries, (iv) checking the results in terms of hypotheses and methods, and (v) public communication and representation of the results. However, these approaches are generally based on fixed steps and do not have the flexibility and dynamic structure of the learning process, such as the alternatives and delegation of tasks and responsibilities found in the flexible inquiry approach. As stated by Pasternack (2019), traditional inquiry-based learning processes include steps such as independent selection of the topic, testing of hypotheses, and communicating the results to the public, but it can be noted that there is no flexibility throughout the process.

The concept of scientific inquiry (SI) is defined by Lederman et al. (2014, 2017) as a combination of scientific process skills, creativity, and critical thinking. Scientific inquiry involves processes such as observing data, making inferences, classifying, predicting, measuring, questioning, and analyzing. However, the flexible inquiry understanding addresses these processes within a broader framework, and the existence of the FIBT sequence along with task-responsibility alternatives clearly highlights the distinctiveness of this approach. Especially in the third stage of the FIBT sequence, the question “How can we know if the prediction or hypothesis is correct?” which shifts from the dimension of questioning information to the dimension of research, supports this distinction. With this question, students will propose solutions to validate or falsify their ideas. Moreover, the understanding of teachers must be different from that of students. In this regard, within the framework of Pedagogical Content Knowledge (PCK), teachers are expected to possess both deep knowledge of the subject and the skills to effectively convey that knowledge to students (Shulman, 1987). This skill encompasses not only the teacher’s knowledge of the subject but also their ability to manage the teaching process and guide student understanding. Park (2008) emphasizes that the understanding of scientific inquiry must go hand in hand with the nature of science, while Bybee (2000) states that scientific inquiry involves not only the skills but also the understanding of how students will apply these skills. In this sense, the flexible inquiry understanding is built around the discovery of scientific knowledge, where students learn how to question and investigate this knowledge and experience the processes that scientists undergo.

Scientific inquiry is defined as the process through which a scientist conducts research and generates knowledge. It includes the methodology of knowledge and scientific knowledge is integrated with scientific reasoning and critical thinking (Anggraeni, Adisendjaja & Amprasto, 2017). Flexible inquiry emphasizes applying these processes without being tied to fixed environments such as experiments and laboratories and allows for changing roles and responsibilities between teacher and student. In this way, a more dynamic and customizable learning environment is created.

One of the most significant findings emphasized by teachers is that the FIBT process enables students to identify their own shortcomings and to critically examine their thoughts, allowing them to detect and correct any inaccuracies, deficiencies or errors in their expressions. It was determined that Teachers Güner and Hazar have knowledge gaps and misconceptions regarding the inquiry-based learning approach, while Teachers Deniz, Erol, and Ferhan are familiar with this approach but do not apply it at every grade level. In particular, the fact that Teachers Deniz and Ferhan do not find flexible inquiry-based teaching suitable for the high school entrance exam in eighth grade is an indication of their misunderstanding. Similarly, Öztürk (2022) highlighted that one of the participating teachers expressed the view that the inquiry-based learning approach was not applicable to eighth-grade students. Moreover, some teachers who are close to the flexible inquiry understanding expressed that they are unable to implement FIBT activities due to the heavy workload in the curriculum. In parallel, Öztürk (2022) also emphasized that teachers did not find the FIBT model suitable for every topic, noting that they might prefer an inquiry approach for subjects like biology, which have a stronger verbal component, and that they are concerned about covering the curriculum. In another study (Bayram, 2015), it was found that pre-service teachers faced internal challenges (such as lack of guidance, content knowledge, and process knowledge) and external challenges (such as time constraints, lack of materials, and students’ preparedness) when designing activities for inquiry-based teaching. Teacher Beyhan also explained that during group work, the increasing noise in the classroom and the efforts to maintain order led to time loss, which made her avoid having students work in groups. Similarly, Batu and Kaptan (2017) stated that while group work in model-based inquiry activities has positive effects on students, teachers face difficulties in classroom management due to the increased noise and the time spent on maintaining order when students work in groups.

As a result, the flexible inquiry understanding offers more flexibility by focusing on more task and responsibility alternatives compared to other inquiry models found in the literature. It enables students not only to learn scientific knowledge but also to question, research and analyze it and experience the processes of scientific knowledge production. This understanding is distinguished by its adaptability to different course contents and learning environments, and it offers students opportunities to develop their scientific process skills. Moreover, the study emphasizes that teachers must first embrace an inquiry-based learning philosophy in order to successfully implement inquiry-based teaching practices.

This study has a limitation in terms of sample size. Since the study group consists of only eight science teachers, the generalizability of the findings to broader educational contexts is limited.

Suggestions in light of the findings of the study;

- Although the Ministry of National Education adopted an “inquiry based learning” approach in both the 2018 and 2024 Science Curriculums, the current assessment and evaluation methods are not compatible with this approach. Therefore, it is recommended that both classroom assessments and high school entrance exams be aligned with the inquiry-based learning approach. In this way, teachers can implement flexible inquiry-based teaching practices more effectively.
- A guidebook containing activity designs suitable for each grade level could be prepared to help teachers better understand and implement inquiry-based, especially flexible inquiry-based, practices. This guidebook can offer a wealth of activity ideas tailored to each topic for teachers working with students in grades 5 through 8.
- In order for inquiry-based practices to be implemented successfully, teachers need to receive continuous feedback. In this process, it can be emphasized that teachers need the guidance of field experts before, during and after the implementation. With this feedback and guidance, teachers will feel more motivated and competent, and their practices can be more effective.
- Regular and systematic in-service training should be provided to teachers to develop their understanding of inquiry in general and flexible inquiry in particular. The content of these trainings can be shaped according to the current deficiencies and needs of teachers. This can make teachers more effective in educational and instructional processes.

Research and Publication Ethics Statement

Hacettepe University Ethics Committee stated that the research was ethically appropriate and necessary permission was given to conduct the research (20.06.2022 / E-35853172-399-00002244779). All the information in the article was obtained within the framework of academic rules, and the principles of publication ethics were followed during the article writing process.

Contribution Rates of Authors to the Article

This study is a part of the master thesis titled “Examination of Science Teachers’ Understandings of Scientific Inquiry”, completed by first author under the supervision of second author. Both authors contributed equally to the process of transforming the thesis into an article.

Statement of Interest

The authors declare that there is no conflict of interest.

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The Utilization of History within the Framework of Interdisciplinary Approach in Geography Courses*

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Article Information	ABSTRACT
Received: 03.05.2025	In recent years, one of the prominently emphasized concepts in educational activities is interdisciplinarity. In this research, was to examine the extent to which geography teachers benefit from history within the framework of the interdisciplinary approach in geography lessons. The data in the research were collected with semi-structured interview forms. According to the findings obtained from the research a significant majority of the geography teachers showed a high interest in history, and all of them believed that history could contribute to geography lessons. It has been observed that geography teachers utilize history in various ways in their lessons including referring to historical processes of the topics, talking about first historical landmarks, and the impact of geography on historical events. It has been determined that geography teachers perceive the connection between the curriculum and textbooks with history as primarily inadequate; they think that there are issues that need to be improved.
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1. INTRODUCTION

The advancement of science and its ability to elevate societies to higher levels depend on the importance given to it by the society it seeks to grow within. When societies believe in the necessity of scientific advancement, they will provide the necessary environment for its development, and in parallel with this progress, they themselves will change and develop. However, the advancement of science is not achievable through breakthroughs in just one field. This is because disciplines are interconnected and support each other's development with the knowledge they gain. The statement from Gilbert (1909, as cited in Baerwald, 2010) emphasizes that progress occurs in science through the interactions among different disciplines, and unauthorized entry of scientific fields into each other's domains is one of the fruitful methods of interaction. This highlights that partial or limited incursions of disciplines into each other's areas are key to progress. Synthesizing knowledge from different disciplines and creating new interdisciplinary research areas are considered crucial for economic development and fostering innovations. Based on these topinions, it is evident that the disciplines that can be expressed as interdisciplinarity must support each other and collaboratively produce knowledge or products and thus it holds great importance and cannot be overlooked by policymakers (Rekers & Hansen, 2015). It is evident that if policy intervention encourages efficient interdisciplinary research, science will progress much faster.

Geography is one of the disciplines that require an interdisciplinary approach due to its diverse content. Geography can be divided into two main sub-branches: physical geography (including geomorphology, climatology, biogeography, etc.) and human geography or anthropogeography (including culture, population, politics, etc.). These sub-branches diversify within themselves and develop in cooperation with quite different disciplines in terms of content. The multidimensionality of geography offers numerous examples of its impact on national identity, migration, and the formation and development of human communities. (Bryce, 1886).

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Due to its interdisciplinary nature, geography should be built on spatial analysis and human-environment interaction to encourage communication and interaction with other disciplines (Baerwald, 2010). Harris (2012) views geography as a powerful field that will develop strong social and political awareness about critical issues facing humanity. Therefore, he states that geography serves as a tool for fostering values and commitment to social action. According to Sağdıç and Demirkaya (2014), geography has emerged as an interdisciplinary field that integrates intersecting technologies with art and science education, and they added that geography serves as a bridge between human and natural sciences in terms of the subjects it addresses. They highlighted that geography lessons can be considered the most suitable courses for interdisciplinary instruction.

Geography has two main effects on the development of interdisciplinary research (Baerwald, 2010). The first of these effects is contextually supportive factors such as strong research environments in different fields. The second effect is the strong and facilitating aspect of geographical proximity in creating social networks. Geography has diversified its research tradition by exploring the role of place and space in factors that influence human well-being, livelihood, and human-environment interactions, alongside the classical tradition of field research such as spatially-based regional analysis. Due to these features, geography increasingly is seen and valued as a “bridge discipline” according to Gober (2000). Geography as a discipline continues to maintain its status as a bridge discipline by connecting human and natural system studies and enabling intellectual synthesis. The bridge discipline feature of geography facilitates interactions between geographers and many other disciplines, creating opportunities for productive collaborations (Baerwald, 2010).

Due to its research area, geography has the most interaction with history and often becomes inseparable from it, making it difficult to distinguish their subjects from each other. Indeed, the close connection between geography and history has given rise to a specific field of study known as historical geography. According to Bryce (1886), the roots of history lie in geography because without a clear and vivid understanding of a country's physical structure, the events of life that people have experienced within it would have no significance or meaning. Darby (1953) presents the relationship between geography and history as a mutual necessity and quotes the expression from Heylyn's *Microcosmus*, “history without geography, like the dead, contains neither life nor motion.” However, by referring to the beginning of the quote, “Without history, geography has life and motion, but this motion is random and variable,” Darby emphasizes that without the support of history, geography lacks regular motion.

When considering that history as a discipline is concerned with human experiences within the context of human interactions, it becomes evident that there is a strong connection between history and geography because geography is the study of how humans uniquely interact with and adapt to their physical environment. This provides us with two closely related disciplines: one focuses on human interactions with each other, and the other centres on the relationship between humans and their environments. Both disciplines aim to focus on what humans do in diverse historical contexts, acknowledging humans as creative thinking beings. The attempt to establish a special relationship between geography and history is not about setting rigid boundaries. In fact, there is considerable overlap between these two disciplines and many others. However, it is inevitable for each of them to have a defined network of subjects (Guelke, 1997). According to Darby (1953), expanding the vision of history to encompass all aspects of human movement from social and economic perspectives made historical studies more realistic and directed them towards a more geographical approach. In this regard, Michelet, who believes that history is in a compulsory relationship with geography, expresses that without a geographical foundation, the creators of history, namely humans, would appear to be walking in the air. In other words, Michelet emphasizes that without geographical basis, historical knowledge cannot have a solid footing.

The area that overlaps most between geographers and historians is the role of the past in the present. Bringing up questions about heritage and memory refers to the relationship between these two fields (Ogborn, 1999). In summary, as expressed by Hartshorne, parallel to Kant's views, “Explanation based on time is history, while explanation based on space is geography.” History differs from geography only in terms of time and space. The former is a report of successive and time-referencing phenomena. The latter is a report of phenomena that are side by side in space. That is, history is a narrative, while geography is a description. ... Geography and history fill our entire perceptual environment: geography provides the definition of space, while history enables the definition of time (Guelke, 1997).

The strong bond between geography and history necessitates benefiting from each other's knowledge when explaining them to individuals at various levels because presenting these two disciplines with their organic bond within themselves to individuals will enhance the understanding of both disciplines' content. The social life and societal structure in a country are largely shaped by various geographical factors prevailing in that country (Harichandan, et al. 2013). Various historical events have been greatly influenced by geographical factors, and even in some cases, geographical factors have played a significant role in shaping historical events. Effectively conveying this relationship to students at various educational levels is the most suitable way of presenting the nature of that discipline. Knowing the historical events that have occurred and influenced people, such as wars, migrations, natural disasters, pandemics, and such phenomena will enable a better understanding of the subjects addressed by both human and population geography today (İskender Kılıç, 2019). Indeed, the first cultural centres established by humans, their economic activities, and livelihood methods from the past to the present are among the topics that history contributes to geography (Doğan, 2014). Moreover, it can be argued that many primary sources that are of importance to the discipline and teaching of history will provide valuable information in the evaluation of socio-cultural, economic, and demographic subjects in the field of geography (İskender Kılıç, 2019).

Conveying information from different disciplines by establishing connections between them brings about an interdisciplinary curriculum approach. Designing an interdisciplinary curriculum requires familiarity with relevant literature. This literature encompasses theories, research processes, innovative pedagogies, assessment methods, institutional context, and faculty support strategies and it typically includes the fundamental design elements that characterize interdisciplinary curriculum. An interdisciplinary curriculum aims to solve complex problems that cannot be addressed by a single discipline, using perspectives developed by different disciplines (Repko, 2007). Kockelmans (1979, as cited in Soupepez, 2016) defined the interdisciplinary concept as “solving a set of problems that can only be achieved by integrating the parts of existing discipline.” The need for interdisciplinary curricula arises from the increasing complexity of problems to be solved, and modern challenges largely possess an interdisciplinary nature (Soupepez, 2016). According to DeZure (1999), “life is interdisciplinary.” Considering this perspective, the teaching of all sciences necessitates an interdisciplinary approach. Therefore, programming the education and teaching process with an interdisciplinary approach is considered important. In this case, the integration of in-depth knowledge put forth by individual disciplines is especially necessary for the effective sustainability of the education and teaching process (Sağdıç & Demirkaya, 2014).

According to Soupepez (2016), one of the main and often overlooked benefits of interdisciplinary education is that it allows students to think thoroughly about their areas of expertise and helps them understand what disciplines entail. Indeed, this view makes the interdisciplinary teaching of history and geography, which have a close relationship with each other, almost necessary because the education-teaching process fundamentally aims to familiarize students with the working areas of different disciplines and how these areas function. According to Nissani (1997), the benefits of interdisciplinary learning and teaching are expressed as follows: more meaningful learning experiences, new opportunities arising from the transitions between two disciplines, demonstrating real-life applications, gaining diverse perspectives, flexibility in problem-solving, academic freedom, social change, critical thinking, building shared knowledge, establishing trust, encouraging creativity, and developing transferable skills.

At the student level, the most common benefit of an interdisciplinary curriculum approach is that it encourages students to connect ideas and concepts from various disciplines, fostering a constructive paradigm that leads to a deeper understanding (Soupepez, 2016). Achieving these benefits for students during the learning process is among the goals of instructional programs. These benefits largely support the development of high-order thinking skills. When examining the instructional programs of the Ministry of National Education (MEB) in Turkey, the importance given to interdisciplinary approaches and the development of high-order thinking skills is conveyed through the following statements: “...*a comprehensive set of instructional programs has been developed, which directs the use of high-order cognitive skills, ensures meaningful and permanent learning, is well-grounded and associated with prior knowledge, and integrates with other disciplines and daily life in terms of values, skills, and competencies.*” (MEB, 2018). The statement is included in all instructional programs prepared by the Ministry of National Education.

1.1. Purpose of the Research and Statement of the Problem

Given the nature of their content, it is both easy and essential to establish connections between topics in geography and history curricula. Therefore, implementing an interdisciplinary curriculum approach in these subjects is highly important. Establishing connections between the two disciplines at the curriculum level is not sufficient on its own because it is crucial for teachers, the practitioners of the program, to be aware of these connections, believe in their importance, and incorporate them into their teaching during the lesson delivery. Since there are very few studies that directly address the interdisciplinary relationship between history and geography in the literature (Zeren Akbulut, 2019), it is thought that the study will contribute to the field and guide teacher education. Therefore, in the research, the aim was to explore the use of an interdisciplinary approach by incorporating history into geography lessons, particularly from the perspective of teachers, who are the practitioners of this approach. To achieve this goal, the following questions were addressed in the research:

1. What are geography teachers' interest levels in history and the reasons behind their interest levels?
2. What are the opinions of geography teachers regarding the contributions of history to geography instruction?
3. What are the ways and forms in which geography teachers utilize history in their lessons?
4. What are the opinions of geography teachers regarding the support of the geography curriculum and textbooks for collaboration with the history discipline?

2. METHODOLOGY

The research was designed using a qualitative research method, specifically a case study. In qualitative case studies, there is a search for meaning and understanding (Merriam, 2015). In a case study, the researcher examines a real-life situation, a current condition, or multiple situations within a specific time frame. When describing the situations, the researcher utilizes data obtained from interviews, documents, observations, and other relevant reports (Creswell, 2021). In the research, the aim was to describe geography teachers' interest in historical topics and their use of historical subjects by relating them to the geography curriculum. This description was based on data obtained from interview sessions.

2.1. Participants

The research was conducted in the central districts of Erzurum, and it involved 15 teachers who teach geography in secondary education institutions. The participants include 11 males and 4 females. The participants were selected using convenience sampling method (see Merriam, 2015). Five of the participants have 10-15 years of professional experience, four have 15-20 years of professional experience and three have 5-10 years of professional experience. On the other hand, the remaining three participants have 30-35, 20-25 and 0-5 years of professional experience. Some of the participant teachers mentioned that they had taken history courses during their undergraduate studies and that they collaborated with other teachers in group meetings while carrying out their profession. One of the teachers stated that he received training on other disciplines during an elementary school teaching certification program. Another teacher stated that he, individually, attended a course to improve his proficiency in the Turkish language and he read books related to subjects like history, literature, and about the importance of mathematics. Another teacher mentioned that although she did not receive specific training on other disciplines, she used various disciplines in her lessons to ensure permanent learning. However, none of the participant geography teachers have received any specific training in their undergraduate studies or afterwards regarding interdisciplinary learning in geography teaching or utilizing knowledge from other disciplines.

2.2. Data Collection Tools

A semi-structured interview form was used to collect data in the research. The preparation of the interview form began with a thorough review of the relevant literature, especially the research of Zeren Akbulut (2019) and specific questions were created. The questions were initially presented to expert faculty members in the field teaching history and geography, and based on their feedback, modifications were made to the questions. Then a piloting of the data collection tool was conducted with two geography teachers. Based on the feedback from the pilot study and the participant teachers' opinions, the data collection tool was finalized with necessary adjustments. The interview form contains questions aimed at revealing the following aspects regarding geography teachers: their experience in receiving training from other disciplines, their interest levels in history and the reasons behind it, their opinions regarding the contributions of history to geography instruction, the extent to which they utilize historical content in their lessons and the ways they use, their opinions on the extent to which geography curriculum and textbooks support collaboration with the history. The interviews took place between March 2021 and December 2021 either face-to-face in the researcher's office or in the schools where the teachers work. However, due to the Coronavirus disease (COVID-19) pandemic, some interviews were conducted over the phone. Since detailed answers were received for each question, there was no need to interview the participants a second time. Written consent was obtained from the teachers during face-to-face interviews, and consent was obtained through email for phone interviews for teachers' voluntary participation.

2.3. Data Analysis

Data analysis is the process of extracting meaning from the data through an inductive and comparative method while seeking answers to research questions (Merriam, 2015). The data obtained from the interviews were transferred to a Word document on a computer. The data was then thoroughly read and analysed using content analysis, a qualitative research technique used in qualitative research. *"In content analysis, the fundamental process involves organizing similar data into specific concepts and themes and interpreting them in a way that the reader can understand"* (Yıldırım & Şimşek, 2013, 259). During the analysis stage, the two researchers independently read the data that had been transcribed, and they created categories based on the content. Afterward, the researchers came together to compare the categories they had created and to ensure the alignment between the data and the categories. Through collaborative discussions, they refined and finalized the categories. In the research, the findings were tabulated, and they were presented with quotations from the participants. An effort was made to include quotations from all participants as much as possible. Quotations from the teachers were labelled with codes such as P (Participant) 1, P2, P3, ..., P15.

3. FINDINGS

In this section of the research, the findings were presented with tables and quotations from the participants.

3.1. Geography Teachers' Interest Levels in History and the Reasons Behind Their Interest Levels

In the interviews, geography teachers were asked about their interest levels in history and the reasons behind these interest levels. The findings from the interviews were presented in Table 1 and Table 2.

Table 1.

Geography Teachers' Interest Levels in History

Interest Level	f
High	9
Moderate	5
Low	1

It was observed that the interest of geography teachers in history was mostly at a high level. In the dimension of interest in history, nine teachers responded at a high level, five at a moderate level, and one at a low level. During the interviews, some teachers explained their interest in history with concrete examples. Seven teachers mentioned that they read history books as an indicator of their high interest in history. For instance, Teacher P2 stated that he was currently studying at a second university in the International Relations department, where the courses have a strong emphasis on history and he expressed a high interest in European history, particularly because the resources used in geography lessons were mostly of European origin. Teacher P1 mentioned that he engaged in small-scale studies in the field of historical geography and prepared scientific projects for TUBITAK (The Scientific and Technological Research Council of Turkey). Another teacher shared that he used history books while preparing his master's thesis. The reasons for geography teachers' interest levels in history were presented in Table 2.

Table 2.

The Reasons for Geography Teachers' Interest Levels in History

The reasons for interest	cf
Curiosity from the past	7
Professional necessity	5
Influence of the family	2
National sentiments	2
Desire to know their origins	1
Influence of history books	1
Affection towards the Ottoman Empire	1
Desire to learn our history more accurately	1
The reasons for lack of interest	
The memorization required in history	1

The most significant reasons for geography teachers' interest in history are their curiosity from the past and the professional necessity related to their teaching profession. Teachers mentioned the relationship between the two disciplines and the contribution of history to geography regarding professional necessity. The frequency of expressing other opinions is relatively lower. The views of "influence of the family" and "national sentiments" were mentioned twice, while the views on "desire to know their origins," "influence of history books," "affection towards the Ottoman Empire," and "desire to learn our history more accurately" were expressed once each. In this regard, two teachers did not provide a specific reason, while one teacher stated that history requires memorization, and due to lack of memorization skills, his interest in history was lower. The following statement are cited from the teachers' opinions:

P 1: "My interest in history is moderate. It is related to our field of study as geography teachers. There is a saying by Carl Ritter that 'Geography and History are two sisters.' I have engaged in small-scale studies in the field of historical geography. Last year, I prepared a scientific project for TUBITAK...I am currently reading a book titled *Historical Geography* written by a professor from Faculty of Language, History, and Geography in Ankara University.... Generally, geographers ask me how I know so much about history. I love history, and I have had various readings, especially in this field ..."

P 5: "If I were to compare myself to a university student studying history at an undergraduate level, I would consider myself at a moderate level. My father is a graduate of art high school. But we had a large library at our home. Most of these books were history books. I believe there was İsmail Hami Danişment's "Türkiye Tarihi" among them. Bekir Büyükkarın's historical novels such as "Suların Gölgesinde," "Gün Batarken" and "Tanyeri,". I had read them in secondary school. There were also Kara Murat and Tarkan magazines. They were not films, but they were magazines in a weekly publication format, and we used to buy them every week... Can you imagine this? While reading these magazines, I was in the first or second grade of elementary school. These memories take me back to the 1980s..."

P 6: "Let's say it's a moderate level... Maybe we can even say it's slightly above moderate. I have read some of Ahmet Cevdet Paşa's "Tarihi Cevdet," and I have at least skimmed through Yılmaz Öztuna's "Büyük Türkiye Tarihi." I've read two books from "Yalan Söyleyen Tarih Utansın, so I love history. Our history is a mirror of our future. Our interest in history comes from a desire to keep our national feelings at a higher level and to learn about our past more accurately ..."

P 9: "My level of interest in history is high. Everyone might consider it high, but I really have a profound passion for history. In fact, I regret not studying history formally. I've had this curiosity since elementary school. I have read numerous books in historical fields, including historical novels. Of course, historical novels can't be the primary source of learning history. However, when we can make connections and establish links with real historical events, we can approach the subject more consciously."

P 10: "My level of interest in history used to be low in the past, then it became moderate. Now, it is high. My curiosity about history is related to knowing my roots and origins. As time went by, I realized that while describing geography, I started to establish better connections with history. I know geography very well, but to explain it better, I need to

have a good knowledge of history as well. I have researched, asked questions, and learned from the internet to acquire this knowledge. Lately, I have been reading historical books extensively, particularly enjoying informative historical books. Knowing one's past helps establish a stronger connection with geography. It allows me to perceive events more clearly and explain them better. That's why my current interest in history is high".

P 12: *"My interest level is high. I am interested in civilizations, people, and cultures that lived in the past. My father was also interested in history and used to read a lot of historical books. He used to say, "If a person doesn't know his past, he can't determine his future." I prefer reading historical books because they captivate my interest. The reason behind my interest in history is family-related".*

P 15: *"I am very interested in history, especially reading about Ottoman history. The reasons behind my passion are my deep admiration for the Ottoman Empire and my curiosity about how they managed to sustain their state for 600 years. I find it fascinating to learn about the actions of some Ottoman sultans in maintaining the order of the state, although not all of them".*

3.2. Geography Teachers' Opinions on the Contributions of History to Geography Education

Geography teachers' opinions regarding the contributions of history to geography education were asked, and the findings were presented in Table 3 and Table 4.

Table 3.

Geography Teachers' Opinions Regarding the Contributions of History to Geography Education

Opinions	F
Believe that there is a contribution	15
Believe that there is no contribution	-

As seen in Table 3, all participating geography teachers believe that history contributes to geography education. The teachers' opinions regarding the contributions of history to geography education were presented in Table 4.

Table 4.

Contributions of History to Geography According to Geography Teachers

Contributions	f
Making certain topics understandable	7
Attracting and capturing students' interest and attention	3
Understanding geological eras	2
Instilling a sense of national consciousness	2
Ensuring permanent learning	1
Deepening the subjects	1
Enabling the teacher to have a better grasp of the topics taught	1
Making the lesson enjoyable	1
Showing the impact of geography on historical events	1
Helping students grasp the geographical importance of Turkey	1
Helping students understand our relationships with neighbouring countries	1
Developing children's perspectives on events	1
Raising conscious citizens.	1

Geography teachers have expressed that history is related to geography, specially making significant contributions to the fields of human geography and economic geography. Geography teachers have stated that history contributes most to explaining, understanding, and concretizing geography topics. The second-ranked opinion of teachers is that history is beneficial in attracting students' attention to the subject and fostering their interest and motivation. The third-ranked opinion is about its contributions to understanding geological eras and instilling a sense of national consciousness. Teachers have expressed their opinions once regarding the following contributions of history: ensuring permanent learning, deepening the subjects, enabling the teacher to have a better grasp of the topics, making the lesson enjoyable, showing the impact of geography on historical events, helping students grasp the geographical importance of Turkey, introducing our neighbours and understanding our relationships with them, developing children's perspectives on events, and nurturing conscious citizens. Some teacher opinions are quoted as follows:

P 2: *"Having a high level of historical knowledge allows me to explain events more profoundly.... For instance, when discussing economic policies, we need to cover the economic policies that started with the establishment of our republic. These topics are also part of history. While others may have a superficial understanding of these topics, my affinity for history enables me to delve deeper and provide more information. When talking about population, for example, we refer to the first population census. Why did the Ottoman Empire feel the need for a census? Initially, they conducted male population counts. Why male population? However, without understanding the reasons behind these*

counts, students may fail to grasp their significance fully. Therefore, we need to relate these censuses to historical events. When students ask why such a census was conducted, we can explain that this was done to assess the available manpower for military purposes, especially during times of war. Nevertheless, in Scandinavian countries, the census served different purposes and was not related to war. When we fail to convey this broader perspective to students, and neglect explaining the military needs during the Ottoman Empire's decline, the topic remains superficially understood".

P 5: "In geography, there are geological eras, and in history, there are historical ages. When I explain the oldest geological eras, I tell the children, "You know about historical ages, right? Geological eras are like them." They have been familiar with historical ages since childhood, from around the fourth grade of elementary school, so I try to convey that these are also geographical ages. They encounter geological eras for the first time in the 9th grade".

P6: "Of course, history and geography are the foundation of social sciences.... When explaining the physical structure of the Caucasus, I make a reference to the Caucasian Front to capture the students' attention. We ask why the Caucasus is important for us... Similarly, when discussing Cyprus, I mention that it was once entirely connected to Turkey before the Mediterranean submerged, and I talk about the Cyprus Peace Operation.... When we delve into history, we can instantly go back to the conquest of Cyprus and even as far back as the 1500s. What does this lead to? When we correctly present the connection and relationship between history and geography, we see that they complement each other. History and geography are interconnected; when we integrate them, the enjoyment of the lesson and the appreciation for geography increase. By simplifying the content to the students' level, they find joy in learning. It is essential to convey both national history and national geography. History can be national, and so can geography. The area we live in is our national geography. I am one of the teachers who enjoy using these connections, and I cannot separate them".

P 7: "History has significant contributions to geography education in the tenth grade including topics like cultural centres, geographical discoveries, and transportation systems and in the eleventh grade including the history of civilizations and the first civilizations established in Anatolia. These are the contributions of history to geography education. For example, we refer to Anatolia as the cradle of civilizations. Which civilizations were established? how long did they last, and what cultural heritage did they leave behind? We then synthesize this knowledge with geography to deliver the information. History significantly aids us, especially in these areas. History contributes to understanding and teaching geographical topics by making abstract concepts more concrete. Let me illustrate this with an example: For instance, where was the Urartian established geographically? In Van. History helps us understand by concretising them through topics like the Urartian's early agricultural systems, the fortresses they left behind, and the artifacts found there ...".

P13: "...When talking about human events, such as migration, we inevitably refer to history. History and geography are intertwined in a way particularly in human geography. I believe that history contributes significantly to geography. When I explain the historical context first and then delve into geographical topics, it becomes easier to understand. Sometimes students interrupt the class, saying, "Our lesson is not about history!" However, there are certain topics, such as the migration of tribes or settled life, where we must use history while teaching them".

P 14: "To explain the current situation of any country, one needs to know its historical development. For example, in China, there was a one-child policy, but now it has been changed to a two-child policy. What factors have influenced this policy change? History contributes to understanding historical processes. Especially in human and economic geography, history makes contribution".

P 15: "Exactly, of course. While discussing geographical areas, plains, and geographical locations, we can provide examples of their historical development. People have struggled to possess these lands. We can use this while explaining the geographical location of Anatolia, emphasizing its suitable climate and soil".

3.3. The Way and Forms of History Geography Teachers Use in the Lessons

One of the questions asked to geography teachers is about their utilization of history in their lessons and, if they do use history, how they utilize it. The findings were presented in Table 5 and Table 6.

Table 5.
Geography Teachers' Utilization of History in Their Lessons

Utilization Status	F
Utilizing	15
Not utilizing	-

As seen in Table 5, all geography teachers make use of history. It can be observed that the teachers share the idea that "utilizing history is a necessity", according to the viewpoint of participant P2. The teachers expressed the frequency of their utilization of

history as follows: “generally,” “when necessary,” intensively,” “to the best of their ability,” “frequently,” and “whenever possible.” The forms of teachers’ utilization of history were shown in Table 6.

Table 6.

The Forms of Geography Teachers’ Utilization of History

Forms of Utilization	F
Mentioning historical processes of topics	11
Talking about origins (firsts)	6
Presenting topics by relating them to history	6
Discussing the impact of historical events on geography	5
Utilizing emotions and consciousness transfer	4
Establishing connections between historical ages and geological eras	2
Demonstrating changes	2
Applying the principle of relevance to current events	2
Explaining the history of geography and geographers	1
Screening documentaries related to history	1

It is observed that geography teachers most frequently utilize history in the form of “mentioning historical processes, in other words, chronological development” of topics. The views that teachers mentioned with the same frequency afterwards are “talking about origins (firsts)” and “presenting topics by relating them to history.” Teachers have expressed that they utilize history in discussing topics related to origins (firsts), such as the first settlements, the first civilizations, the first cultural centres, the first population census, and the first forest fire. Regarding the association of topics with history, teachers have stated that they refer to history in appropriate subjects and teach their lessons by providing examples from history. The forms of utilization that teachers have mentioned ranked moderate are “discussing the impact of historical events on geography” and “utilizing emotions and consciousness transfer.” Especially regarding the utilization of emotions and consciousness transfer, it is observed that teachers emphasize national sentiments. Teachers have mentioned the forms of “establishing connections between historical ages and geological eras,” “demonstrating changes,” and “applying the principle of relevance to current events” two times each. On the other hand, the forms of “explaining the history of geography and geographers” and “screening documentaries related to history” were mentioned once each and ranked lower in the responses. Some teachers during the interviews state that incorporating the first two forms of utilization, demonstrating changes, and explaining the history of geography and geographers have already been required by the curriculum. Here are some quotes from the teachers’ opinions:

P 1: “We utilize history within the topics in our curriculum. For instance, when discussing transportation, I talk about the history of transportation and mention the efforts of Abdulaziz and Abdulhamit in this field. While delivering our lessons, especially in economic geography and human geography, I delve into historical processes. When explaining industry, I mention the Izmir Economic Congress. Similarly, when teaching population geography, I talk about the historical development of the population”.

P 2: “In my lessons, I frequently utilize history. For instance, the reason for the emergence of the first civilizations in this region can be attributed to the availability of geographical location. We can say that the climate has a significant effect on the presence of the first civilizations in Egypt, Mesopotamia, and the Mediterranean basin. When explaining why the historical artifacts of civilizations in Mesopotamia did not reach our time, we refer to the geographical climate. We also discuss the Egyptian civilization, highlighting that its historical significance as a strong civilization and its distinctiveness can be attributed to the desert landscapes that surrounded it”.

P 3: “Yes, I try to utilize history as much as possible in my lessons. Especially when discussing migration, I use the historical development of migrations”.

P 6: “...For example, I mostly utilize history through verbal lecturing. When necessary, I mention historical events briefly during the lessons. I also use history for conveying emotions and consciousness to my students....”.

P 7: “Especially regarding history, we can emphasize the historical days of our city, or at least the city where we teach and receive education. For instance, Atatürk’s arrival in Erzurum and the Erzurum Congress are directly related to both history and the historical and geographical aspects of Erzurum. Apart from these, we are currently in May. The conquest of Istanbul took place on May 29th. Perhaps it is one of the greatest victories in Turkish history, and it is essential to emphasize these topics. While describing the geography, I mention these subjects. However, when narrating Atatürk’s arrival in Erzurum, I provide independent information. While discussing topics related to Atatürk, I also offer independent facts about the city. Regarding the conquest of Istanbul, let’s assume that today is May 29th, and I have a class to teach. Here’s how I approach it: After entering the classroom, before introducing my geography lesson, using the principle of relevance in education, I ask questions like, ‘What is significant about today? What does this date remind you of?’ This way, we can create an activity that not only imparts geographical knowledge to our students but also encourages them to understand their past, fostering a connection with history”.

P 8: "Certainly yes... I benefit from it when connecting historical eras with geological eras. Moreover, the evolution of geography as a scientific discipline throughout history, the works of ancient Turkish or foreign geographers and their academic studies, the history of cartography, the developmental process and stages of maps, the changes in economic activities and settlements throughout history, population censuses in history, and the transformations in population policies... These are the ones that come to my mind. These topics, especially when linked to history, help to enrich our lessons".

P11: "I use history in almost every lesson. To instil a sense of patriotism in children, I provide relevant historical examples during discussions. When describing countries, I motivate students by incorporating historical topics into the lessons."

P 12: "I try my best to incorporate history into geography lessons. However, due to time constraints and the need to cover the subject matter, I cannot use it as extensively. Nevertheless, whenever I use historical content, I find that showing a documentary related to the topic helps students grasp the subject better".

3.4. Geography Teachers' Opinions Regarding the Collaboration of Geography Curriculum and Textbooks with the Discipline of History

Geography teachers were asked about their opinions on the collaboration of the geography curriculum and textbooks with the discipline of history. The findings were presented in Table 7.

Table 7.

The Level of Support for Collaboration Between the Geography Curriculum and Textbooks with the Discipline of History According to Geography Teachers

	Adequate	Adequate but needs to be improved	Inadequate	Not specified
Curriculum	1	6	6	2
Textbook	1	5	7	2

It was identified that geography teachers considered the integration of history into the curriculum and textbooks inadequate. However, it is also observed that in almost equal frequency, they consider the curriculum and textbooks adequate but believe there are areas that need to be improved. One of the teachers (P 4) stated that historical topics are included in the textbooks as reading texts and suggested that instead of brief excerpts, there should be more extensive content about history. Another teacher (P 10) suggested that historical information should be presented in textbooks in the form of information pool. On the other hand, another teacher (P 5) proposed that the historical context from the first unit should be integrated into other units throughout the curriculum. Two teachers (P 8 and P10) emphasized the importance of collaborative efforts, particularly the integration of history and geography through group studies. In addition, two teachers (P 9 and P 15) pointed out that the intensity of the curriculum hinders the integration of history with geography. However, three teachers (P2, P7, P10) pointed out that the main responsibility for integrating history lies with the teacher. P2, who finds the textbook inadequate, expressed his views as follows: "I see that there is a lack of historical topics in the geography textbook. In fact, the reflection of history depends more on the teacher than the book." Here are some quotes from the teachers' opinions:

P 4: "Yes, it has been supported... History should be given more inclusion in the geography curriculum and textbooks, with a perspective that draws more lessons from the past. Historical topics are generally presented as reading texts in the textbooks. The content should be covered more extensively".

P 5: "Adding the historical development of geography and Turkish geographers and scientists interested in geography to the 9th-grade geography textbook is a beneficial step. However, in my opinion, this first unit can be interspersed. This should not only be limited to the first unit but spread throughout all units. For example, when explaining Earth's roundness, we should mention Galileo, who was the first to propose this idea. When historical context is provided at the right moment, children are more likely to remember it. Because when everything is presented all at once, it ends abruptly. The child doesn't go back and revisit that unit again. At the beginning of the four-year education process, during the first exam, the child studies. In the remaining 3.5 years, there is no need to go back that content. The initial efforts are good. Hopefully, there will be more to come. There are positive developments, but it's not entirely adequate yet".

P 8: "I cannot say it is adequate for the program. There are inevitably some difficulties... In the new curriculum, there is not much connection between geography and history. Only in the initial topics, there is a historical process of geography, with examples of the interaction between nature and humans. In addition to that, there is also a history of cartography. In the old curriculum, interdisciplinary connections were not very intense... However, this matter absolutely requires collaborative efforts and coordination. When we discuss this in our group meetings, we write it down on paper, but we don't implement it..., emphasis should be placed on the collaboration between teams, especially on history and geography cooperation".

P 10: "As of now, it is inadequate. For instance, our ninth and tenth-grade curricula have changed. Significant historians have been added to the ninth-grade geography curriculum. However, the topics related to history are quite inadequate. This inadequacy applies to the history curriculum as well. For example, when describing Sarıkamış, there should be an information pool about the harsh continental climate of eastern Anatolia. Neither in history nor in geography has there been much interdisciplinary connection. These connections can be provided to students within information pool. This connection is insufficient across all grade levels. There is no such connection in the textbooks. Only in ninth grades, where there are more class hours available, these topics can be addressed more comprehensively. This can be achieved through the teacher's own efforts. It can be carried out with teachers during group meetings".

P13: "I don't believe that the geography curriculum adequately incorporates history. However, I believe that history books should include more information about geography. Currently, there is significant focus on migration in history, but not enough attention is given to other topics related to geography".

P 14: "In the 9th grade, we can mention the historical development of geography. Apart from that, there isn't much. Aristotle, Piri Reis, etc., have contributed to geography. In the 11th grade, there is the historical development of economic policies and population policies implemented in Turkey. The human geography topics in the 11th and 12th grades are also relevant to history. In my opinion, this is normal and adequate. Could there be a better program than this? More benefit could be derived from history".

4. RESULTS, DISCUSSION AND RECOMMENDATIONS

In the research, it was observed that geography teachers, during their undergraduate studies, take courses from other disciplines. However, they do not receive an education that specifically utilizes knowledge from other disciplines in geography education, both at the undergraduate and graduate levels. It is understood that, apart from establishing collaboration with other disciplines during subject group meetings, some teachers personally show interest in other disciplines by participating in relevant courses and reading books. The fact that teachers do not receive training in this content during their undergraduate education or professional careers suggests a lack of an interdisciplinary teaching approach. Indeed, it is suggested in conducted studies that teacher candidates should be provided with interdisciplinary education during their teacher training process (Sağdıç & Demirkaya, 2014), and teachers should receive in-service training on interdisciplinary education during their professional career (Zeren Akbulut, 2019). These recommendations also indicate that there is a lack of an interdisciplinary approach in the teacher training and in-service education programs implemented in Turkey.

It has been observed that geography teachers generally have a high interest level in history. In terms of interest in history, nine teachers responded with high, five with moderate, and one with low interest level. The most significant reasons for geography teachers' interest in history are their longstanding curiosity about history and the professional necessity.

Teachers have mentioned the relationship between the two disciplines and the contribution of history to geography in terms of professional necessity. The views on "family influence," "national sentiments," "desire to know one's origins," "historical artifacts in the library," "love for the Ottoman history," and "the desire to learn our past more accurately" were expressed less frequently. In a research conducted by Jolley and Ayala (2015) with three history teachers and one geography teacher, it was revealed that the teachers were individually interested in geology and archaeology (due to its relevance to historical content), even though they were not directly related to geoarchaeology. Furthermore, they demonstrated personal efforts to acquire more knowledge in these areas. Without even program requirements, it is observed that teachers' individual curiosity enables them to acquire knowledge in different fields.

All geography teachers who participated in the research believe that history contributes to geography education. Teachers stated that history particularly plays a significant role in explaining, understanding, and making geography topics more tangible. Teachers also expressed their views on various contributions of history to geography education, including attracting students' attention and ensuring interest and motivation, understanding geological eras, fostering national consciousness, facilitating permanent learning, deepening the subjects, enabling teachers to be competent on topics, making the lessons enjoyable, demonstrating the impact of geography on historical events, helping students grasp the geographical significance of Turkey, introducing neighboring countries and understanding our relations with them, developing children's perspectives on events, and contributing to citizenship education. In the research conducted by Zeren Akbulut (2019), geography and history teachers expressed their views on the benefits of interdisciplinary teaching including creating cultural awareness, developing expression skills, enhancing transferability of knowledge, fostering analytical thinking and communication skills, and contributing to academic achievement.

In line with the findings obtained in the research, there are other researches that emphasize the importance of this interdisciplinary approach as a significant factor in fostering active student learning (Fisher, 1998 as cited in Hassen, 2015). Vale et al. (2012, as cited in Jolley and Ayala, 2015) also state that in curricula designed with an interdisciplinary approach, students using collaborative interdisciplinary methods will increase their motivation to solve new problems, strengthen their own discipline-specific skills, and learn interdisciplinary communication practices. Jolley and Ayala (2015) state that the interdisciplinary approach, supported by pre-developed curricula and additional resources, will largely contribute to students

in geography education. These positive findings are parallel to the results of this research. According to Karvanková and Popjaková (2018), geography, as a science, lies at the intersection of social, technical, and natural sciences. Due to its content, geography can easily relate to social themes such as social sciences, education, and history. In addition, Karvanková and Popjaková (2018) state that teachers are not very successful in fostering a holistic perspective in their students regarding nature and its interconnected components. They point out that students have difficulty understanding geography topics because they cannot establish connections between them. The reason for this difficulty is attributed to traditional teaching methods and indirectly to the curriculum. Karvanková and Popjaková (2018) argue that the fundamental way to learn a subject effectively and permanently is to present it with all its components and connections. In this regard, they propose that an interdisciplinary approach is the key principle. These views align with the findings of this research, which suggest that history, and accordingly an interdisciplinary approach, facilitate permanent and effective learning in geography lessons. Jolley and Ayala (2015), in line with the mentioned studies, reached the conclusion that students not only achieve geoarchaeological gains but also see the benefits of connecting disciplines to each other. They expressed that such an approach is enjoyable and fun. There are also various studies indicating that delivering geography topics through an interdisciplinary approach is found to be quite enjoyable by students (Craven, 2011; Greenwood, 2013; Jolley & Ayala, 2015). In Craven's (2011) research, which examined an inspiring series of case studies on geography education in schools in the United Kingdom, students prepared a personal heritage and learning journal that included researching their names (first names and surnames), family origins, and changing communities. The statement "students had the opportunity to examine the streets they lived in and see how they changed over time" provides content that supports the teachers' view in the research regarding the contribution of using history in geography education to citizenship education.

All geography teachers utilize history. It is observed that the teachers share K 2' opinion, "*using history is a necessity.*" It is observed that teachers mostly benefit from history in the form of "discussing the historical processes of topics, in other words, chronological development of topics". Teachers have then expressed their use of history in the following order: "mentioning firsts (origins or roots)," "narrating topics by relating them to history," "discussing the impact of geography on historical events," "using it for emotion and consciousness transfer," "establishing connections between historical ages and geological eras," "showing change," "utilizing the principle of relevance," "explaining the history of geography and geographers", and "showing documentaries related to history." During the subject group meetings, some teachers have stated that the ways of discussing historical processes and origins, as well as demonstrating change and explaining the history of geography and geographers, are already required by the curriculum. Sağdıç and Demirkaya (2014) emphasize that the interdisciplinary teaching method is not only a requirement of the curriculum but also a method that geography teachers sometimes consciously and sometimes unconsciously apply, and this method is indispensable. Furthermore, Sağdıç and Demirkaya (2014) refer to the fact that geography teachers mostly communicate with history teachers, and this connection is closely related to the emergence of history and geography sciences, fundamentally based on the relationship between time and place. Indeed, the teachers' expression of establishing a connection between history and geography while explaining topics during the research supports the notion that it is a natural process. This conclusion further supports that geography teachers establish connections with historical topics while presenting their subjects and utilize history to make the topics more concrete and easily understandable. In the research conducted by Alim and Doğanay (2016), geography teachers expressed that when it comes to collaboration in geography classes, especially in the 10th and 12th grades, they consider history as the primary subject with which they can cooperate due to shared topics. In the research conducted by Zeren Akbulut (2019), geography teachers similarly identified various topics where connections could be established between history and geography. Craven's research (2011) likely supports the view that geography teachers can benefit from history for "emotional and conscious transfer." Craven's (2011) historical geography study aimed to encourage students and teachers to think about themselves, their identity, belonging, and their place within their communities in an interdisciplinary manner.

The compatibility of curricula and textbooks is essential in establishing interdisciplinary relationships between subjects. The findings from Scoffham's research (2016) regarding the growing emphasis on interdisciplinary approaches as students' progress through different grade levels align with the notion that teachers sometimes establish connections with historical topics out of necessity due to curriculum requirements. According to Scoffham (2016), as students advance to higher grades, the topics become more comprehensive, leading to an increase in the content supporting interdisciplinary subjects. Consequently, the research concludes that as students progress to higher grade levels, there is a more pronounced emphasis on interdisciplinary approaches supported by the curriculum. In contrast, Greenwood (2013) concluded that as the grade level advances in primary school, there is a decline in curriculum-based interdisciplinary connections between subjects. Greenwood (2013) pointed out that topics are presented more broadly in elementary school and as the grade level increases, a more discipline-focused approach is adopted. The reason for this shift is attributed to the Irish education system's requirement for more discipline-focused examinations. The studies conducted by Scoffham (2016) and Greenwood (2013) have indicated that one of the most crucial factors for the implementation of an interdisciplinary approach in schools is the support of the relevant curriculum for this approach. Greenwood (2013) mentions in his research that, when explaining why teachers opt for cross-curricular approaches at certain levels, a considerable number of teachers cited the school's policy of using interdisciplinary approaches. In Turkey, since lessons are mainly conducted according to centralized educational programs rather than individual school policies, the teachers in the research stated that they established connections based on the curriculum's outlined relationships. Our research revealed that geography teachers perceive the program and textbooks as inadequate in terms of incorporating them with history. It was observed in almost equal frequency that teachers found the program and textbooks adequate, but they also believed that there were aspects that needed improvement. Teachers have suggested several

improvements including more extensive historical content in textbooks, presenting historical information in an information pool, integrating historical aspects from the first unit into other units, reducing the curriculum's intensity, and placing particular importance on history-geography collaboration through subject group studies. In a research conducted by Zeren Akbulut (2019) with history and geography teachers, geography teachers presented recommendations on how to implement interdisciplinary approaches such as providing in-service training on the application of interdisciplinary methods, preparing textbooks that showcase examples of such practices, and designing curricula across different subject areas and simultaneously, and incorporating history and geography courses in teacher education programs at education faculties. In a research conducted by Alim and Doğanay (2016), it was revealed that nearly all geography teachers believed that interdepartmental collaboration and cooperation among colleagues enhance success.

Based on the findings of this research, the following recommendations can be proposed:

Živković et al. (2017) asserted that in order for teachers to integrate innovative teaching models into their daily instructional practices, they should be introduced to these models during their learning process and be given continuous professional development to keep them motivated. Interdisciplinary teaching approach provides more dynamism in the planning and implementation of a specific problem. The connection between the science and social sciences curricula and the geography curriculum highlights the importance of providing students with interdisciplinary access to geographical phenomena, processes, and laws, enabling them to acquire more productive, permanent, and practical knowledge (Živković et al. 2017). Therefore, based on the results of this research and other related research (Baerwald, 2010; Bryce, 1886; Greenwood, 2013; Jolley & Ayala, 2015; Scoffham, 2016; Živković et al., 2017), it is believed that adopting an interdisciplinary approach for all subjects and preparing curricula accordingly would contribute to an increase in the quality of education. The strong interdependence between history and geography subjects requires an interdisciplinary approach.

Another suggestion is to enrich geography teachers' understanding of geography teaching by diversifying their approaches and incorporating effective teaching methods that involve exploring various knowledge domains (Bryce, 1886). Bryce (1886) articulates his intention in his lessons to explore the intersections between geography and history studies and to reflect on the kind of geographical knowledge that a history teacher requires for success. This notion emphasizes the importance of not only geography teachers but also history teachers adopting an interdisciplinary approach by incorporating geography into their teaching. This emphasis highlights the necessity for geography teachers to receive training in interdisciplinary teaching methods.

Through the implementation of an interdisciplinary approach in teaching, students can gain a clearer understanding of the subject matter across various disciplines. According to the Nuffield Primary History website (as cited in Hayes, 2010), 'interdisciplinary learning' is seen as a creative method to enrich children's knowledge, skills, and comprehension and motivates them to learn through interconnected topics. Thus, it is believed that crossing the boundaries of disciplines will enable children to embark on explorations that stimulate their imagination and encourage active questioning, initiative-taking, and engaging in discussions about various topics.

Lastly, providing training to teacher candidates who will implement geography teaching programs based on an interdisciplinary approach is crucial for their future professional careers. Teacher candidates should not only receive instruction on other disciplines but should also undergo practical training in implementing interdisciplinary teaching. Sağdıç and Demirkaya (2014) highlights the importance of including training on how to implement interdisciplinary teaching in the teacher training process for educators who will be practitioners of an interdisciplinary program. Additionally, as highlighted in the literature (Zeren Akbulut, 2019), in-service training should also be provided to current teachers to equip them with interdisciplinary education.

Research and Publication Ethics Statement

Ethical issues were taken into consideration in the research. First of all, ethical approval was obtained for the research with the decision of Atatürk University, Social and Human Sciences Ethics Committee, Educational Sciences Unit Ethics Committee dated 18.02.2021 and numbered 02/11. Before the interviews, the participants were informed about the purpose of the research and that their identity information would be kept confidential and their consent was obtained with the voluntary participation form.

Contribution Rates of Authors to the Article

It can be said that the authors took responsibility in all stages of the study. However, the first author played a more active role in data analysis and writing the findings section, the second author played a more active role in data analysis, writing the introduction and discussion section, and the third author played a more active role in data collection.

Statement of Interest

The authors declared no conflicts of interest with respect to the research.

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A Structural Equation Model of Academic Literacy and Critical and Reflective Thinking Dispositions*

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Article Information	ABSTRACT
Received: 25.05.2025	Academic literacy requires metacognitive skills, such as reading and understanding academic texts, analyzing, making inferences, problem solving, and the ability to create text in academic language. These processes are thought to be effective on both critical and reflective thinking. The purpose of this research is to determine the relationship between pre-service teachers' academic literacy skills and their reflective and critical thinking dispositions. The research employs a relational model, one of the quantitative research methods. The research sample, determined by the cluster sampling method, consists of 975 students studying in Turkish teaching departments of universities in seven different regions of Turkey during the 2019-2020 academic year. While the latent variables of academic disposition and use of knowledge explained 10% of reflective thinking according to the study, this rate increased to 12% when critical thinking was added to the predictor in the first model. Academic literacy of teacher candidates as measured by latent variables of academic disposition and use of knowledge explains 12% of their critical thinking in second model. However, when reflective thinking is added to this equation, it was observed that the rate of prediction increased to 14%. Thus, both models tested were confirmed to be accurate.
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1. INTRODUCTION

Academic literacy has emerged as a concept based on the understanding of multiple and diverse literacy according to different situations and fields (Ahmed, 2011; Gee, 2013; Güneş, 2019) in terms of culture, language and time period (Hagood, 2000; Sheridan-Thomas, 2006; Street, 1997; UNESCO, 2004). It requires metacognitive skills that include reading and understanding the academic text, analyzing the text in terms of its superficial and deep structure, making inferences, and problem solving as well as creating an academic text in a language that frames the content knowledge in a particular discipline (Canlı, 2024; Clark et al., 2002; Cliff & Hanslo, 2010; Eğmir, Beycan & Dede, 2020; Jordaan & Moonsamy, 2015; Junqueira, 2016; Liendo & Palmira Massi, 2017; Weideman, 2003). As such, academic literacy not only involves epistemological foundations such as receiving, understanding, transforming and creating information, but also depends on functional use of literacy skills (Lea, 2004; Lea & Street, 1998; Tardy, 2005; Wingate, 2015), including listening and speaking in addition to reading and writing (Neeley, 2001; Richards & Pilcher, 2018). There are four basic elements of academic literacy depending on the personality and experiences of the individual: scientific discourse which covers expertise, meaning making and understanding the nature of knowledge; participation in the process which includes learning and research skills within the scope of scientific subject area, and finally technical competencies based on functional use of language skills (Dunham, 2012; Huang & Archer, 2017; Lea & Street, 2006). To these three, Ivanič (2004) adds the element of creativity, which focuses on mental processes and creative action, and social practice, which includes writing and the process of using language in a purposeful way (Lillis, 2003). It has been argued that critical (Du Plessis, 2016; Gunn et al., 2011; Kelly & Brower, 2017; Larson, 2014; McWilliams & Allan, 2014; Takano, 2013) and reflective thinking (Arancibia Aguilera, 2014; Henderson & Hirst, 2007; Jonsmoen & Greek, 2017) play an important role in the process of applying these basic elements. In addition, it is hypothesized that the processes required by academic literacy are effective on the elements of critical and reflective thinking. This is because academic literacy, which is defined as the

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construction of knowledge (Dowse & Van Rensburg, 2015), requires the processing of knowledge with critical and reflective processes.

Critical thinking is an intellectual process which involves meta-cognitive skills (Paul, 2005) such as forming hypotheses and questions by breaking down a situation, a problem or information into simpler components in a logical and systematic way (Feldman, 2009; Hoy, 2010; Irving & Williams, 1995). The next step is to present these components for careful scrutiny and create meaning to reach the best possible result, attention, classification (Cottrell, 2005), questioning, problem solving (Bangert-Drowns & Bankert, 1990; Mihriay, 2020) as well as reasoning (Angraini & Wahyuni, 2021). From this perspective, critical thinking requires observing, collecting information, evaluating the quality of information (Nicoll, 1993), determining the necessary methods to evaluate information (Nardi, 2017), being aware of one's own prejudices, not allowing one's thoughts to be manipulated (Brunette & Whitaker, 2019), being open to experience, exhibiting an inquisitive attitude, and avoiding judgment until all basic data have been evaluated (King, 1968; Paul, 2005). Reflective thinking, on the other hand, includes problem-solving skills (Korthagen, 1985; Durak, 2020), logical reasoning, creative mental processes, and critical analysis and judgment, which require the active evaluation of facts, concepts and ideas (Kish et al., 1997; Lombard & Grosser, 2008; Oxman & Barell, 1983; Smith, 1958). In essence, the process is cyclical, that is, critical thinking positively affects reflective thinking, and reflective thinking positively affects critical thinking (Aryani et al., 2017; Batur & Özcan, 2020; Hendriana et al., 2019). This is due to the fact that reflective thinking requires forming hypotheses, evaluating and verifying all information, documents and evidence in a logical, active and persistent way, and then reaching the truth by making inferences through signs and indicators (Carey, 1979; Dewey, 1997).

1.1. Statement of the Problem

Reflective thinking activities, implemented through cooperative learning, have been found to have a substantial positive influence on students' critical thinking abilities (Erdogan, 2019). Additionally, the development of a curriculum that emphasizes critical thinking has been shown to have a positive impact on 5th-grade students' reflective thinking skills in terms of understanding and significance (Eğmir & Ocak, 2018). A study conducted by Aşkın Tekkol and Bozdemir (2018) found a correlation between reflexive thinking inclinations and critical thinking capabilities. The relationships among metacognitive writing strategies, critical thinking skills, and academic writing were examined using structural equation modeling (Teng & Yue, 2023). Another study by A. Göğüş, N. G. Göğüş, and Bahadır (2019) revealed that those with medium-level abilities in critical thinking and reflective thinking are more effective at problem-solving. The effects of employing a pedagogical method centered around critical thinking on both academic literacy (Hammer and Green, 2011) and academic writing proficiency (Borglin, 2012; Borglin & Fagerström, 2012; Ebadi & Rahimi, 2018; Loo, 2020; Pujiono, 2020; Tahir, Dollah & Radiyani, 2020) have been examined. Furthermore, it is believed that academic writing has an impact on the development of critical thinking skills. (Hamied & Emilia, 2020; Islamiyah & Al Fajri, 2020; McKinley, 2013; Suwono et al., 2023; Tohamba, 2021). Statistically significant relationships have been found between academic literacy and critical thinking (Ayyıldız Çolak, 2022; Tekin, Aslan & Yağız, 2016; Türkben & Satılmış, 2022). The correlation between students' critical thinking abilities and their proficiency in academic language (Grosser and Nel, 2013; Wilson, 2016), as well as their competence in academic writing (Rahmat et al., 2020), has been established. The utilization of reflective thinking by PhD students has been shown to positively influence their academic writing skills (Pham et al., 2020). Nevertheless, there has been a lack of study conducted to establish the correlation between academic literacy and the inclination to engage in critical and reflective thinking.

This study planned to test two alternative models. The first model (Model A) is based on the theoretical framework that suggests that academic literacy influences reflective thinking dispositions through critical thinking (Hammer & Green, 2011; Yaacob et al., 2021). The second model (Model B) was developed based on research suggesting that reflective thinking fosters critical thinking skills by increasing an individual's level of mindfulness (Ramdani et al., 2019; Liao & Wang, 2019). Comparatively testing this two-pronged theoretical assumption aims to fill the gap in the literature and provide a more in-depth explanation of the relationship between academic literacy and cognitive thinking skills.

The aim is to examine the correlation between the academic literacy skills of candidate teachers and their reflective and critical thinking tendencies. This will be done by adopting a comprehensive approach and employing an alternative model method known as the structural equality model.

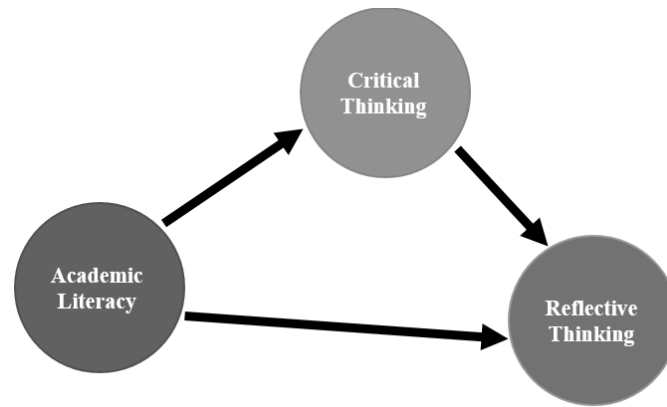


Figure 1. Alternative model A

Academic literacy and critical thinking certainly appear to have an impact on reflective thinking. However, it is also argued in the literature that critical thinking influences the development of reflective thinking skills (Al Hashim, 2019; Yaacob et al., 2021). Therefore, in the first model to be tested, academic literacy was treated as the exogenous variable, critical thinking as the mediator variable and reflective thinking disposition as the endogenous variable.

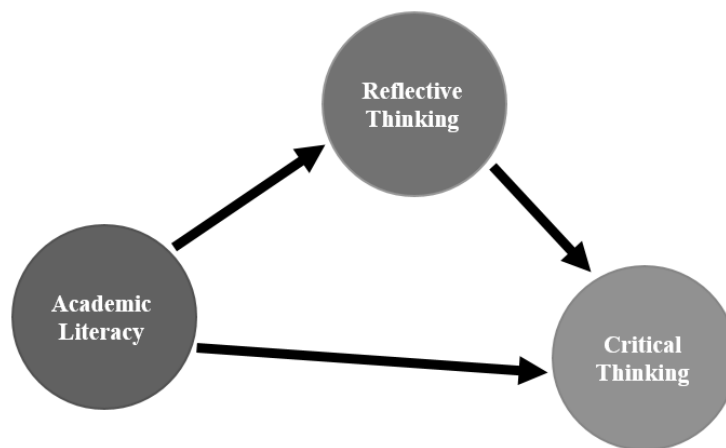


Figure 2. Alternative model B

In addition to the views that were instrumental in creating the first model, it is also stated that reflective thinking improves critical thinking (Deringöl, 2019; Ramdani et al., 2019; Liao & Wang, 2019). From this point of view, in the second model to be tested, reflective thinking is treated as mediator variable and critical thinking disposition as the endogenous variable.

1.2. Purpose of the Study

The aim of the research is to analyze the correlations among academic literacy, critical thinking, and reflective thinking using an alternative model technique. In this context, the aim is to identify direct and indirect relationships between these variables. The study employs Structural Equation Modeling (SEM), which allows for the testing of complex variable relationships and mediation effects within a comprehensive analytical framework. Furthermore, the structural equation modeling approach used in this study also aims to contribute to the field from a methodological perspective by demonstrating the utility of SEM in exploring multi-layered cognitive constructs in educational research.

1.3. Problem of the Study

What is the correlation between the academic literacy of candidate teachers and their levels of critical thinking and reflective thinking?

1.3.1. Sub-problems of the study

To what degree does the level of academic literacy among teacher candidates predict their inclination towards critical thinking?

To what degree does the level of academic literacy among candidate teachers predict their inclination towards reflective thinking?

To what degree does the academic literacy of teacher candidates predict their inclination to engage in reflective thinking using the critical disposition mediator variable?

To what degree does the level of academic literacy in candidate teachers predict their inclination towards critical thinking compared to the reflective disposition mediator variable?

2. METHODOLOGY

The research employed a quantitative research methodology. Quantitative research is a method in which the researcher investigates an issue that necessitates the examination of variables. It entails gathering measurable data from participants and employing statistics and graphs to examine the data within the context of specific, focused inquiries. (Clark & Creswell, 2015). The study was conducted using the correlational research approach. This pattern, known as multivariate analysis, examines the correlation between many factors and identifies which variables have a stronger influence on the others (Creswell, 2012; Sönmez and Alacapınar, 2019). However, in a relational research paradigm conducted on a single group, the independent variable must be either sequential or continuous. (Gliner, Morgan, and Leech, 2017). To elucidate the intricate associations among variables in these patterns, it is advisable to employ structural equation models, hierarchical linear models, and logistic regression approaches for a more comprehensive analysis. (Creswell, 2018). In this research, Structural Equation Modeling (SEM) was specifically employed due to its capacity to simultaneously estimate multiple interrelated relationships among both latent and observed variables, assess mediation effects, and account for measurement error. Considering the multidimensional structure of the constructs examined such as academic literacy, critical thinking, and reflective thinking, SEM offers a theoretically grounded and statistically robust framework to test complex hypothetical models (Kline, 2016; Schumacker and Lomax, 2016).

2.1. Participants

Departments of Turkish teaching at universities in Turkey during the 2019-2020 academic year made up the sample for this research. One university with a Turkish language teaching department from each of Turkey's seven geographical regions was selected through stratified sampling and cluster sampling, both of which are probabilistic sampling designs. In stratified sampling, the universe is divided into sub-layers by the researcher and a sample, in which each subgroup can be represented, is created. (Creswell, 2012). Cluster sampling ensures that the sample is formed by choosing a group in such cases where individuals cannot be selected one by one (Özen & Gül, 2007). The research was carried out with undergraduate teacher candidates at each stage of their education at the selected universities through a probabilistic method.

Table 1.
Sample of the Research

Demographic characteristics		<i>n</i>	%
Grade	1 th grade	224	22.97
	2 th grade	238	24.41
	3 th grade	264	27.08
	4 th grade	249	25.54
Gender	Female Student	663	68.00
	Male Student	312	32.00
Total		975	100

Research was conducted on a total of 975 1st, 2nd, 3rd and 4th grade students studying in the Turkish Education Departments of _____ Universities in the 2019-2020 academic year. The number of participants necessary for SEM analysis does not have a precise numerical value. Barrett (2007) states that a minimum of 200 samples is required for SEM. Nevertheless, Schreiber et al. (2006) suggest utilizing 10 samples for each parameter. The study encompassed a total of 11 parameters, comprising 5 variances, 6 regression coefficients, and one covariance. Out of the 975 samples, the parameter was computed for sample number 88.63. Thus, it was concluded that the sample size was sufficient.

2.2. Data Collection Tools

2.2.1. Academic Literacy Scale

Cronbach's Alpha reliability coefficients of the 23-item three-factor scale developed by Demir and Deniz (2020) for pre-service teachers were as follows: .84 for academic disposition, .78 for research process, .76 for use of knowledge, and .87 for the overall scale. The construct reliability of the factors was .81 for writing process, .80 for avoidance, and .68 for writing pleasure. The scale was validated by confirmatory factor analysis ($\chi^2=457.55$, $sd=226$, $RMSEA=.045$, $SRMR=.053$, $NFI=.91$, $NNFI=.95$, $CFI=.95$, $GFI=.92$, $AGFI=.91$) and the internal consistency coefficient of the scale was noted to be .72.

2.2.2. Critical Thinking Disposition Scale

Cronbach's Alpha reliability coefficients of the three-dimensional, 11-item, five-point Likert-type scale developed by Akin et al., (2015) were as follows: .75 for critical openness, .68 for reflective skepticism, and .78 for the overall scale. The construct reliability of the factors were .92 for writing process, .93 for avoidance, and .72 for writing pleasure. The scale was validated by

confirmatory factor analysis ($\chi^2=53.24$, $df=40$, $RMSEA=.040$, $NFI=.90$, $NNFI=.96$, $GFI=.96$, $AGFI=.93$, $CFI=.97$, $IFI=.97$, $SRMR=.046$).

2.2.3. Reflective Thinking Level Scale

It was determined that the reliability values, test-retest and internal consistency values of the five-point Likert type scale with 16 items and four factors developed by Başol and Evin-Gencil (2013) were above 70 for the overall scale. The scale was validated by confirmatory factor analysis ($\chi^2/df=4.48$; $GFI=.93$; $AGFI=.90$; $NNFI=.92$; $CFI=.93$; $RMSEA=.07$).

2.3. Data Collection and Analysis

Necessary permissions were obtained from the Firat University Social and Human Sciences Scientific Research and Publication Ethics Committee and the Ministry of National Education for data collection. The voluntary nature of participation was emphasized during the collection of data. According to the multiple normality analysis performed, the kurtosis and skewness values were found to be between ± 1 (Tabachnick & Fidell, 2015). In addition, it can be said that the mean, median, peak value, kurtosis, skewness values are normal according to p-p, q-q, stem-leaf, box and line graphs (Tabachnick & Fidell, 2015). Accordingly, Cronbach's Alpha coefficients were found to be over 70%. Correlation analysis was performed and the level of correlation between endogeneity and exogenous variables was calculated. According to Davis (1971), interpretation of the correlation coefficient (r) is as follows: between .01-.09 there is a negligible relationship; between .10-.29 is a low correlation; between .30-.49 the relationship is average; .50-.69 demonstrates a strong relationship; and .70 or above means a very strong relationship. According to Cohen (1988), if the multiple regression coefficient (R^2) is less than .0196, then the effect is small; if $.1300 \geq R^2 \geq .0196$ then it is medium; if higher than .2600, then the effect is large (S. Özsoy & G. Özsoy, 2013). The correlation analysis shows that there are strong, medium, and low levels of significant relationships between the variables, indicating that structural path analysis can be performed. As a result of the structural path analysis, the compatibility of the tested models was determined using the chi-square (χ^2), the ratio of chi-square to standard deviation, RMSA, standardized RMR, NFI, NNFI, CFI, GFI and adjusted goodness-of-fit index (AGFI) (Çokluk et al., 2012).

3. FINDINGS

Under this heading, the findings obtained as a result of the analyses are tabulated and interpreted:

Table 2.

Multiple Linear Correlation Results

Scales	1.	1.1.	1.2.	1.3.	2.	3.
1. ACADEMIC LITERACY		.70**	.72**	.81**	.51**	.29**
1.1. Academic Disposition			.37**	.33**	.58**	.36**
1.2. Research Process				.33**	.39**	.30**
1.3. Use of Knowledge					.25**	.06
2. CRITICAL THINKING						.49**
3. REFLECTIVE THINKING						
M	3.74	4.17	3.64	3.41	4.04	3.68
Std. deviation	.34	.39	.40	.57	.41	.40
Skewness	.20	-.15	.01	.08	-.13	.09
Kurtosis	-.14	-.41	-.21	-.19	-.41	-.17
Cronbach's α	.70	.71	.73	.70	.73	.71

* $p < .05$, ** $p < .01$

As a result of the multiple linear correlation analysis, a strong positive and significant relationship was found between academic literacy and critical thinking ($r=.51$, $p<.01$). Likewise, a strong positive correlation was found between academic disposition and critical thinking ($r=.58$, $p<.01$). Positive moderate correlations were found between academic disposition and reflective thinking ($r=.36$, $p<.01$) research process and critical thinking ($r=.39$, $p<.01$), research process and reflective thinking ($r=.30$, $p<.01$). A moderately significant positive correlation was found between critical thinking and reflective thinking ($r=.49$, $p<.01$). A low level of positive correlation was found between academic literacy and reflective thinking ($r=.28$, $p<.01$). Similarly, a low-level positive correlation was found between the use of knowledge and critical thinking. However, a negligible relationship was found between the use of knowledge and reflective thinking.

Table 3.

Model Fit Extents for Model A

Fit Extents	Value	Fit
χ^2	.00	Perfect Fit
$\chi^2/sd=1188$	.00	Perfect Fit
RMSEA	.00	Perfect Fit
Standardized RMR	.00	Perfect Fit
NFI	1.00	Perfect Fit
NNFI	1.00	Perfect Fit
CFI	1.00	Perfect Fit
GFI	1.00	Perfect Fit
AGFI	1.00	Perfect Fit

It is generally preferred that the chi-square value of the model be close to zero. Indeed, the chi-square value of the applied model was zero ($\chi^2 = .00$). The fact that the χ^2/sd ratio is less than 2 at the value of .00 indicates that the model has a perfect fit (Tabachnick & Fidell, 2001). The RMSA and Standardized RMR values below .05 and at .00 indicate that the model has a perfect fit. NFI, NNFI, CFI, GFI and AGFI values of 1.00 indicate a perfect fit. Based on the findings, it can be stated that the model has a good fit. Performing structural regression and path analysis with large samples causes the p value to be significant (Çokluk et al., 2012).

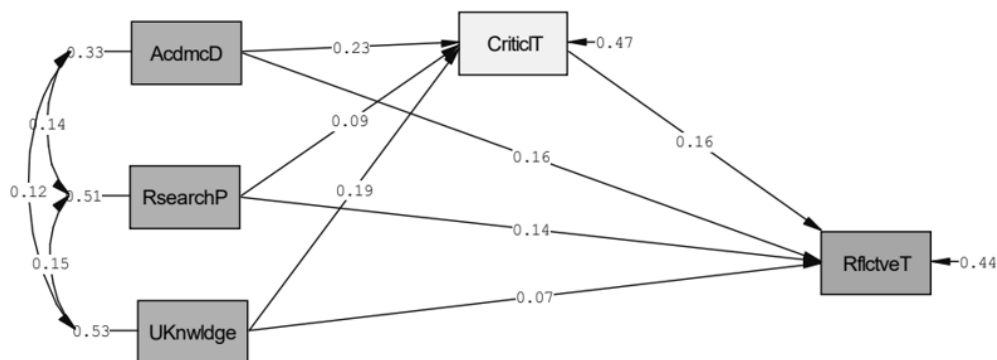


Figure 3. Path analysis for Model A

Academic disposition significantly predicted critical thinking ($\beta=.23$) and reflective thinking ($\beta=.16$), while critical thinking significantly predicted reflective thinking ($\beta=.16$). The indirect effect of academic disposition on reflective thinking ($\beta=.04$) is significant. The research process significantly predicted critical thinking ($\beta=.09$) and reflective thinking ($\beta=.14$). The indirect effect of academic disposition on reflective thinking ($\beta=.01$) is not significant. The research process significantly predicted critical thinking ($\beta=.19$) and reflective thinking ($\beta=.07$). The indirect effect of academic disposition on reflective thinking ($\beta=.03$) is significant.

Table 4.

Equations Between Extrinsic Latent Variables for Model A

Structural Equations	R ²
$CritclT = 0.23*AcadmD + 0.094*RsearchP + 0.19*UKnwldge$	.12
$RflctveT = 0.16*CritclT + 0.16*AcadmD + 0.14*RsearchP + 0.067*UKnwldge$	.12
Reduced Form Equations	R ²
$CritclT = 0.23*AcadmD + 0.094*RsearchP + 0.19*UKnwldge$	.12
$RflctveT = 0.20*AcadmD + 0.16*RsearchP + 0.097*UKnwldge$	.10

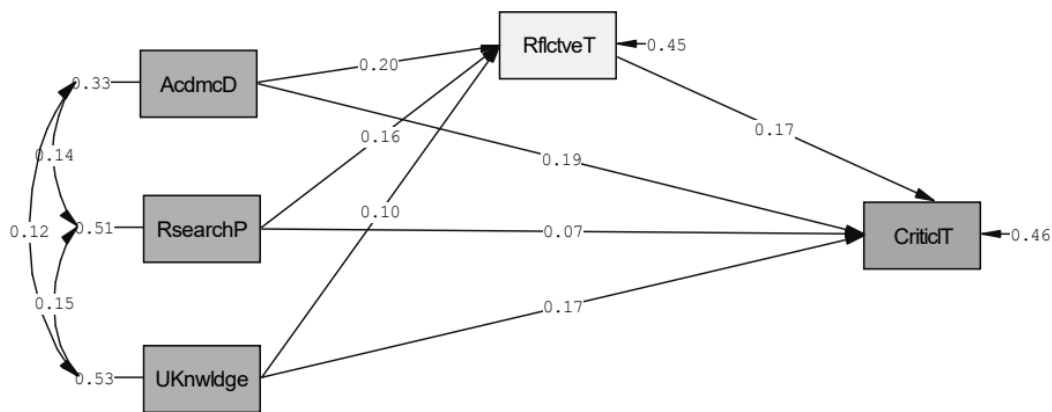
Academic literacy of teacher candidates, measured by latent variables of academic disposition and knowledge use, explains 12% of their critical thinking. While the latent variables of academic disposition and use of knowledge explained 10% of reflective thinking, this rate increased to 12% when critical thinking was added to the predictor.

Table 5.

Model Fit Extents for Model B

Fit Extents	Value	Fit
χ^2	.00	$p > .05$
$\chi^2/df=1188$	.00	Perfect Fit
RMSEA	.00	Perfect Fit
Standardized RMR	.00	Perfect Fit
NFI	1.00	Perfect Fit
NNFI	1.00	Perfect Fit
CFI	1.00	Perfect Fit
GFI	1.00	Perfect Fit
AGFI	1.00	Perfect Fit

The chi-square value of the model is desirably zero ($\chi^2 = .00$). The fact that the χ^2/df ratio is less than 2 at the value of .00 indicates that the model has a perfect fit (Tabachnick & Fidell, 2001). The RMSEA and Standardized RMR values below .05 and at .00 indicate that the model has a perfect fit. NFI, NNFI, CFI, GFI and AGFI values of 1.00 indicate a perfect fit. Based on the findings, it can be stated that the model has a good fit.



Chi-Square=0.00, df=0, P-value=1.00000, RMSEA=0.000

Figure 4. Path analysis for Model B

Academic disposition significantly predicted critical thinking ($\beta = .23$) and reflective thinking ($\beta = .16$), while critical thinking significantly predicted reflective thinking ($\beta = .16$). The indirect effect of academic disposition on reflective thinking ($\beta = .04$ /small) is significant with medium effect. The research process significantly predicted critical thinking ($\beta = .09$ /small) and reflective thinking ($\beta = .14$). The indirect effect of academic disposition on reflective thinking ($\beta = .01$) significant with negligible effect size. The research process significantly predicted critical thinking ($\beta = .19$ /medium) and reflective thinking ($\beta = .07$ /small). The indirect effect of academic disposition on reflective thinking ($\beta = .03$) is significant with small effect.

Table 6.

Equations Between Extrinsic Latent Variables for Model B

Structural Equations	R ²
CritclT = 0.17* RflctveT + 0.19* Acdmcd + 0.068* RsearchP + 0.17* UKnwldge,	.14
RflctveT = 0.20*Acdmcd + 0.16*RsearchP + 0.097*UKnwldge	.10
Reduced Form Equations	R ²
CritclT = 0.23*Acdmcd + 0.094*RsearchP + 0.19*UKnwldge	.12
RflctveT = 0.20*Acdmcd + 0.16*RsearchP + 0.097*UKnwldge	.10

The latent variables of academic disposition and use of knowledge explain 10% of reflective thinking. Academic literacy of teacher candidates, as measured by latent variables of academic disposition and use of knowledge, explains 12% of their critical thinking. However, when reflective thinking is added to this equation, it was observed that the rate of prediction increased to 14%.

4. RESULTS, DISCUSSION AND RECOMMENDATIONS

A moderate positive correlation was found between academic disposition, which is a sub-dimension of academic literacy, and reflective thinking. However, a negligible relationship was found between the use of knowledge and reflective thinking. In addition, a moderate positive correlation was found between the research process and reflective thinking because organizing information and activating it during new experiences and research leads to new discoveries. Reflective thinking facilitates and helps manage these skills successfully. This indicates that reflective thinking supports the functional application of academic

processes, especially during research and problem-solving. Latent variables, academic disposition and use of knowledge predicted reflective thinking at low level significance. With the addition of critical thinking to the established equation, the rate of prediction increased. The effect of critical thinking, which enables the logical and systematic analysis and selection of information, helped explain this. This shows that critical thinking reinforces the reflective process by adding a logical structure to how knowledge is processed. It is believed that individuals with high academic literacy tendencies also have high reflective thinking skills based on the ability to organize their views, thoughts and knowledge from previous experiences and apply them going forward. This is a natural fit, considering that the processes involved in academic literacy are directly related to these skills. Therefore, reflective thinking can be seen as both a product and a facilitator of academic literacy. The finding that academic reflective writing skills of university students develop as a result of the development of their reflective thinking skills supports this inference (Bowman, 2021). This emphasizes the importance of reflection in strengthening academic writing competence. It was also found that Turkish language literature teacher candidates developed positive attitudes towards academic writing after reflective teaching practices (Aydın, 2017). Such practices appear to enhance engagement and motivation in academic writing tasks. There is also evidence to support the claim that the academic performance of university students who have good reflective writing skills supersedes that of their peers (Tsingos-Lucas et al., 2017).

There was a strong positive relationship between academic disposition and critical thinking, which is a sub-dimension of academic literacy, in addition to a moderate positive relationship between the research process and critical thinking. Low positive correlations were found between the use of knowledge, another sub-dimension of academic literacy, and critical thinking. Pre-service teachers' academic disposition and use of knowledge explain their critical thinking at a low level. However, with the addition of reflective thinking to the equation, the effect of the prediction increases to a moderate level. This reinforces the view that reflective thinking acts as a complementary factor in critical thinking development. It is undeniable that reflective thinking skills are also effective in the stages of selecting, processing and organizing the information thinking through the filter of logic and questioning, which are part of critical thinking. In addition, critical thinking based on inquiry and analysis brings new ideas and discoveries. Hence, both reflective and critical thinking processes are essential for higher-order learning and knowledge production. All of this helps to explain why such skills are at a higher level in individuals with an academic literacy disposition. Graduate students are able to learn more easily and successfully apply the given critical thinking techniques and improve their academic literacy skills during academic literacy education (Islamiyah & Al Fajri, 2020). This finding highlights the value of incorporating critical thinking skills training into academic literacy programs. A statistically significant strong relationship was found between pre-service teachers' academic writing skills and their critical thinking disposition (Bayat, 2014). This supports the notion that critical thinking directly contributes to the organization and clarity of academic texts. Similarly, a low-level positive correlation was found between the knowledge use sub-dimension of academic literacy and critical thinking. It has been found that the activities carried out during academic literacy education contribute to the critical thinking skills of teacher candidates (Hamied & Emilia, 2020). This underlines the importance of designing academic literacy instruction that targets analytical skill development. In support of this, a statistically significant medium-sized positive relationship was found between teacher candidates' academic literacy and their critical thinking dispositions. (Türkben & Satılmış, 2022; Ayyıldız Çolak, 2022). Similarly, it has been determined that as the science literacy of science teacher candidates increases, their critical thinking tendencies also increase statistically (Tekin, Aslan, & Yağız, 2016). It was concluded that critical thinking skills should be developed in order for students to write coherently and consistently. (McKinley, 2013). Another finding was that critical thinking education appeared to increase the writing performance and critical thinking disposition of university students (Taghinezhad et al., 2018), and support their academic writing skills (Borglin, 2012; Borglin & Fagerström, 2012; Ebadi & Rahimi 2018; Loo, 2020; Pujiono, 2020; Tahir et al., 2020). This reveals the dual benefit of thinking-focused instruction in fostering both reasoning and writing. However, it has been determined that critical thinking-based activities support scientific literacy (Suwono et al., 2023). Academic writing is also said to improve critical thinking (Hamied & Emilia, 2020; Tohamba, 2021). In the structural equation modeling conducted between metacognitive writing strategies, critical thinking skills and academic writing, positive relationships were found between the variables (Teng & Yue, 2023). Another noteworthy relationship exists between students' critical thinking skills and academic language proficiency (Grosser & Nel, 2013; Wilson, 2016), and academic writing skills (Rahmat et al. 2020). In a study conducted on doctoral students, it was determined that practices based on reflective thinking affect academic writing skills positively (Pham et al., 2020). This supports the view that reflection-based approaches are especially valuable in advanced academic contexts.

A significant, positive and moderate relationship was found between critical thinking and reflective thinking. Both models determined that the prediction rates increase when reflective thinking or critical thinking are added to the equation. Positive and significant relationships were found between pre-service teachers' reflective thinking skills and critical thinking skills (Tekkol & Bozdemir, 2018; A. Göğüş, N. G. Göğüş & Bahadır, 2019; Eğmir & Ocak, 2020; Erdoğan, 2020). Pre-service teachers' critical thinking skills predict reflective thinking skills at a moderate level (Erdoğan, 2020). Based on the results, university students' critical thinking skills act as a significant predictor of their reflective thinking skills, and reflective thinking skills can also be a significant predictor of their critical thinking skills (Ghanizadeh, 2017).

Based on the conclusion that academic literacy predicts critical and reflective thinking skills, activities that develop different thinking skills should be implemented in practices for the development of students' academic literacy skills. In this context, task-based and inquiry-oriented approaches gain importance. Similar studies can be conducted on different thinking skills or metacognitive skills that will be affected by academic literacy. In order to improve academic literacy, problems in the field can

be identified through action or situational research. And existing methods can also definitely be improved. Such efforts would contribute directly to producing more autonomous, critical, and reflective learners.

Research and Publication Ethics Statement

This research received ethical approval from the Firat University Social and Human Sciences Research Ethics Committee at its 12th meeting held on 15 November 2018 (Decision No: 4) and documented under Approval No: 295117, dated 21 November 2018.

Contribution Rates of Authors to the Article

First author, who designed the research and carried out the analysis, wrote methods, findings and suggestions. Second author, who conducted the data collection process, wrote the introduction and discussion.

Statement of Interest

Authors there's no financial/personal interest or belief that could affect their objectivity. The authors saw the final version of the article and approved to submit it to the journal.

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YAYIN İLKELERİ VE YAZIM KURALLARI

1. YAYIN İLKELERİ

Hacettepe Üniversitesi Eğitim Fakültesi Dergisi, yılda dört kez (Ocak, Nisan, Temmuz, Ekim) yayınlanan uluslararası hakemli bir dergidir ve aşağıda belirtilen ilkeler doğrultusunda yayın yapmaktadır:

1. Dergimiz, yayın politikası gereğince, eğitimin tüm alanlarıyla ilgili nicel ve nitel özgün araştırma makaleleri ile derlemelere yer vermektedir.

2. Derginin yayın dili İngilizce'dir.

3. Dergiye gönderilen makalelerin başka bir yerde yayınlanmamış veya yayınlanmak üzere eş zamanlı olarak başka bir dergiye gönderilmemiş olması gerekmektedir. Hacettepe Üniversitesi Eğitim Fakültesi Dergisi yayınlanmak üzere kabul edilen makalelerin tüm yayın haklarına sahiptir.

4. Dergiye gönderilecek makalelerin <https://dergipark.org.tr/> adresinden yüklenmesi gerekmektedir. Baş Editöre, Yayın Kurulu üyelerine veya dergi iletişim e-posta adresine gönderilen makaleler resmi başvuru olarak kabul edilmemektedir.

5. Dergiye gönderilen makaleler ilk olarak şekil incelemesinden geçirilir. Dergi şablonuna uygun olarak hazırlanan makaleler daha sonra Baş Editöre gönderilir. Baş Editör ve Yayın Kurulu tarafından derginin yayın ilkelerine uygunluğu incelenir ve uygun görülen makaleler alan editörlerine atanır. Alan editörleri makaleleri alanın var olan bilgi birikimine katkısı yönünden inceler ve uygun görürlerse makaleyi hakemlere gönderirler. Ön inceleme aşamalarında aşağıdaki noktalar göz önünde bulundurulur:

- a) Yayın etiğine uygunluğu
- b) Dergi yayın ilkelerine uygunluğu
- c) Çalışmanın konusunun bilimsel açıdan özgünlüğü ve güncelliği
- d) Çalışma konusunun eğitime katkısı
- e) Yazım kurallarına ve makale yazım şablonuna uygunluğu

6. Ön incelemeler sonucunda uygun olduğuna karar verilen çalışmalar bilimsel açıdan değerlendirilmesi için hakemlere gönderilir. Hakem raporlarına dayalı olarak makalelerin yayınlanıp yayınlanmayacağına Baş Editör ve alan editörleri karar verir. Gerek duyulması durumunda çalışmalar, hakemlerden gelen eleştiri ve öneriler doğrultusunda, gözden geçirilmesi veya önerilen düzeltmelerin yapılması için yazarlara geri gönderilir.

7. Yazar(lar)la hakemler arasındaki iletişimi sadece Baş Editör ve alan editörleri sağlar. Dergide makalelerin değerlendirilmesi sürecinde çift taraflı kör hakemlik sistemi uygulanmaktadır.

8. Yayına kabul edilen makalelerin basılması için, yazar(lar) tarafından yükümlülük formunun imzalanması ve dergiye iletilmesi gerekmektedir. Ayrıca, yazar(lar)dan makaleyi bir intihal kontrol programı ile taramaları ve intihal kontrol programının ürettiği en çok % 10 benzerlik oranının olduğunu belgeleyen bir program çıktısını, garanti ve yükümlülük formuyla beraber göndermeleri istenir.

9. Hakemlerden gelen dönütler ve Baş Editör ile alan editörlerin kararına bağlı olarak dergiye gönderilen makalelerin ilk tur hakem değerlendirme süreçlerinin yaklaşık olarak 6-8 hafta sürmesi öngörülmektedir. Ancak bu süre alandan alana değişebilir. Değerlendirme yapmayı kabul etmeyen hakem olması durumunda süre uzayabilmektedir.

10. Yayına kabul edilen ve son biçimi verilen makaleler üzerinde yazar(lar) değişiklik yapamaz.

11. Yayınlanan makalenin içeriğinden (kaynakların ve alıntılarının doğruluğundan, ileri sürülen görüşlerden ve telif hakkı olan çizelge, resim ve diğer görsellerden) yazar(lar) sorumludur.

12. Gelecek sayılarda basılmak üzere doi numarası verilen makaleler, **doi numarası sırasına veya kabul tarihine göre değil** makalelerin konuları ve alanları temel alınarak basılmaktadır. Her bir sayıda basılacak olan makaleler eğitimin farklı alanları dikkate alınarak Baş Editör tarafından belirlenmektedir.

13. Yayına kabul edilen makaleler için yazar(lar)a ve hakemlere ücret ödenmez.

14. Açık erişim politikası gereğince, dergi sayıları ve makaleler derginin web sayfasında yer alır ve makalelerin tam metinlerine pdf dosyası olarak erişilebilir.

15. ULAKBİM TR Dizin kuralları gereği makalelerde yer alan tüm yazarların ORCID numaralarının makalenin son şekline eklenerek gönderilmesi gerekmektedir. ORCID numarası eksik yazarlara ait makalelere doi numarası verilmez ve erken görünüm olarak yayına açılmaz.

2. YAZIM KURALLARI

2.1. BAŞLIK VE DİPNOTLAR

Makale başlığı iki yana yaslı, 12 punto, koyu ve Cambria yazı tipinde, en çok 15 sözcük, bağlaçlar hariç her sözcüğün ilk harfi büyük olarak yazılmalıdır. Türkçe yazılmış makalelerde makalenin İngilizce başlığına da aynı biçim kullanılarak yer verilmelidir. Makale ile ilgili olarak, tezden üretilme, bir konferansta sunulma veya proje kapsamında yapılma gibi özel durumlar varsa (*) ile başlayan bir dipnot ile yazılmalıdır. Bu ekleme makale kabul edildikten sonra gerçekleştirilecektir. Yazar kimliklerinin tahmin edilmesine neden olabileceği için, yazarların makale gönderimi sırasında böyle bir dipnota yer vermemeleri gerekmektedir. Makale geliş, kabul, erken görünüm ve basım tarihlerinin eklenmesi ve makalenin APA 7 referans verme stiline göre Türkçe ve İngilizce kaynak gösterimleri, kabul süreci sonrasında editörlerce yapılacaktır. Bu nedenle ilk aşamada bu alanların şablondaki gibi bırakılması gerekmektedir.

Çalışma kabul edildikten sonra çalışmanın yazar(lar)ının adı soyadı ortalı, koyu, 11 punto, Cambria yazı tipinde, soyadı büyük harflerle ve ortalanmış olarak, yazar sayısı birden fazla ise yazarlar tarafından belirlenen sırayla yazılacaktır. Yazar(lar)ın unvanıyla birlikte, çalıştığı yerin açık adı, şehir-ülke bilgisi, e-posta adresi ve ORCID numarası, başlığın altındaki yazar ismi ya da isimleriyle eşleştirilmiş dipnotlarla (*) belirtmeli ve makalenin ilk sayfasının altındaki dipnotta yer almalıdır. Bu ekleme makale kabul edildikten sonra gerçekleştirilecektir. Yazar kimliklerinin tahmin edilmesine neden olabileceği için, yazarların makale gönderimi sırasında böyle bir dipnota yer vermemeleri gerekmektedir.

Dipnotlar için ek açıklama: Çalışma herhangi bir bilimsel etkinlikte bildiri olarak sunulmuş ise, makalenin başlığına dipnot simgesi (*) konularak, makalenin ilk sayfasının altında etkinliğin adı, yeri ve tarihi belirtilmelidir. Çalışma herhangi bir araştırma kurumu ya da fonu tarafından desteklenmiş ise, makalenin başlığına dipnot simgesi (*) konularak, desteği sağlayan kuruluşun adı, projenin numarası ve tamamlandığı tarih ilk sayfanın altında belirtilmelidir. Çalışma lisansüstü tezlerden üretilmiş ise, makalenin başlığına dipnot simgesi (*) konularak, tezin adı, danışmanın adı ve tamamlandığı tarih ilk sayfanın altında belirtilmelidir. Dipnotlardaki tüm bilgiler Palatino Linotype yazı tipinde, girintisiz ve 10 punto olmalıdır.

2.2. MAKALE DİLİ VE ÖZET

Makaleler İngilizce dilinde hazırlanıp gönderilecektir. İngilizce kısa özet, Cambria yazı tipinde, 9 punto ve 300 sözcüğü geçmeyecek şekilde tek sütun ve iki yana yaslı olarak şablonda belirtilen alana yazılmalıdır. Kısa özet içinde kaynak verilmemelidir. Her kısa özeti altında, çalışmayı betimleyen 2-5 anahtar sözcük bulunmalıdır.

3. BÖLÜMLER VE ALT BÖLÜMLER

Çalışmalarda ana bölüm başlıkları (birinci düzey başlıklar) Arabik rakamlarla numaralandırılarak Cambria yazı tipinde, 11 punto, koyu, sola yaslı ve tümü büyük harf biçiminde yazılmalıdır. Alt bölüm başlıkları (ikinci düzey başlıklar) Cambria yazı tipinde, 11 punto, koyu, sola yaslı, her sözcüğün ilk harfi büyük olarak yazılmalıdır. Üçüncü

düzey başlıklar ise Cambria, 11 punto, koyu, italik, sola yaslı, yalnızca ilk sözcüğün ilk harfi büyük olacak biçimde yazılmalıdır.

Metin içindeki paragraflar en az üç cümleden oluşmalı ve paragraflar arasında bir satır boşluğu bırakılmalıdır. Aynı şekilde başlıkların öncesinde ve sonrasında da bir satır boşluk verilmelidir. Makalenin tamamında girintiye yer verilmemeli, paragraflar arasında önce ve sonra aralık değerleri 0 olmalıdır. Metin içi atıfların yazımında, tablolarda, şekillerde ve kaynakça yazımında APA 7 yazım stili kullanılmalıdır.

Çalışmalarda ana bölümler sırasıyla;

- GİRİŞ
- YÖNTEM
 - Evren ve örneklem/Çalışma Grubu/Katılımcılar/Denekler (bunlardan sadece biri)
 - Veri toplama yöntem(ler)i/teknikleri/araçları
 - Verilerin analizi
- BULGULAR
- TARTIŞMA, SONUÇ VE ÖNERİLER
- KAYNAKLAR

gibi temel bölümlerinden oluşmalıdır. Bununla birlikte çalışmalarda kullanılan yönetime göre yazarlar ilave bölüm veya alt bölümler oluşturabilirler.

Ana metine “1. GİRİŞ” alt başlığı yazılarak başlanmalıdır. YÖNTEM, BULGULAR ve TARTIŞMA, SONUÇ VE ÖNERİLER bölümlerine yeni sayfadan başlanmamalı, bir bölüm bittikten sonra, aynı sayfada diğeri onu izlemelidir. Sıklıkla kullanılan istatistiksel tekniklerin sunulmasında APA 7 yazım stili temel alınarak, istatistiksel değerlere cümleler içerisinde yer verilmelidir. Bununla birlikte, uygun yerlerde yazar(lar) tablolar ve şekillerden faydalanabilirler. Makale metninin tamamının yazımında APA 7 yazım stili kullanılmalıdır.

4. ŞEKİLLER

Şekiller yazım alanından taşmayacak şekilde makale içinde uygun görülen yerlere ortalı olacak şekilde yerleştirilebilir. Ana metinden şekle atıfta bulunulmalı ve mümkünse şekil açıklamalıdır. Her bir şeklin altında Arabik rakamlarla numaralandırılmış bir şekil başlığı yerleştirilmeli, makale boyunca aynı numaralandırma devam etmeli ve APA 7 yazım stiline uygun olarak yazılmalıdır. Şekil başlıkları biçim olarak Cambria yazı tipinde, 10 punto, sola yaslı, yalnızca ilk sözcüğün ilk harfi büyük olacak şekilde yazılmalıdır. Şekil başlığında kaynak kullanılmış ise parantez içinde kaynak bilgisi eklenmelidir. Eğer şekil içinde yazılar varsa, 9veya 10 punto olacak şekilde Cambria yazı tipiyle yazılabilir.

5. TABLOLAR

Tablolar sola dayalı olacak şekilde ve tamamında Cambria yazı tipi kullanılarak hazırlanmalıdır. Tablo başlığı, 10 punto ile yazılmalı, başlığın her kelimesinin sadece ilk harfi büyük olmalı ve başlık, tablo sayısının altında verilmelidir. Tablolarda APA 7 yazım stili kullanılmalıdır. Tablolara metin içinde tablo sayısı belirtilerek atıfta bulunulmalı ve tablo bittikten sonra yorumlanmalıdır. Tablolar, metin içinde kullanıldıkları yerde veya izleyen sayfada yer almalıdır. İlgili not ve kaynaklar, tablonun altında, “Not:” veya “Kaynak:” ifadelerinden sonra belirtilebilir.

6. KAYNAKLARIN BELİRTİLMESİ

Makalenin sonunda, varsa ek(ler)den önce kaynaklar, APA 7 yazım stiline uygun olarak verilmelidir. Kaynakların tamamı, 10 punto ile ve her bir kaynağın arasında 1 satır boşluk verilerek, Cambria yazı tipinde ve iki yana yaslı, tek satır aralığında, önce ve sonra paragraf değerleri 0 olacak şekilde, girintiye yer vermeden yazılmalıdır. Kaynakçada yer alan her kaynağa metin içinden atıfta bulunulduğundan, yine aynı şekilde metin içinde kullanılan her bir kaynağa da kaynakçada yer verildiğinden emin olunmalıdır.

7. EKLER

Yazar(lar) ihtiyaç duyarlarsa kaynakçadan sonra ve geniş özetten önce, Ekler bölümü oluşturabilirler. Bu kısımda verilecek eklere makale içinden mutlaka atıfta bulunulmalıdır. Birden fazla ek kullanılacaksa numaralandırılabilir.

Yazarların eklere koyacakları eklentilerin makale içinde verilmesi durumunda bütünlüğü bozacak biçimde olması gerekmektedir. Makale içinde tablo veya şekil ile verilebilecek unsurlara Ekler’de yer verilmemelidir.

8. MAKALE ŞABLONU

Bir makale çalışmasıyla ilgili bütün ayrıntılara “Yazım Kuralları”nda burada belirtilmemiş olabilir. Biçimlendirmeye ilgili daha ayrıntılı bilgi, dergiye yollanacak çalışmalar için kullanılması gereken şablon dosyada bulunmaktadır. Burada verilen bilgilerle şablon dosyadaki bilgilerin çelişmesi durumunda şablon dosyası temel alınmalıdır.

Çalışmaların derginin yazım kurallarına uygun hazırlanabilmesi için şablon dosyanın kullanılması gerekmektedir. Eğer yazım işlemi başka bir dosyada yapılmışsa ilgili dosyanın içeriğinin şablon dosyaya aktarılması önerilmektedir. Şablona uygun olarak hazırlanmayan makaleler şekil kontrolü aşamasında yazarlara iade edilecektir.

9. DÜZELTME ÇİZELGESİ

Makaleye ilişkin düzeltme önerileri almış olan yazar(lar), “Düzeltilme Çizelgesi” üzerinde, her hakemin istemiş olduğu düzeltme/değişiklik önerilerine dayalı olarak yapılan işlemi sayfa numarası belirterek çizelgede belirtmelidir.

Hacettepe Üniversitesi Eğitim Fakültesi Dergisi İletişim:

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PUBLICATION POLICIES AND AUTHOR GUIDELINES

1. PUBLICATION POLICIES

Hacettepe University Journal of Education is an international, peer-reviewed journal that is published four times a year (January, April, July, October) and publishes in accordance with the following principles:

1. In accordance with its publication policy, our journal includes original quantitative and qualitative research articles and reviews in all areas of education.

2. The language of the journal is English.

3. Articles that are submitted to the journal should not have been published elsewhere or submitted to another journal for review. Hacettepe University Journal of Education claims all the rights of the articles that are accepted for publication.

4. Articles to be submitted to the journal should only be uploaded at <https://dergipark.org.tr/>. Articles sent to Editor-in-Chief, Editorial Board members or journal contact e-mail addresses are not considered as official submissions.

5. Articles submitted to the journal are first subjected to formal review. Then, the articles prepared according to the journal template are sent to the Editor-in-Chief. Editor-in-Chief and the Editorial Board examine the compliance with the journal's publication principles and appropriate articles are assigned to field editors. Field editors examine articles in terms of their contribution to the existing knowledge of the field and, if they deem appropriate, they initiate the blind review process. The following points are taken into account during the preliminary examination:

- a) Compliance with publication ethics
- b) Compliance with publication principles
- c) Scientific originality and significance of the subject of the study
- d) Contribution of the subject study to the field of education
- e) Compliance with spelling rules and journal manuscript template

6. The studies that are found to be suitable as result of preliminary examinations are sent to the referees for scientific evaluation through blind review. Editor-in-Chief and field editors decide whether the articles will be published based on the reviewer reports. If deemed necessary, the works are sent back to the authors for review or for proposed corrections in accordance with the criticisms and suggestions from the referees.

7. Only Editor-in-Chief and field editors provide communication between the author(s) and the referees. In the evaluation of the articles in the journal, a double-blind review system is strictly applied.

8. In order to publish accepted articles, author responsibilities form must be signed by the author(s) and submitted to the journal. In addition, the author(s) are required to scan the article with a plagiarism control program and submit the program output documenting that the plagiarism control program has a maximum similarity rate of 10%, together with the guarantee and liability form.

9. Depending on the feedback from the reviewers and the decisions of the Editor-in-Chief and field editors, the first round of peer review process of the articles is expected to take approximately 6-8 weeks. However, this period may vary from field to field. The period may be extended if a need to replace a reviewer emerges.

10. The author (s) cannot make any changes on the accepted and finalized articles.

11. The author(s) is responsible for the content of the published article (the accuracy of the references and citations, the arguments and copyrighted tables, pictures and other images).

12. Articles that are given a doi number to be published in future issues are printed on the basis of the subjects and fields of the articles, **not on the order of the doi number or the date of acceptance**. The articles to be published in each issue are determined by the Editor-in-Chief considering the different fields of education.

13. No fee is paid to the author(s) and reviewers for the articles accepted for publication.

14. In accordance with the open access policy, the number of journals and articles are available on the journal's web page and full texts can be accessed as a pdf file.

15. According to the index rules of ULAKBİM TR, the ORCID numbers of all the authors in the articles must be submitted with the final form of the article. Authors whose ORCID number is missing are not given a doi number and the article is not published as online first.

2. AUTHOR GUIDELINES

2.1. TITLE AND FOOTNOTES

The title of the article should be justified, 12 point, bold, Cambria font, maximum 15 words, and the first letter of each word should be capitalized except for the conjunctions. In the articles written in Turkish, the English title of the article should be written in the same format. If there are special cases related to the article, such as being produced from the thesis, presented at a conference or produced within the scope of a project, it should be written with a footnote starting with (*). This will be done after the article is accepted. Authors should not include such a footnote at the time of submission, as this may lead to an estimate of their identity. Article arrival, acceptance, online first and publication dates will be added and Turkish and English references will be revised according to the APA 7 conventions by the editors after the acceptance process. Therefore, in the first stage, these fields should be left empty in the template.

After the acceptance of the study, the author (s) name of the study should be written in centered, bold, 11 point, Cambria font, surname in capital letters and centered. If the number of authors is more than one, they will be written in the order specified by the authors. Along with the title (s) of the author (s), full name of the place of work, city-country information, e-mail address and ORCID number, should be indicated with footnotes (*) paired with the author's name or names under the title and should be included in the footnote at the bottom of the first page of the article. This addition will be done after the article is accepted. Authors should not include such a footnote at the time of submission, as this may lead to an estimate of their identity.

Annotations for footnotes: If the study has been presented as a paper in any scientific activity, the footnote icon (*) should be placed in the title of the article, and the name, place and date of the activity should be indicated at the bottom of the first page of the article. If the study has been supported by any research institution or fund, the footnote symbol (*) should be placed in the title of the article, and the name of the sponsor, the number of the project and the date of completion should be indicated at the bottom of the first page. If the study has been produced from graduate theses, then the title of the thesis, the name of the supervisor and the date of the completion should be placed at the bottom of the first page by placing a footnote symbol (*) in the title of the article. All information in the footnotes should be in Palatino Linotype font, non-typed and 10 font size.

2.2. ARTICLE LANGUAGE AND ABSTRACT

Studies should be prepared and sent in English. Abstract should be written in Cambria font, 9 font size and written in single column and justified in the field specified in the template, not exceeding 300 words. References should not be included in the abstract. Below each abstract, there should be 2-5 keywords that describe the study.

3. SECTIONS AND SUBSECTIONS

Main section titles (first level titles) should be numbered with Arabic numerals and written in Cambria font, 11 font size, bold, left justified and all must be in capital letters. Subheadings (second level headings) should be written in Cambria font, 11 font size, bold, left justified, and the first letter of each word should be capitalized. The third level

headings should be written in Cambria, 11 font size, bold, italic, left justified and only the first letter of the first word should be capitalized.

The paragraphs in the text should include at least three sentences and one line space should be left between the paragraphs. Likewise, one line space should be given before and after the headings. There should be no indentation throughout the article, and the spacing values before and after the paragraphs should be 0. APA 7 writing style should be used for in-text citations, tables, figures and bibliography.

The main sections in the manuscript should be:

- INTRODUCTION
- METHOD
 - Universe and sample / Working Group / Participants / Subjects (only one of them)
 - Data collection method (s) / techniques / tools
 - Analysis of data
- RESULTS
- DISCUSSION, CONCLUSIONS AND SUGGESTIONS
- REFERENCES

However, according to the methodology used in the studies, authors can create additional sections or sub-sections.

Main text should start with "1. INTRODUCTION". METHOD, FINDINGS AND DISCUSSION, CONCLUSION AND SUGGESTION parts should not be started on a new page, but should be the subsequent part of the main text. In presenting frequently used statistical techniques, statistical values should be included in the sentences based on APA 7 guidelines. Additionally, author (s) may make use of the tables and figures where appropriate. The whole manuscript should be written according to APA 7 writing style.

4. FIGURES

Figures can be placed as centered, where appropriate, and they should not exceed the margins for written parts. In-text references should be made to the figure and, where possible, the figure should be explained. A figure title with Arabic numerals should be placed under each figure; the same numbering should continue throughout the article and be written in accordance with the APA 7 writing style. Figure captions should be written in Cambria font style, 10 font size, left-aligned, and the first letter of the first word should be capitalized. If a source is used in figure title, the source information should be added in parentheses. If the figure includes text, it can be written in Cambria font style and 9/10 font size.

5. TABLES

Tables should be left aligned and all the text in the tables should be written in Cambria font style. The title of the table should be in 10 font size and below the table number; and only the first letter of every word should be capitalized. APA 7 writing style should be used for the tables. Tables should be cited by specifying the number of tables in the text and they should be interpreted after the table. Tables should be placed in the text where they are used or on the following page. Related notes and references can be indicated at the bottom of the table after the "Note:" or "Source:" indicators.

6. REFERENCING

At the end of the article, references should be given according to APA 7 writing style before any appendices. All references should be written by using Cambria font style, 10 font size, before and after the paragraph values of "0", justified, single line spacing, with no indentation. There should be a single line spacing between each reference. It should be ensured that each reference in the references part is referred from the text, and that every reference used in the text is also included in the reference part.

7. APPENDICES

If the author(s) need it, they can create an appendices section after the bibliography and before the extended abstract. The appendices to be given in this section must be cited within the article. If more than one appendix is used, it can be numbered. The attachments to be included in the appendices should be in a way not to disrupt the integrity if they are given in the article. The elements that can be given in tables or figures should not be included in the Appendices.

8. ARTICLE TEMPLATE

Not all details about an article work are specified here in the “Author Guidelines”. More information about formatting is included in the template file, which should be used for studies to be submitted to the journal. If the information given here contradicts the information in the template file, it should be based on the template file.

In order to prepare the works according to the spelling rules of the journal, the template file should be used. If writing is completed in another file, it is recommended to transfer the contents of the file to the template file. Manuscripts that are not prepared in accordance with the template will be returned to the authors during the stylistic control stage.

9. REVISION CHECKLIST

The author(s) who have received reviewer comments for the article should state the page number on the “Revision Checklist” sent together with the reviewer reports, specifying the page number based on the change requested by each reviewer.

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