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RESEARCH ARTICLE

Secondary School Students' Mental Images of the Concept of "Goodness"

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ABSTRACT

We can say that the concept of goodness is a concept that is known by everyone in social life and that everyone has different views on this issue. Goodness is also a concept in which a positive or negative point of view is formed depending on the lifestyles, life expectations and social situations of individuals. The aim of this research is to reveal the differences of these perspectives and how much the gender status affects these differences through the mental images created by the students. The study group of this research consists of 28 female and 32 male secondary school students studying in Malatya. Data of secondary school students in the study group "Goodness is similar to ....., because ....." is obtained by completing the sentence. Content analysis technique was used in the analysis and interpretation of the obtained data. As a result of the research, it has been revealed that secondary school students girls and boys see "goodness" more as "the concept of goodness as a human perception".

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1. Introduction

The concept of image, which is an important tool for individuals to express their abstract thoughts by concretizing them, is frequently used especially in metaphorical expressions. According to TDK (2019), an image is defined as a similar image reflected in the mind of an object that the sense organs can see and perceive from the outside. Based on this definition, we can say that images, which are called mental or mental, are the reshaping of the concepts in the real world in the imagination of people because what we call image is not a copy of real phenomena, but a reconstructed form of reality through the filter of reason. Therefore, the created phenomenon actually represents something new (Keser, 2005). Mental images may vary according to the events that people experience in their own lives, their mind structures, vocabulary or imagination.

In the emergence of mental images; the likeness, the likened and the interest between the two is very important (Coşkun, 2010). We can say that it is extremely important to establish a connection between the image to which an object will be compared and to explain the object to be compared with a strong metaphor. While mental images are created, the simulated object may not be seen or heard in the environment. The mental images we create are seen and heard to visualise a schema in our minds in the absence of the instantaneous simulated emotional input (Kosslyn et al., 1995, cited in Nanay, 2021). According to some researchers who support this situation, mental images are not a depiction of the objects that exist at the moment, but actually a description of the situations or objects stored in our minds (Kosslyn et al., 2006, cited in Borst & Kosslyn, 2008).

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Although the concept of mental image is a concept that many researchers look at from a different point of view and produce different theories about its emergence, it can be said that it is basically a mental production, more simply a process of analogy. When it is desired to reveal mental perceptions about any concept, the concept of mental image can be utilised. In this study, mental images were used to reveal the perceptions about the concept of "goodness".

The concept of well-being, which almost everyone can express an opinion about, can be stated as the absence of disease or any disability in the person until the 1940s, but with new definitions, it has been explained not only as the absence of disease but also as the individual not feeling deficient in terms of internal and social aspects (Doğan, 2006). While the concept of well-being was more associated with physical or mental health in the past, social workers have taken into consideration the high levels of happiness, pleasure and perception of the meaning of life in the measurement of well-being (Oishi, 2010, cited in Attepe Özden et al., 2017).

This concept of goodness, which has changed over time, has become one of the main objectives of education, and it has become a virtue to raise good people and to ensure that a person helps another person without any material or moral benefit (Aktepe & Aktepe, 2009). It can be said that this concept that education wants to gain has a very important place in social life and positively affects the mood of the person. In addition to education, people are always advised to be good in divine or non-divine religions (Şahin, 2010). We can say that goodness and being good is a concept that should always exist for the whole world. In this study, it was tried to reveal how this concept, which is one of the important factors that ensure the continuity and peace of social life, is perceived by secondary school students.

1.1. Purpose and Importance of the Research

The aim of this study is to learn the mental images of secondary school students about the concept of "goodness" and to reveal how secondary school students perceive the concept of goodness. In the study, data were collected by having the study group complete the sentence "Goodness is similar to ....., because .....". Depending on the main purpose, answers to the following questions were sought.

What are the mental images of secondary school students about the concept of "goodness"?

In which categories can the mental images that secondary school students have about the concept of "goodness" be grouped?

What is the relationship between the mental images formed by male and female secondary school students about the concept of "goodness"?

The limited number of studies conducted with secondary school students on the concept of goodness and the limited number of secondary school students' perspectives on the concept of goodness make this study important. It is hoped that this study will contribute to the field.

2. Method

The study protocol was approved by the Social and Human Sciences Scientific Research and Publication Ethics Committee of İnönü University (Decision number: E.673721).

2.1. Research Model

In the study, phenomenology design, which is one of the qualitative research methods, was used in order to reveal the mental images of secondary school students regarding the concept of "goodness". The phenomenology design focuses on phenomena that we are aware of but do not have a detailed and deep understanding (Yıldırım & Şimşek, 2021). At the same time, we can say that the phenomenological design is also suitable for measuring people's emotional experiences, for example; Trotman (2006) used the phenomenological design to measure how imagination affects the creativity of primary school students and how this is reflected in education (Merriam, 2018).

2.2. Working Group

The study group of the research consists of 28 female and 32 male secondary school students studying in Malatya province. The main factor in the determination of this study group was the fact that middle school students' cognitive development level requires them to develop the skills of perceiving, interpreting and expressing abstract concepts through symbolic expressions. In addition, the fact that the demographic structure of Malatya province, where the research was conducted, was capable of representing the research population and the sample size was sufficient to serve the purpose of the research was also effective in the selection of this group.

2.3. Data Collection

The data of the study were obtained through a structured metaphor form in order to reveal the perceptions and thoughts of the participants in depth. Before the metaphor forms were distributed, students were informed about what a mental image is and asked to create an image of the concept of “goodness”. Secondary school students participating in the study were asked to fill in the sentence "Goodness is similar to ....., because ....." in a sincere way. The students likened goodness to a single concept in line with the information they received about mental imagery and explained why they likened it to this concept by providing justification after the phrase because.

In this process, a non-directive, open-ended approach was adopted so that the students could think freely and express their

feelings and thoughts comfortably; thus, the meanings that the participants attributed to the concept of goodness in their inner worlds were revealed in a unique way. The metaphor form was used as a data collection tool suitable for reflecting the subjective perceptions, experiences and value judgments of individuals in accordance with the qualitative nature of the research. The metaphorical expressions obtained from the interviews provided important clues in terms of revealing both the students' perspectives on the concept of goodness and the meanings they attribute to abstract concepts.

In addition, it was observed that students reflected their cognitive and affective orientations together in the process of producing metaphors; this situation enabled in-depth analysis of the data and added richness to the interpretation process. Volunteerism was taken as a basis throughout the process, students' identity information was kept confidential and ethical principles were followed. The data collected in this direction provided a qualified and meaningful content in achieving the objectives of the research.

2.4. Analyzing the Data

Content analysis technique was used to analyze the data collected with metaphor forms and a specific order was followed in the analysis process. Metaphors were analyzed in 4 different stages (Yıldız & Ertürk, 2019).

2.4.1. Coding and extraction

The open-ended interview forms collected from the students in the study group were analysed and the forms of the students who could not form valid mental images were excluded from the study and the valid mental images were coded in alphabetical order and gender.

2.4.2. Sample mental image compilation

The mental images created by the study group were collected and it was seen that the students created 33 valid mental images. The ones that best represent the theme of these images are given as examples under the relevant table in the findings section.

2.4.3. Category development phase

After the mental images related to the concept of "goodness" were given in a single table, 11 themes were formed in this direction by analysing the relationships between the images created by the students and their reasons. While creating the themes, Koçoğlu (2018), Yıldız and Ertürk (2019), Kekeç and Töre (2020) studies were used. These themes are:

"Goodness as the Perception of Togetherness and Trust Environment", "Goodness as the Perception of Dependency", "Goodness as the Perception of Basic Life Function", "Goodness as the Perception of Purity and Cleanliness", "Goodness as the Perception of Production Place", "Goodness as the Perception of Abstract Concept", "Goodness as the Perception of Order Providing Power Element", "Goodness as the Perception of Human Being", "Goodness as the Perception of Warmth Source", "Goodness as the Perception of Natural Assets", "Goodness as the Perception of Materiality".

2.4.4. Validity and reliability

Before the 33 mental images created by the students in the study group were placed in the categories developed to ensure reliability, an expert in the field of curriculum and instruction was consulted and asked to place the mental images in the categories he found appropriate.

3. Findings

According to the findings obtained in the study, it was observed that female and male secondary school students produced 33 valid mental images related to the concept of "goodness" (Table 1). These collected images were categorised under 11 similar themes.

3.1. Mental Images of Secondary School Students Regarding the Concept of “Goodness”

When the mental images of secondary school students regarding the concept of "goodness" were examined, 28 female and 32 male secondary school students within the scope of the research created a total of 33 valid mental images. Secondary school students tried to explain how they created the images they produced about the concept of "goodness" with their own thoughts.

3.2. Distribution of Mental Images Formed Regarding the Concept of "Goodness" According to Similar Aspects

3.2.1. The concept of goodness as the perception of togetherness and trust environment

The theme of "Togetherness and Trust Environment" includes the images of "family" of 1 female student and "football club" of 1 male student (Table 2).

Table 1. Perceptions of the study group regarding the concept of well-being.

Mental image code	Mental Image Name	Gender	Secondary School Students Representing Mental Imagery	
			f	%
1	Tree	2m 3f	5	8.6
2	Family	1f	1	1.7
3	Alcohol	1m	1	1.7
4	Shopping Addiction	1f	1	1.7
5	Mum and Dad	5m 5f	10	17.2
6	Friend	2m	2	3.4
7	Ataturk	1f	1	1.7
8	Cloud	1m	1	1.7
9	Flower	1m1f	2	3.4
10	Factory	1f	1	1.7
11	Football Club	1m	1	1.7
12	Youth	1f	1	1.7
13	Sun	3m	3	5.1
14	Judge	1f	1	1.7
15	Life	2m 1f	3	5.1
16	Internet	1f	1	1.7
17	Profession	1f	1	1.7
18	Breath	1m	1	1.7
19	Forest	1m	1	1.7
20	Teacher	1m	1	1.7
21	Money	1m 1f	2	3.4
22	Police	1m	1	1.7
23	Wind	1f	1	1.7
24	Love	1m 2f	3	5.1
25	Cigarette	1f	1	1.7
26	Soba	1m	1	1.7
27	Water	2m 1f	3	5.1
28	Field	1m	1	1.7
29	Drugs	1f	1	1.7
30	Virus	1m	1	1.7
31	Investment	1f	1	1.7
32	Food	2f	2	3.4
33	Newborn Child	1f	1	1.7

Table 2. Distribution of mental images formed regarding the concept of goodness as a perception of togetherness and trust environment.

Mental Image Code	Goodness as a Perception of Togetherness and Trust Environment	Gender	Student Representing Mental Imagery	
			f	%
2	Family	1f	1	1.7
11	Football Club	1m	1	1.7

When the mental perceptions under the theme of the concept of goodness as the perception of togetherness and trust environment are examined, we can say that 1 female and 1 male student tried to explain the concept of goodness with family and football club and saw goodness as the basis of togetherness.

Examples of mental images created for the concept of goodness as a perception of togetherness and trust environment are given below.

"Favour is like a family. Because when we do good, we feel happy like we are with our family." (Female secondary school student)

"Goodness is like a football club. Because in order to be successful in a football club, everyone has to help each other." (Male, secondary school student)

3.2.2. The concept of well-being as a perception of dependency

The theme of "Goodness as a Perception of Dependence" includes the mental images formed by 3 female and 1 male student participating in the study about the concept of goodness.

Table 3. Distribution of mental images formed regarding the concept of goodness as addiction perception.

Mental Image Code	Well-being as a Perception of Addiction	Gender	Student Representing Mental Imagery	
			f	%
3	Alcohol	1m	1	1.7
4	Shopping Addiction	1f	1	1.7
25	Cigarette	1m	1	1.7
29	Drugs	1f	1	1.7

When the mental images under the theme of goodness as a perception of addiction are analysed, it is possible to say that 4 secondary school students see goodness as an addiction that people who feel it once will want to experience that feeling all the time.

Some examples of mental images related to the concept of well-being as a perception of dependency are given below.

"Favour is like a drug. Because even if you don't want to do it, your body wants to repeat it constantly with a conscientious instinct." (Female, secondary school student)

"Favour is like alcohol. Because you know that it will make you feel better when it exists." (Male, secondary school student)

3.2.3. Well-being as a perception of basic life function

The theme of "Goodness as a Perception of Basic Life Function" includes the mental images created by 2 female and 1 male students.

Table 4. Distribution of mental images formed regarding the concept of well-being as a perception of basic life function.

Mental Image Code	Well-being as a Perception of Basic Life Function	Gender	Student Representing Mental Imagery	
			f	%
18	Breath	1m	1	1.7
32	Food	2f	2	3.4

When the mental images forming the theme of goodness as the perception of basic life function are analysed, it can be said that 3 secondary school students see goodness as a basic concept that must exist in life and ensures the continuity of life.

Some examples of mental images created for the concept of well-being as a perception of basic life function are given below.

"Goodness is like breath. Because while breath enables people to exist in life, goodness enables people to exist in society." (Male, secondary school student)

"Goodness is like food. Because food fills one's stomach, but kindness fills one's soul." (Girl, secondary school student).

3.2.4. Goodness as the perception of purity and cleanliness

The theme of "Goodness as the Perception of Purity and Cleanliness" includes the concepts of newborn child and water that 2 female and 2 male students formed about the concept of goodness.

Table 5. Distribution of mental images formed regarding the concept of goodness as the perception of purity and cleanliness.

Mental Image Code	Goodness as a Perception of Purity and Cleanliness	Gender	Student Representing Mental Imagery	
			f	%
27	Water	2m 1f	3	5.1
33	Newborn Child	1f	1	1.7

When the mental images forming the theme of goodness as the perception of purity and cleanliness are analysed, it can be said that 4 secondary school students wanted to indicate that the nature of goodness is completely far from evil by likening the concept of goodness to concepts that are described as clean in every aspect.

Some examples of mental images created for the concept of goodness as the perception of purity and cleanliness are given below.

"Goodness is like water. Because goodness is clean and pure like water. There is no equivalent." (Girl, secondary school student)

"Goodness is like a newborn child. Because the newborn child knows no evil and makes everyone happy." (Girl, secondary school student).

3.2.5. Goodness as a perception of place of production

The theme of "Goodness as a Perception of Place of Production" includes the images created by 1 female and 1 male student in the study group.

Table 6. Distribution of mental images formed regarding the concept of goodness as a perception of place of production.

Mental Image Code	Favour as a Perception of Place of Production	Gender	Student Representing Mental Imagery	
			f	%
10	Factory	1f	1	1.7
28	Field	1m	1	1.7

When the mental images that constitute the theme of goodness as the perception of a place of production are examined, we can say that 2 students tried to explain the concept of goodness by likening it to a production centre that produces and multiplies and is multiplied to be enough for all people.

Examples of mental images created for the concept of favour as the perception of production place are given below.

"Favour is like a field. Because good or bad, you always get your reward." (Male, secondary school student)

"Goodness is like a factory. Because the more products you produce in a factory, the more you earn. The more favours you do among people, the better you get in return." (Female, secondary school student).

3.2.6. Goodness as an abstract concept perception

The theme of "Goodness as an Abstract Concept Perception" covers the mental images created by 5 female and 5 male students in the study.

Table 7. Distribution of mental images formed for the concept of goodness as an abstract concept perception.

Mental Image Code	Goodness as an Abstract Concept Perception	Gender	Student Representing Mental Imagery	
			f	%
12	Youth	1f	1	1.7
15	Life	2m 1f	3	5.1
16	Internet	1f	1	1.7
24	Love	1m 2f	3	5.1
30	Virus	1m	1	1.7
31	Investment	1m	1	1.7

When the mental images forming the theme of goodness as an abstract concept perception were analysed, 10 students tried to explain the concept of goodness with abstract concepts whose existence cannot be seen but which are felt by all of us.

Some examples of mental images related to the theme of goodness as an abstract concept perception are given below.

"Goodness is like youth. Because as you live, you feel yourself developed and renewed, and as you do good, you experience the reality and pleasure of world life." (Female, secondary school student)

"Favour is like an investment. Because if you help a person in a difficult situation, that person will help you when you are in a difficult situation in the future." (Male, secondary school student)

"Goodness is like a virus. Because the more the virus spreads, the more people it infects." (Male, secondary school student).

3.2.7. Goodness as a perception of order providing power element

The theme of "Goodness as the Perception of Order-Providing Power Factor" includes the mental images formed by 1 female and 1 male student in the study group towards the concept of goodness.

Table 8. Distribution of mental images formed regarding the concept of goodness as the perception of the power element providing order.

Mental Image Code	Goodness as a Perception of Order Providing Power Element	Gender	Student Representing Mental Imagery	
			f	%
14	Judge	1f	1	1.7
22	Police	1m	1	1.7

When the mental images that constitute the theme of goodness as the perception of order-providing power element are analysed, we can say that 2 students tried to explain goodness with the professions that should exist in society that provide order.

Examples of mental images created for the theme of favour as the perception of a power element providing order are given below.

"Goodness is like the police. Because it maintains order in society." (Male, secondary school student)

"Goodness is like a judge. Because the judge removes bad people from the society, and goodness removes bad people from the society." (Female, secondary school student).

3.2.8. Goodness as human perception

The theme of "Goodness as Human Perception" covers the mental images created by 6 female and 8 male students in the study group.

Table 9. Distribution of mental images formed regarding the concept of goodness as human perception.

Mental Image Code	Goodness as Human Perception	Gender	Student Representing Mental Imagery	
			f	%
5	Mum and Dad	5m 5f	10	17.2
6	Friend	2m	2	3.4
7	Ataturk	1f	1	1.7
20	Teacher	1m	1	1.7

When the mental images created about the concept of kindness as a human perception are analysed, it can be said that 14 students tried to explain the concept of kindness with people who are close to them, whom they consider very valuable to them and whom they have great love for.

Some examples of mental images created for the concept of goodness as a human perception are given below.

"Favour is like a parent. Because it is as valuable, important and loving as a parent." (Female, secondary school student)

"Goodness is similar to Atatürk. Because Atatürk, just like goodness, is a person who stands against evil and strives to prevent it." (Female, secondary school student).

3.2.9. Goodness as a perception of warming source

The theme of "Goodness as a Perception of Warming Source" includes the mental images created by 4 male students in the study group.

Table 10. Distribution of mental images formed regarding the concept of goodness as a source of warming.

Mental Image Code	Goodness as a Perception of Warming Source	Gender	Student Representing Mental Imagery	
			f	%
13	Sun	3m	3	5.1
26	Stove	1m	1	1.7

When the mental images created about the concept of kindness as a perception of warming source are examined, we can say that 4 students tried to explain the concept of kindness with beings that warm both themselves and their surroundings and give them energy.

Some examples of mental images created for the concept of goodness as a perception of warming source are given below.

"Favour is like a stove. Because the more you light the stove, the more you do good deeds, the warmer you get." (Male, secondary school student)

"Goodness is like the sun. Because, like the sun, goodness illuminates the world and makes people happy." (Male, secondary school student)

3.2.10. Goodness as the perception of natural assets

The theme of "Goodness as the Perception of Natural Entities" includes the mental images created by 5 female and 5 male students for the concept of goodness.

Table 11. Distribution of mental images formed regarding the concept of goodness as the perception of natural assets.

Mental Image Code	Goodness as a Perception of Natural Entities	Gender	Student Representing Mental Imagery	
			f	%
1	Tree	2m 3f	5	8.6
8	Cloud	1m	1	1.7
9	Flower	1m 1f	2	3.4
19	Forest	1m	1	1.7
23	Wind	1f	1	1.7

When the mental images created for the concept of goodness as the perception of natural entities were examined, 10 students tried to explain goodness with natural entities that it should exist spontaneously and naturally in society, such as entities that exist spontaneously in the natural environment.

Some examples of mental images created for the concept of goodness as the perception of natural beings are given below.

"Goodness is like a tree. Because trees provide shade where people can rest, and goodness is something that people who are tired of evil can rest." (Female, secondary school student)

"Goodness is like a flower. Because flowers beautify the world like goodness." (Male, secondary school student).

3.2.11. Goodness as a perception of materiality

The theme "Goodness as Material Perception" consists of the mental images developed by 2 female and 1 male students about the concept of goodness.

Table 12. Distribution of mental images formed regarding the theme of goodness as perception of materiality.

Mental Image Code	Goodness as a Perception of Materiality	Gender	Student Representing Mental Imagery	
			f	%
17	Profession	1f	1	1.7
21	Money	1m 1f	2	3.4

When the mental images created for the theme of goodness as a materialistic perception are examined, we can say that 3 students tried to associate and describe the concept of goodness with the logic of gain.

Some examples of mental images related to the theme of goodness as perception of materiality are given below.

"Favour is similar to a profession. Because in a job, you work to earn money, and when you do a favour, you do it to be rewarded." (Female, secondary school student)

"Favour is like money. Because the more it is, the happier it makes people." (Male, secondary school student)

3.3. Comparison of the Mental Images Formed for the Concept of "Goodness" Related to Gender Variable

In the table below, the study group in the research is compared in terms of gender variable. In Table 13, the mental images formed by female secondary school students and male secondary school students for the concept of goodness show differences. The distribution of these differences is also indicated in the table.

Table 13. Distribution of mental images formed regarding the theme of goodness as perception of materiality.

Themes	Gender				Total	
	Female Secondary School Student		Male Secondary School Student			
	f	%	f	%	f	%
1. The Concept of Goodness as a Perception of Togetherness and Trust Environment	1	1.7	1	1.7	2	3.4
2. The Concept of Well-Being as a Perception of Dependency	3	5.1	1	1.7	4	6.8
3. Well-being as a Perception of Basic Life Function	2	3.4	1	1.7	3	5.1
4. Purity and Cleanliness Goodness as Perception	2	3.4	2	3.4	4	6.8
5. Goodness as a Perception of Place of Production	1	1.7	1	1.7	2	3.4
6. Goodness as an Abstract Concept Perception	5	8.6	5	8.6	10	17.2
7. Favour as a Perception of Order-Providing Power Element	1	1.7	1	1.7	2	3.4
8. Goodness as Human Perception	6	10.3	8	13.7	14	24.1
9. Goodness as a Perception of Warming Source	0	0	4	6.8	4	6.8
10. Goodness as a Perception of Natural Entities	5	8.6	5	8.6	10	17.2
11. Goodness as a Perception of Materiality	2	3.4	1	1.7	3	5.1

4. Discussion and Conclusion

Within the scope of the research, it was tried to find out how secondary school students view the concept of well-being, how they shape it, and what importance it has in their lives. It can be said that the concept of goodness is generally perceived as good physical health and good mood. However, it can be stated that secondary school students perceive the concept of goodness as something that is not bad and is for the benefit of human beings. This situation can also be explained by the connection that individuals establish with social relations and moral values in their lives (Narvaez, 2006). Within the scope of the research, it was concluded that the students in the study group formed quite different images from each other and that male students approached the concept of goodness more emotionally, albeit with a slight difference. Similarly, Gilligan (1982)'s ethical care theory also supports these emotional differences of the students.

In general, when the well-being levels of individuals are evaluated, the proportion of positive emotions is more important than negative emotions (Diener & Lucas, 2000, cited in Yalçınkaya et al., 2019). Similar to this situation, for secondary school students, goodness and well-being match more with positive elements. Lyubomirsky et al. (2005) also revealed in their study that positive behaviours such as kindness and helpfulness increase an individual's subjective well-being. In this direction, it can be said that the students have high rates of likening the concept of goodness to elements that are seen positively by everyone. Many students in the study group tried to express that kindness protects, raises and develops people by associating kindness with parents, which is seen as a positive concept by almost everyone. Again, some of the students in the study group associated goodness with the tree, which evokes positive emotions in people, and emphasised that goodness is very important and deep-rooted for human life. This metaphor shows that the individual constructs meaning through the symbolic bond he/she establishes with nature, and it may also be compatible with Lakoff and Johnson (1980)'s conceptual metaphor theory framework.

In Güleç (2021)'s study on the concepts of goodness and evil with primary school fourth graders, while primary school students expressed the concept of goodness with feelings, thoughts or concepts that are seen as moral, in this study with secondary school students, with the increase in age level - although positive mental images were more - students likened goodness to drugs, alcohol or different addictions. This result also shows that with the onset of adolescence; students start to develop a more aware and critical view of environmental risks (Steinberg, 2005). At the same time, the increase in the level of social awareness of this age group enables them to orientate towards a wider range of conceptualisations (Eccles, 1999).

Most of the students in the study group tried to explain the concept of goodness with values that should exist in human life and provide order and continuity in society. In the study of Yaşaroğlu and Biçer (2020), in which they examined the metaphorical perceptions of primary school students about the root values, it is similar to the result of the study that primary school students explained the root values of Honesty, Self-control, Respect and Benevolence with the concepts of goodness.

In line with the mental images created by the middle school students in the study group, it can be said that they tried to explain the concept of goodness with concepts that do not seem bad to them. In line with this result in Karasu (2018)'s study on philosophising with fourth-grade primary school students, it is

possible to see that students try to explain goodness as something that is not bad. In this context, it is seen that the difference of two or three years in the age range of the students does not cause very significant changes in the concepts.

As a result, students' intellectual structures about the concept of goodness are strongly influenced by family, school environment, social expectations and developmental levels. For this reason, it is important that value education is systematically included in curricula and that basic human concepts such as kindness are addressed from cognitive and affective aspects. Revealing the meanings that students attribute to concepts through mental images will contribute to more meaningful and effective foundations of educational policies.

5. Recommendations

In line with the results obtained in the study, the following suggestions can be developed:

In order to increase the awareness of secondary school students about the concept of kindness and to develop their thoughts about this concept, in-class or out-of-class social activities can be organised through implicit learning. These activities can be enriched with practices such as volunteering activities, in-group cooperation activities, drama, story completion and empathy-based workshops. In particular, teacher-guided activities that will enable the modelling of goodness behaviour can contribute to the positive development of students' mental images.

Teachers can focus more on these concepts and ensure their continuity in order to reduce misconceptions in students and to ensure that the concepts that should exist in terms of society are fully perceived by students in order to raise conscious and socially beneficial students. Teachers can be supported to create cognitive and affective awareness in students through in-class discussions, story analyses, metaphor studies and activities based on peer interaction.

Compliance with Ethical Standards

The study protocol was approved by the Social and Human Sciences Scientific Research and Publication Ethics Committee of İnönü University (Decision number: E.673721).

Conflict of Interest

The authors have no conflict of interest to declare.

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RESEARCH ARTICLE

Experiences of a Child with Cerebral Palsy in Inclusive Education: A Case Study Based on Parent and Teacher Perspectives

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ABSTRACT

This study aims to examine the experiences of a child diagnosed with cerebral palsy regarding inclusive education in the preschool period. Designed with a qualitative research approach, the study was conducted with the participation of a five-year-old girl with cerebral palsy attending a public school, her classroom teacher, and her mother. Data were collected through semi-structured interviews, family information forms, and observation forms completed by the teacher at two different time points, and analyzed using content and descriptive analysis techniques. The findings revealed that the child became more engaged in classroom activities following her participation in inclusive education. Interviews with the mother indicated that the child was raised in an emotionally supportive but socioeconomically limited environment, and that the parent actively participated in the educational process while seeking various external support resources. Teacher observations highlighted notable improvements in the child's social skills, adherence to rules, and classroom behavior. Inclusive education is internationally recognized as a crucial practice enabling children with disabilities to participate in learning alongside their peers. In the context of cerebral palsy, inclusive education is particularly significant since children face not only motor difficulties but also social and emotional challenges, making supportive school environments essential for their development. The findings were discussed in line with the related literature, and practical implications were provided. Specifically, the study suggests that inclusive education practices should be supported with individualized strategies for children with cerebral palsy, that collaboration between teachers and families should be strengthened, and that teacher training on inclusive methods should be provided to enhance classroom participation.

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1. Introduction

Cerebral Palsy (CP) is a neurodevelopmental condition that emerges during early childhood and persists throughout the individual's lifetime. Although CP has long been the subject of extensive research, it remains among the clinical cases that are still difficult to diagnose and classify (Rosenbaum et al., 2007). CP is defined as a chronic and developmental motor disorder that results from a non-progressive injury to the developing brain (Jan, 2006; Krigger, 2006). Originating in the fetal period and caused by damage to the infant's central nervous system, this condition affects posture and movement, leading to functional limitations. In addition to the motor impairments associated with CP, individuals frequently experience accompanying sensory, perceptual, cognitive, affective, and

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psychomotor deficiencies; abnormal fluctuations in the electrical activity of neurons; secondary lesions; and musculoskeletal system problems (Rosenbaum et al., 2007; Singhi et al., 2002).

Building on this clinical understanding, brain lesions occurring prenatally or during early childhood in children with CP lead to impairments not only in motor functions but also in cognitive, sensory, and perceptual processes (Rosenbaum et al., 2007). These multifaceted impairments highlight the complex developmental challenges faced by children with CP. Research findings indicate that as children grow older, academic demands and social interactions become increasingly complex, correlating strongly with heightened academic, social, and emotional difficulties (Sigurdardottir et al., 2010; Wendelborg & Tøssebro, 2010). Given these challenges, inclusive education emerges as an essential process for facilitating the effective participation of individuals with special needs in social life. Therefore, special education programs aim to empower these individuals to realize their full potential and foster social integration (Aral & Gürsoy, 2007; Eripek, 2005 Ministry of National Education (2000) defines inclusive education as the practice of educating individuals with special needs alongside their peers, taking into account their disabilities and individual characteristics. This approach is founded on an inclusive philosophy that embraces not only individuals with disabilities but also all children (Ferguson, 1996).

Extensive literature supports this philosophy, emphasizing that inclusive practices enhance students' reading comprehension, bolster social and emotional development, and promote healthy peer relationships (Baydık & Bakkaloğlu, 2009; Güldenoğlu, 2008; Sucuoğlu & Kargın, 2008). Lindsay (2007) similarly underscores the importance of peer relationships and teacher interaction, not only for academic achievement but also for the emotional and social development of individuals with special needs. Together, these perspectives make clear that an effective inclusive process requires an integrated focus on pedagogy, teacher attitudes, and classroom social dynamics (Florian & Black-Hawkins, 2011).

While research on inclusive education has expanded across various disability groups, studies examining the perspectives of mothers of children with intellectual disabilities (Özen et al., 2002), autism spectrum disorder (Ateş & Rakap, 2021), visual impairments (Akmeşe et al., 2023), and hearing impairments (Yersel & Durualp, 2024) are comparatively well documented. However, this body of work reveals a notable scarcity of research focusing specifically on children with CP, indicating a significant gap in understanding the experiences of this population within inclusive educational settings. This gap underscores the urgent need for a targeted investigation into the unique developmental and social challenges faced by children with CP. In addition, although clinical and developmental studies of CP have examined diagnosis (Herskind et al., 2015), assessment (Coceski et al., 2021), clinical symptoms (Rosenbaum et al., 2007), and developmental characteristics (Wright et al., 2008), qualitative, case-based research exploring the lived experiences of preschool-aged children with CP in inclusive classrooms remains limited. Moreover, studies that integrate the perspectives of both teachers and families simultaneously are especially rare (Ainscow et al., 2004; Shakespeare, 2006).

To address these intertwined gaps in the literature, the present study investigates the preschool inclusive education experience of a child with CP from the dual perspectives of the teacher and the mother. The child's natural classroom experiences were observed without intervention, and the teacher's instructional practices were analyzed in relation to the child's participation. Thus, this study seeks to answer the following research questions:

1. What types of changes were observed in the child with CP throughout the preschool education process, from the beginning to the end of the academic year?
2. What attitudes did the teacher and peers display to support the child with CP in adapting to the school environment?
3. What strategies did the mother of the child with special needs implement at home to support the school process?
4. What challenges did the child with CP encounter during the inclusive education process, and what types of solutions were proposed in response to these challenges?

2. Method

In this study, ethical approval was regarded not merely as a formal requirement but as a fundamental principle guiding every stage of the research process. Prior to data collection, the necessary approval was obtained from the Social and Humanities Sciences Research Ethics Committee of Karabük University with the decision number 2025/04(9) on 28.04.2025; however, the researchers proceeded with the awareness that ethical responsibility extends beyond formal authorization. Throughout the study, therefore, particular attention was paid to issues such as informed consent, voluntary participation, and the protection of privacy.

All participants were informed about the purpose of the study, provided written consent, and participated on a voluntary basis. Confidentiality and professional privacy were meticulously maintained. Data related to the child were not collected directly but obtained through forms completed by the teachers. Consent for the use of this data was obtained from the child's mother, and the information was used solely for research purposes in an anonymous manner. Since the child was represented indirectly, particular care was taken to protect her rights and privacy.

2.1. Design

This study aims to explore the inclusive education experiences of a preschool child diagnosed with CP, drawing on the perspectives of both the teacher and the mother. To this end, the research was designed as a qualitative case study. This study was designed as a qualitative case study. More specifically, it was conducted as a single, holistic case study, focusing on the experiences of one child with cerebral palsy in a preschool inclusive education setting (Yin, 2018). Yin (2018) highlights that case studies are particularly well-suited for obtaining an in-depth understanding of complex social phenomena within their natural contexts. Similarly, Stake (1995) notes that case studies offer a contextualized lens through which the lived experiences of individuals can be thoroughly examined.

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2.2. Participants

The study group of this study consists of a five-year-old girl diagnosed with CP, her classroom teacher, and her mother, selected through typical case sampling, one of the purposive sampling methods. Typical case sampling allows for the selection of individuals who are considered ordinary in relation to the research topic but possess strong potential to represent the context. In this regard, it aims to enhance the transferability of findings to similar contexts by conducting an in-depth examination of a case that is unexceptional yet meaningful (Patton, 1990; Yıldırım & Şimşek, 2013). In this study, selecting a student with CP receiving inclusive education at the preschool level was deemed appropriate as it both reflects a typical case in practice and enables a holistic examination of experiences related to the process. In addition, demographic and contextual information was provided to further describe the participants: the teacher had 8 years of professional experience in preschool education; the mother was a homemaker, had completed secondary education, and lived in a lower-middle socioeconomic environment; and the child, who was five years old at the time of the study, had been attending preschool for approximately one year.

2.3. Instrumentation

The research data were collected using three distinct tools: semi-structured interview forms, a family information form, and student observation forms. The researchers developed the interview forms to gather the teacher's and mother's views regarding the child with CP in relation to classroom adaptation, peer relationships, participation in the instructional process, and developmental progress. These forms were subsequently reviewed for content validity based on feedback from an experienced teacher working in the field. Additionally, the family information form provided in-depth and context-specific information about the child's health status, socioeconomic environment, and developmental history.

The researchers structured the Student Observation Form to systematically assess the classroom behaviors of the child with CP. In addition to the observation process, sample interview questions were also included to enhance transparency, such as: (1) "How does your child adapt to classroom activities and routines?" and (2) "What strategies do you use at home to support your child's participation in the school process?" The validity of the form was evaluated based on the expert opinions of five academicians specialized in the fields of special education and early childhood education, and necessary revisions were made in accordance with the feedback received. The form consists of 17 items rated on a five-point Likert scale ("Always," "Often," "Sometimes," "Rarely," "Never"). Furthermore, to illustrate the scope of the assessment, sample observation items were provided, including: (1) "The student follows the classroom rules" and (2) "The student participates in group activities in accordance with the instructions."

The teacher completed this form at two separate time points: at the beginning and the end of the academic term. The behaviors assessed included areas encompassing both social and educational competencies, such as "following instructions," "adhering to rules, "participating in classroom activities," "complying with hygiene rules," and "free time usage skills." Through this approach, the child's development during the school process was monitored using both qualitative interviews and an observation tool developed by researchers based on expert input. According to the observation results, many behaviors that were initially observed at the "sometimes" and "rarely" levels had progressed to the "often" level by the end of the term. This development indicates significant improvements in the child's adaptation, task responsibility, and social interaction skills. These findings were also consistent with the views of the teacher and the parent, thereby reinforcing the reliability of the research results.

2.4. Data Analysis

The data from the interviews were analyzed using a content analysis technique, which is commonly employed in qualitative research (Miles & Huberman, 1994). The data obtained from the interviews were first coded, and these codes were then grouped under themes based on shared meanings. To ensure reliability in the content analysis, the data were independently coded by two researchers. Following Neuendorf (2002)'s guidelines that intercoder reliability should be established, the level of agreement between the coders was calculated and found to be 87%, indicating a high degree of consistency. During the coding process, expressions with similar content were clustered together, and the analyses were presented by incorporating representative quotations from the participants. This approach aimed to enhance the contextual depth of the findings.

The data obtained from the classroom observation form were analyzed using the descriptive analysis technique. In this analytical process, the teacher's observations from the beginning and end of the term were compared, and the child's behavioral development was evaluated. To enhance the validity and reliability of the study, various strategies were employed throughout the data collection and analysis processes. In this context, expert opinions were consulted, participant consent was obtained, and data triangulation across sources was ensured to maintain the comprehensiveness of the interpretations.

3. Findings

This section reports on the changes observed in a five-year-old girl diagnosed with CP throughout the preschool education process, from the beginning to the end of the academic year; the attitudes displayed by the teacher and peers to support the child's adaptation to school; the strategies implemented by the mother to support the school process at home; the challenges faced by the child during the inclusive education process; and the solutions developed in response to these challenges. The findings were derived from the data collected through observation forms (semi-structured interview forms) and the family information form.

3.1. Findings from the Interview with the Mother

In this section, the data obtained from the parent's perspective regarding the preschool inclusive education process of the child with CP were analyzed through content analysis. The findings were organized under four main themes: (1) School adaptation and emotional development, (2) Peer relationships and social participation, (3) Family involvement and support strategies, and (4) Inclusive education and teacher support.

Theme 1: School adaptation and emotional development

According to the mother's account, the child experienced significant difficulties during the initial adaptation to the preschool period. The primary source of these challenges was the recognition of the child's physical differences by her peers, which had an emotional impact on the child.

"*In the early days of school, our adaptation process was quite difficult. My daughter was negatively affected by her physical differences and by her peers. Her willingness to go to school decreased. For example, she would ask things like, 'Why do I walk on my toes?' or 'Why do I go to physical therapy*."

By the end of the term, the mother stated that the child had begun to accept her differences.

"*Over time, my daughter began to accept herself. She was aware of the difficulties, but her questions became less frequent.*"

The mother noted that she observed both emotional and behavioral reflections of the inclusive education process. She also stated that the initial reluctance, social incompatibility, and behavioral issues diminished over time, and that the process gradually became more emotionally balanced.

Theme 2: Peer Relationships and Social Participation

The mother stated that her child initially experienced various problems in her social relationships. These difficulties were attributed both to the child's internal challenges and external factors, such as peer bullying:

"*My daughter went through many difficult moments, both because of her obsessive tendencies and due to peer bullying. Through our teacher's dedicated efforts and collaboration within the inclusive education process, we were able to minimize these issues by the end of the term.*"

At the beginning, the child's tendency to express herself through physical contact, such as hitting or pushing, was observed in her peer interactions, which led to social exclusion by her classmates:

"*At first, because she saw herself as different, she would engage in physical contact like hitting or pushing her friends. This was very upsetting for us and also caused her to be even more excluded*."

However, over time, with teacher intervention, external support, and the development of social skills, it was observed that the child began to establish more positive social interactions.

"*Now, we are leaving school with her as a child who plays with her friends and treats them with more respect.*"

Theme 3: Family involvement and support strategies

The mother stated that she made multifaceted efforts to support her child's development. These efforts included conducting regular practice at home, using age-appropriate educational materials, and engaging in a continuous process of research to better understand her child's needs.

"*As part of her inclusive education, we reviewed at home what my child learned at school. We bought age-appropriate supplementary books and activity sets, and we worked on them together at home*."

In addition, the mother stated that she consulted various resources for her personal development and connected with other families who had similar experiences.

"*I met families of children with CP, talked with them about the challenges they experienced, got their advice, and joined associations. I also received support from therapists.*"

In response to the child's behavioral challenges, the family and the teacher collaborated to seek solutions. When these efforts proved insufficient, they turned to professional support services such as occupational therapy and play therapy.

"*It was not enough, so we got help from the school guidance counselor. Later, we started play therapy. At the same time, we also began occupational therapy.*"

Theme 4: Inclusive Education and Teacher Support

In the mother's statements, the teacher's role holds central importance. The teacher's dedicated, empathetic, and inclusive approach was identified as a critical factor in the child's development.

"*Our luck was having a young, dynamic, dedicated, and understanding teacher. With inclusive education, there were significant improvements in behavior from the beginning to the end of the term.*"

According to the mother, the teacher ensured the child's participation in the learning process through a love-based approach and communication that did not single her out or highlight her differences.

"*But we owe this, above all, to our teacher, who never separated my child from the others, and who planned and implemented activities to help the other children accept her*."

The mother also regarded the teacher's inclusive approach and love-based communication as the most fundamental factor enabling success in the education of a child with CP.

"*Inclusive education is critical in the educational journey of a child with CP. In this process, it is enough for the child to have a loving teacher. If there is love, there is nothing a child with CP cannot achieve.*"

3.2. Findings from the Teacher Interview

The data obtained from the semi-structured interview conducted with the teacher were analyzed using content analysis. The findings were organized under four main themes: (1) Social development and behavioral transformation, (2) Peer relationships and classroom dynamics, (3) Instructional strategies and adaptations, and (4) Family-school collaboration and behavioral consistency.

Theme 1: Social development and behavioral transformation

The teacher stated that, at the beginning of the academic year, the student exhibited a profile characterized by difficulties in social communication, resistance to accepting rules, and a tendency to center interactions around her desires:

"*At the beginning of the year, she had a hard time socially—she struggled to communicate, did not accept rules, and prioritized her desires… because of this, she had a lot of difficulty with her peers*."

However, throughout the process, these attitudes changed, and the teacher noted that the student developed her social skills and was able to maintain healthier peer relationships.

"*She became a student who was successful in her friendships, sometimes accommodating her peers, making an effort to follow rules, and trying to maintain positive relationships even with those classmates she found most difficult to communicate with*."

The teacher stated that the student progressed at a level comparable to her peers academically, but emphasized that anxiety about failure in certain activities negatively affected her participation.

"*She still struggles academically in some areas because she either does not want to engage in certain activities or holds a bias rooted in fear of failure.*"

Theme 2: Peer relationships and classroom dynamics

The teacher noted that the student's resistance to classroom rules led to conflicts with her peers and that this behavior was met with prejudice by the other children.

"*She was a student who had difficulty solving her problems... her peers were prejudiced against her because of the inappropriate behaviors she exhibited. Also, questions like "Why do I walk on my toes?" or "Why don't the others go to physical therapy?" showed that she was unhappy about the characteristics that made her different from the others.*"

However, as positive behaviors increased over the year, there was a significant improvement in peer relationships, and the attitudes of her classmates also changed in a positive direction.

"*As the negative behaviors decreased, her peers' negative attitudes toward her also came to an end.*"

The teacher also stated that the student did not experience any significant issues in adapting to the school environment overall; however, the lack of structure in the home environment initially led to specific difficulties.

"*Because she came from the comfort and lack of structure at home (like many students), we occasionally incorporated games and activities designed to address this.*"

Theme 3: Instructional strategies and adaptations

The teacher stated that she supported the student's social skills by making use of her tendency toward leadership. This effort proved effective in guiding the student toward positive behavior.

"*Because she is a student who enjoys taking the lead, I often asked her to help me or her classmates. This encouraged her to engage in positive behaviors.*"

In addition, the teacher noted that individualized practices were particularly effective in activities where the student showed a preference for working independently.

"*In some activities, working individually supports her learning. For this reason, I gave her the opportunity and adapted the activities in my daily plan according to her needs*."

The information that the student was receiving individualized support in rehabilitation made it necessary for the approaches used at school also to be based on individualized foundations.

"*Since she works individually in rehabilitation, she expects the same from me at school.*"

Theme 4: Family-school collaboration and behavioral consistency

The teacher emphasized that collaboration with the family played a key role in addressing the student's behavioral issues. Consistency in behavior across both home and school environments formed the foundation for positive change.

"*Ensuring that the rules or approaches implemented at school were continued and reinforced at home through the family's support and collaboration became the most important factor in resolving the problems*."

This statement indicates that strong communication between the family and the teacher was a decisive factor in the student's behavioral development.

3.3. Findings from the Observation Form: Periodical Development

The teacher's evaluations based on the observation forms completed at the beginning and end of the term indicate that the student demonstrated significant development throughout the inclusive education process. Table 1 presents a comparative overview of the changes observed across five key behavioral domains.

Table 1. Observed behavioral changes.

Observed Behaviors	Beginning of the Term	End of the Term
Compliance with rules	Rarely	Often
Participation in classroom activities	Never	Sometimes
Responding to physical cues	Never	Often
The behavior of disturbing others	Often	Sometimes
Working independently	Often	Often
Compliance with daily routines and hygiene rules	Rarely	Sometimes
Following instructions	Sometimes	Often
Table work	Rarely	Rarely
Listening to the teacher's explanations	Often	Often
Listening to peers' explanations	Never	Rarely
Completing assigned tasks	Rarely	Sometimes
Willingness to complete tasks	Rarely	Often
Fulfilling assigned duties	Sometimes	Often
Careful use and protection of materials and equipment	Often	Often
Use of free time	Never	Rarely

Table 1 highlights the behavioral changes observed in the student with CP between the beginning and the end of the academic term, as recorded by the teacher. According to the observation forms, clear differences were identified in the behaviors of a five-year-old girl diagnosed with CP before and after beginning preschool education. These changes, as noted in the teacher's observations, reflect both positive and negative

developments. Below, these changes are presented in terms of improvements and remaining challenges.

Following instructions was rated as “sometimes” at the beginning of the term and improved to “often” by the end. Compliance with rules was observed at the “rarely” at the beginning of the term and improved to “often” by the end. The behavior of disturbing others decreased from “often” at the beginning to “sometimes” at the end, indicating progress. Working independently was rated as “often” at both the beginning and end of the term, showing stability in this area. Similarly, following prompts was consistently rated as “often” throughout the term.

Compliance with daily routines and hygiene rules was observed at the “rarely” level at the beginning of the term and improved to “sometimes” by the end. Table work was rated as “rarely” at the beginning and remained at a similar level by the end. Participation in classroom activities increased from “rarely” at the beginning to “sometimes” at the end. Listening to the teacher’s explanations was consistently rated as “often” at both the beginning and end of the term. Listening to peers' explanations improved slightly, moving from “never” at the beginning to “rarely” by the end. Completing assigned tasks progressed from “rarely” to “sometimes,” while willingness to complete tasks increased significantly from “rarely” to “often.” Fulfilling assigned duties was rated as “sometimes” at the beginning and “often” at the end. Participation in group activities in accordance with the rules improved modestly from “never” to “sometimes.” Careful use and protection of materials and equipment was observed at the “often” level throughout the term, showing consistency. Use of free time improved from “never” at the beginning to “rarely” by the end.

A comparison of the observation forms completed at the beginning and end of the term reveals that the child demonstrated significant positive changes in behavior and development as a result of inclusive education. Notable improvements were observed, particularly in social adaptation skills such as compliance with rules, participation in group activities, and listening to both the teacher and peers. Furthermore, the reduction in behaviors that disturbed others and the increase in communication with playmates indicate a positive shift in the child’s social development. While no major change was observed in the child’s work habits, the overall progress reflects a successful and positive adaptation process.

In summary, both the teacher and the mother emphasized the child’s motivation to participate in classroom activities and the importance of peer support. However, while the teacher highlighted the child’s challenges in completing table work and sustaining attention during group activities, the mother placed greater emphasis on the social and emotional difficulties her child experienced, particularly in peer communication. This synthesis reveals that although their perspectives converge on the value of inclusive education, they diverge in the areas of academic versus social-emotional emphasis.

4. Interpretation of Findings

This study examined the social, emotional, and academic development of a child with CP receiving inclusive education during the preschool period, based on data obtained from teacher and mother interviews as well as teacher-completed observation forms. The findings indicate that the various challenges faced by children with CP during the educational process can be overcome through appropriate strategies, and that the child’s development can be meaningfully supported, particularly when there is strong collaboration between teacher and family.

The adaptation problems the participant child experienced in the early phase of her school life became more pronounced as her physical differences were noticed, manifesting in emotional withdrawal, reduced motivation to attend school, and increased early self-awareness. These findings concur with previous research, which suggests that CP affects not only motor skills but also a child’s psychological and social development (Krigger, 2006; Rosenbaum et al., 2007). Similarly, the literature frequently highlights that children with CP face challenges not only in motor development but also in social and emotional domains (Batshaw et al., 2019; Pfeifer et al., 2011). The child’s questions such as “Why do I walk on my toes?” and “Why don’t the others go to physical therapy?” reflect an early awareness of her differences, while also indicating that this awareness brings emotional vulnerability.

Moreover, the findings regarding the child’s active participation through observing peers and imitating their behaviors can be interpreted within the framework of Bandura’s Social Learning Theory, which emphasizes learning through observation and modeling (Bandura, 1977). Likewise, the significant influence of both family and school contexts on the child’s development corresponds with Bronfenbrenner’s Ecological Systems Theory, which highlights the interplay of multiple environmental systems in shaping children’s experiences (Bronfenbrenner, 1979).

The interviews conducted with the mother revealed not only the emotional burden experienced during the process but also the intense efforts made to overcome it. It was observed that the family supported the child’s learning at home through the use of various materials, regular practice, engagement in reading activities to enhance their knowledge, and participation in social support groups with other families in similar situations. This conscious and proactive attitude played a decisive role in helping the child overcome difficulties in the school environment; notably, the consistency between home and school in managing behavioral issues (e.g., hitting and pushing) formed the foundation for behavioral transformation. These findings align with the emphasis placed by Aral and Gürsoy

(2007), Ferguson (1996) and Sarı (2002) and on the importance of family support and consistency in the inclusion process. Furthermore, the family's recognition of the challenges involved and their collaboration with the teacher and school counseling services, along with their pursuit of professional support (e.g., play therapy, occupational therapy), is particularly noteworthy. This proactive approach parallels existing literature that underscores the role of the family in enhancing the quality of life for children with CP (Calley et al., 2012; Rosenbaum et al., 2007). Additionally, the findings of this study suggest that the inclusion of children with special needs in mainstream education can foster not only their development but also bring about positive developmental changes in their classmates, teachers, and families (Kargın, 2010).

Our data obtained from teacher interview forms administered at the beginning and end of the term revealed that, although the child enjoyed attending school, she experienced various difficulties, particularly in peer relationships and adapting to classroom rules. Notable observations included struggles in following instructions, reluctance to comply with rules, and inadequate interaction with peers. These findings align with existing research indicating that children with CP often require additional support when adapting to authority figures and classroom regulations (Shumway-Cook & Woollacott, 2017). However, by the end of the term, the child demonstrated marked improvement in adhering to classroom rules, with progress attributed to the teacher's guidance and the child's gradual acclimation to the school environment.

The child demonstrated positive communication with individuals outside the family; however, she initially experienced difficulties in interacting with peers. Over time, however, she showed development in this area, began to communicate more easily with her classmates, and was increasingly accepted by them. This finding is consistent with existing research suggesting that participation in inclusive education positively influences the attitudes of typically developing children toward peers with disabilities (Dyson, 2005). It also supports the interpretation that children included in inclusive education settings tend to model the behaviors of their typically developing peers, learn through imitation, and engage in greater self-assessment (Mesibov & Shea, 1996). Observations further revealed that the child's social adaptation process still requires ongoing support. These findings align with prior evidence indicating that children with CP are at risk of social exclusion in inclusive settings and that the social skills of children with special needs must be specifically supported (Gürsel, 2015; Odom, 2021).

All these findings underscore the critical role of the teacher not merely as a transmitter of knowledge but as a transformative guide. Both the insights gathered from family interviews and the results of classroom observations highlight the positive impact of inclusive education on the development of children with CP. In addition, the study shows that a teacher's love-based, inclusive, and sensitivity-driven approach to individual differences significantly facilitates the child's active participation in the classroom environment. Strategies such as assigning responsibilities and offering opportunities for individualized work contributed to the student's academic and social growth. Indeed, the progress documented in the observation forms, particularly the increased frequency of behaviors such as effective use of free time, compliance with instructions, and task completion, supports the effectiveness of the teacher's strategic interventions. Therefore, the findings of the present study extend beyond individual development, demonstrating that when teacher attitudes, family-school collaboration, and a supportive classroom social climate converge, they enable a child with CP to become an active, respected, and contributing member of the learning environment.

At the same time, it is important to note that not all areas showed equal improvement. Although the findings highlighted several positive aspects of the child's inclusion, certain domains demonstrated limited progress. For instance, difficulties in table work and sustaining attention while listening to peers' explanations remained noticeable challenges. These limitations may be explained by the motor difficulties commonly associated with cerebral palsy, which affect fine motor tasks, as well as attention-related challenges that can hinder active engagement in structured learning activities (Rosenbaum et al., 2007). Addressing these areas in inclusive settings requires not only peer and teacher support but also individualized strategies tailored to the child's specific needs.

5. Conclusions and Implications for Policy and Practice

This study examined the developmental process of a child with CP, who was included in preschool inclusive education, based on teacher and mother perspectives as well as teacher observations. The research findings indicate that at the beginning of the education year, the child experienced notable difficulties, particularly in social adaptation, following instructions, and achieving emotional stability. However, over the course of the year, meaningful progress in the child's development was observed, made possible through the teacher's inclusive approach, the family's consistent and informed support, and the effective implementation of individualized instructional strategies.

The findings indicate that the inclusive education process extends beyond academic participation, enabling multifaceted gains such as social inclusion, emotional development, and behavioral transformation. The teacher's supportive, inclusive, and sensitivity-driven approach to individual differences played a key role in helping the student become an accepted and

valued member of the classroom community. Likewise, the family's continued educational support at home, use of professional resources, and consistent collaboration with the teacher directly contributed to the success of the inclusion process. In this regard, the study highlights that for inclusive practices at the preschool level to be effectively sustained, teacher sensitivity, active family involvement, and comprehensive support mechanisms must be implemented simultaneously and holistically.

The results of this study offer several implications for policymakers, practitioners, and researchers. At the policy level, the findings underscore the importance of developing inclusive curriculum policies for preschool-aged children with special needs. In particular, programs must be restructured with consideration for the developmental needs of children with motor and emotional limitations, such as those with CP. For teachers implementing inclusive practices, mandatory in-service training programs should be expanded to cover key areas such as individualized education plans, behavior management, and family collaboration. Furthermore, providing school-based and publicly funded access to supportive special education services, such as occupational therapy, play therapy, and psychological counseling, could represent a significant step toward aligning with the core principles of inclusive education by ensuring equitable access for all children.

From a practical standpoint, teachers must develop instructional strategies and make classroom arrangements that consider the individual characteristics of each student. Identifying a student's strengths and integrating them into the learning process can enhance the effectiveness of inclusive education. Establishing open, continuous, and constructive communication with families is essential to sustaining the process through a shared sense of responsibility. Additionally, implementing consistent discipline and reward systems across both home and school environments can support the permanence of behavioral improvements and contribute to long-term positive change.

6. Limitations and Future Research

This study provides valuable insights into the inclusive education experiences of a preschool child with cerebral palsy from the perspectives of both the teacher and the mother. However, certain limitations should be acknowledged. First, the case study design, while allowing for in-depth exploration, involves a single participant, which limits the generalizability of the findings to the broader population of children with CP. Future research would thus benefit from increasing the number of case-based studies that include participants from diverse socioeconomic contexts, enabling comparative analyses and enhancing the applicability of findings across different settings.

Second, this study primarily employed qualitative methods supplemented by observation forms. While this approach offered rich, contextualized data, incorporating mixed-method designs that integrate quantitative measures could strengthen the validity and reliability of future research outcomes. Such an approach would provide a more comprehensive understanding of the developmental trajectories and educational experiences of children with CP in inclusive settings.

Finally, this study focused on the perspectives of the child's immediate educational environment. Ethnographic research that centers on the roles of families within the inclusion process could yield more profound insights into the cultural, social, and contextual factors that influence the experiences and outcomes of children with CP. Exploring these dimensions would contribute to a more holistic understanding of inclusion and inform the development of culturally responsive educational practices.

Compliance with Ethical Standards

In this study, ethical approval was regarded not merely as a formal requirement but as a fundamental principle guiding every stage of the research process. Prior to data collection, the necessary approval was obtained from the Social and Humanities Sciences Research Ethics Committee of Karabük University with the decision number 2025/04(9) on 28.04.2025; however, the researchers proceeded with the awareness that ethical responsibility extends beyond formal authorization. Throughout the study, therefore, particular attention was paid to issues such as informed consent, voluntary participation, and the protection of privacy.

All participants were informed about the purpose of the study, provided written consent, and participated on a voluntary basis. Confidentiality and professional privacy were meticulously maintained. Data related to the child were not collected directly but obtained through forms completed by the teachers. Consent for the use of this data was obtained from the child's mother, and the information was used solely for research purposes in an anonymous manner. Since the child was represented indirectly, particular care was taken to protect her rights and privacy.

Conflict of Interest

The authors have no conflict of interest to declare.

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RESEARCH ARTICLE

The Effect of Science Activities Supported with Verbal Intelligence Games on the Problem Solving and Scientific Reasoning Skills of Prospective Teachers*

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ABSTRACT

The current study was carried out to determine the effect of science activities supported with verbal intelligence games on the problem solving and scientific reasoning skills of prospective teachers. In the study, a pre-test-post-test control group quasi-experimental design was used. Some applications were conducted with 44 prospective teachers, forming the test and control group in the research. This study was conducted in the intelligence games course taking place in the science teaching program applied in a state university. While the program taught in the intelligence games course in the curriculum of science teaching was used in the control group, science activities supported with verbal intelligence games were applied in the test group. The current study allowed to investigate the verbal intelligence games and the intelligence games forming five sub-dimensions other than verbal intelligence games (reasoning processing games, strategy games, intelligence questions, geometrical mechanical games, memory games) in terms of problem-solving and scientific reasoning skills variables. Verbal intelligence games used in the study were developed by the researcher and applied to prospective teachers for seven weeks. "The Scale of Problem-Solving Skills for Adults" developed by Yaman and Dede (2008) to determine the effect of science activities supported with verbal intelligence games on the problem-solving skills was used and "The Scientific Reasoning Skills Test" prepared by Yüksel (2015) to determine their effect on the scientific reasoning skills was used. Problem-solving skills of the prospective teachers who were applied verbal intelligence games were positively affected in the study. When it comes to the pre-test and post-test data of the scale of problem-solving skills for adults of the test and control groups, no statistically significant difference was found even though mean score of the test group was higher than that of the control group. In the test group, reasoning skills at the prospective teacher who were applied verbal intelligence games were affected positively.

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1. Introduction

Deep rooted games are of a valuable place in human life, particularly in children's life. Games are not only an effective learning media, but they also have an active place in the cognitive, physical and affective development of children (Öztürk, 2007). Intelligence games are of a vital place in the integration of games to education. One of the trials of this

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integration was carried out with the publication and application of Secondary School and İmam Hatip Secondary School Intelligence Games Course Curriculum (MoNE, 2013). In a study by Şen (2020), it was pointed out that intelligence games were included in the curriculum to support the cognitive development of children, finding a solution for the problems encountered, to allow them make the most suitable decision in a short time and to make a social interaction by playing individually or in a group.

Intelligence games course is taught in six sub-dimensions under intelligence games in the curriculum. One of them is verbal games. It is expressed in the curriculum that as well as benefiting from vocabulary in different ways, children also make use of logical deductions thanks to verbal games. Intelligence games course focuses on the development of affective features of problem solving, communication and reasoning at children. Problem solving forms the basis of intelligence games course and its activities (MoNE, 2013).

Games, especially intelligence games, are connected to problem solving and reasoning. Li et al., (2012) indicated that playing games is a continual observation and problem-solving process. In their studies, Bottino et al. (2013) carefully and well-designed intelligence games could contribute to the persistence of reasoning and problem-solving skills at students. Upon taking these cases into consideration, it is thought that gamification of the subject matters taking place in the verbal pats in the science curriculum using verbal intelligence games would contribute to individuals both in cognitive fields and allow them to carry on the learning process in the direction of their wishes.

The current study is of importance in terms of revealing whether supporting the learning process with intelligence games, activating a great many skills, using verbal intelligence games in teaching verbal subjects, which are significant in number, in science course will provide an advantage for individuals in various senses. Teachers are of significant and vital tasks inn supporting the learning process with benefits, helping learners develop different fields. Devecioğlu and Karadağ (2014) pointed out in their studies that teacher's inadequacy in the course and not teaching the course as expert teachers are frequently expressed points for the problems encountered in intelligence games course. The more information one has regarding intelligence games, the better the benefits that will be provided through intelligence games could be transferred to students. It is thought that the prospective teachers who can improve themselves in intelligence games will be in an advantageous position for the integration of these games to the course in the future.

The current study is different from other studies in some respects. Studies were mostly carried out with student groups regarding intelligence games (Aşuluk, 2020; Coşanay & Kasa Ayten, 2023; Doğan, 2023; Güvenç Çalışkan, 2024; Kurbal, 2015; Özen, 2023; Sarı, 2024; Usta et al., 2023; Yılmaz, 2019; Zengin Kılavuz, 2024). In a study carried out by Deniz (2024), to investigate post-graduate theses regarding mental and intelligence games in Türkiye there are some findings supporting this idea. In the related study, upon the review of the distribution of the theses prepared in the field of mental and intelligence games, it was indicated that the studies were carried out with students at the rate of 66.67%, with teachers at the rate of 21.43%, with student guardians at the rate of 3.57% and with prospective teachers at the rate of 2.38%. The current study was conducted with the prospective teachers having their education at the university. The reason why prospective teachers were chosen results from the idea that teachers are at the key point for students who would be able benefit from the uses intelligences games could offer. The study was carried out in the intelligence games course taking place in the science curriculum applied at a state university. This study is of importance in terms of the fact that it investigates verbal intelligence games and five sub-dimensions out of verbal intelligence games (reasoning processing games, strategy games, intelligence questions, geometrical mechanical games, memory games) with the variables of problem-solving skills and scientific reasoning skills.

The problem sentence of the current study comprises the question of "Is there an effect of verbal intelligence games supported with science activities on the problem-solving skills and scientific reasoning skills of prospective teachers?"

1.1. Sub-Problems

1. Is there a statistically significant difference between the pre-test scores of the scale of problem-solving skills for adults for the test and control groups?
2. Is there a statistically significant difference between the pre-test-post-test scores of the scale of problem-solving skills for adults for the test group?
3. Is there a statistically significant difference between the pre-test-post-test scores of the scale of problem-solving skills for adults for the control group?
4. Is there a statistically significant difference between the post-test scores of the scale of problem-solving skills for adults for the test and control groups?
5. Is there a statistically significant difference between the pre-test scores of the scientific reasoning skills test for the test and control groups?
6. Is there a statistically significant difference between the pre-test-post-test scores of the scientific reasoning skills test for the test group?
7. Is there a statistically significant difference between the pre-test-post-test scores of the scientific reasoning skills test for the control group?

8. Is there a statistically significant difference between the post-test scores of the scientific reasoning skills test for the test and control groups?

2. Method

The research was discussed in the Ethical Commission of Gazi University Rectorship with a date of 09.10.2024 and no of 16 and ethically approved. The date and number of the related documents is 21.10.2024-E.1069674.

The current study is a quantitative research with a pre-test-post-test paired control group design from quasi-experimental designs. In this design, the paired groups are assigned to process groups randomly. In this design, a different process is applied to the test group from the control group, while the control group is carried on without any change (Büyüköztürk et al., 2022).

2.1. Population/Sampling

The sampling of the study was made up of 44 prospective teachers forming the test group (n=22) and the control group (n=22) studying in the section of science education of the department of mathematics and science education at a state university in the city of Ankara. The test and control groups were chosen randomly in the research. The prospective teachers studying at the section of science education of the department of mathematics and science education at a state university in the city of Ankara comprise the population of the study.

2.2. Data Collection Tools

Within the scope of the study, "The Scientific Reasoning Skills Test" prepared by Yüksel (2015) to determine their effect on the scientific reasoning skills and "The Scale of Problem-Solving Skills for Adults" developed by Yaman and Dede (2008) to determine the effect of science activities supported with verbal intelligence games on the problem-solving skills were used.

2.2.1. The scientific reasoning skills test

The Scientific Reasoning Skills Test prepared by Yüksel (2015) was examined by field expert instructors in the field and arranged. The validity and reliability calculations of the test was made and applied to 303 students. As a result of the analysis of the data obtained, Cronbach Alpha reliability coefficient was found .76. The test was made up of 26 questions in total, 19 semi-open-ended, seven open-ended. Total 26 questions were examined in seven sub-dimensions as conservation laws (3), proportional thinking (4), determining and controlling variables (4), combinational thinking (4), correlational thinking (4), probability thinking (4) and hypothetical thinking (3).

2.2.2. The scale of problem-solving skills for adults

The scale developed by Yaman and Dede (2008) to determine the problem-solving skill levels of adults is a Likert-type scale. Numbering in the scale corresponds to 1=Never, 2= Rarely, 3=Sometimes, 4=Frequently, 5=Always. The scale was applied to 550 adults. As a result of the findings obtained in the scale, Alpha reliability coefficient was found .88. The total 18 questions were examined in five sub-dimensions as thinking of the solution effects of the problem (5), problem solving through modelling (3), searching for alternative solutions (4), commitment in solving the problem encountered (3), analysing the problem encountered (3).

2.3. Application Process

The activities in the current study were prepared for the prospective teachers studying at the section of science education and forming the test group. As a result of the revision of the literature regarding the national and international books, related articles and theses, the activities in the research were originally formed by the researcher. To make the activities more understandable, instructions were added before them. The games of "Finding the Password, Grouping Vocabular, Mixed Letters, Vocabulary Circle and Word Hunt" were determined by the researcher and depending on feedbacks from the expert educators, the games were finalized. The science activities developed with verbal intelligence games in the research were shaped under the headings of biology, physics, chemistry, nature education, science history, astronomy, renewable energy.

2.4. Data Collection Process

Data collection process of the test and control groups in the research was completed in nine weeks. The data of the study was collected in 2024-2025 academic year. The application and data collection process of the test and control groups were given below in detail:

Table 1. The application and data collection process the test and control groups.

Weeks	Test Group	Control Group
Week 1	Application of Pre-tests	Application of Pre-tests
Week 2	Activity-Based Science Education in the Biology Subjects Supported with Verbal Intelligence Games	Current Science Education Undergraduate Curriculum (Intelligence Games Course)
Week 3	Activity-Based Science Education in the Physics Subjects Supported with Verbal Intelligence Games	Current Science Education Undergraduate Curriculum (Intelligence Games Course)
Week 4	Activity-Based Science Education in the Chemistry Subjects Supported with Verbal Intelligence Games	Current Science Education Undergraduate Curriculum (Intelligence Games Course)
Week 5	Activity-Based Science Education in the Nature Education Subjects Supported with Verbal Intelligence Games	Current Science Education Undergraduate Curriculum (Intelligence Games Course)
Week 6	Activity-Based Science Education in the Science History Subjects Supported with Verbal Intelligence Games	Current Science Education Undergraduate Curriculum (Intelligence Games Course)
Week 7	Activity-Based Science Education in the Astronomy Subjects Supported with Verbal Intelligence Games	Current Science Education Undergraduate Curriculum (Intelligence Games Course)
Week 8	Activity-Based Science Education in the Renewable Energy Subjects Supported with Verbal Intelligence Games	Current Science Education Undergraduate Curriculum (Intelligence Games Course)
Week 9	Application of Post-tests	Application of Post-tests

2.5. Data Analysis

The quantitative data obtained in the research was analysed using Jamovi 2.6.19 application. Normality test (Shapiro-wilk), homogeneity test (Levene), dependent t-test, independent t-test, ANCOVA test were used during the analyses and the data obtained was given as tables in the findings part. The normality and homogeneity test results of the quantitative data collection tools used were given below.

Table 2. Pre-test normality (Shapiro-Wilk) results of the scale of problem-solving skills for adults for test and control groups.

Group	N	W	p
Test	22	.97	.38
Control	22		

As is given in Table 2, since it is p>.05, normality assumption is met.

Table 3. Pre-test homogeneity (Levene) results of the scale of problem-solving skills for adults for test and control groups.

Group	N	F	df	df2	p
Test	22	.02	1	42	.88
Control	22				

As is given in Table 3, since it is p>.05, homogeneity assumption is met.

Table 4. Pre-test normality (Shapiro-Wilk) results of the scientific reasoning skills test for test and control groups.

Group	N	W	p
Test	22	.97	.37
Control	22		

As is given in Table 4, since it is p>.05, normality assumption is met.

Table 5. Pre-test homogeneity (Levene) results of the scientific reasoning skills test for test and control groups.

Group	N	F	df	df2	p
Test	22	3	1	42	.09
Control	22				

As is given in Table 5, since it is p>.05, homogeneity assumption is met.

3. Findings

The analyses of the findings regarding the questions taking place in the research problem were given as tables in this part. Firstly, normality and homogeneity assumptions were examined for the data concerning problem-solving skills. Since the assumptions were met, parametric tests were carried out. Following that, normality and homogeneity assumptions were examined for scientific reasoning skills test. Since there was a significant difference between the pre-test data of the test and control groups even though normality and homogeneity were met, ANCOVA test was conducted.

3.1. Findings Regarding First Sub-Problem

The first sub-problem of the study is “Is there a statistically significant difference between the pre-test scores of the scale of problem-solving skills for adults for the test and control groups?”. To understand whether there was a statistically significant difference between the pre-test scores of the scale of problem-solving skills for adults for the test and control groups, the data was analysed using independent t-test, one of the parametric tests.

Table 6. Pre-test independent t-test results for the scale of problem-solving skills for adults for the test and control groups.

Group	N	X̄	t	df	p
Test	22	64.68	-0.70	42	.49
Control	22	66.45			

Independent t-test results in Table 6 show that since it was p>05, no significant difference was found between the pre-test mean scores for the problem-solving skill of the test and control groups.

3.2. Findings Regarding Second Sub-Problem

The second sub-problem of the study is "Is there a statistically significant difference between the pre-test-post-test scores of the scale of problem-solving skills for adults for the test group?". To understand whether there was a statistically significant difference between the pre-test scores of the scale of problem-solving skills for adults for the test and control groups, the data was analysed using dependent t-test, one of the parametric tests.

Table 7. Pre-test-post-test dependent t-test results for the scale of problem-solving skills for adults for the test group.

Test	N	X̄	t	df	p
Pre-test	22	64.68	-3.30	21	.00
Post-test		68.36			

Dependent t-test results in Table 7 show that since it was p<.05, a significant difference was found between the pre-test and post-test mean scores for the scale for the problem-solving skill of the test group.

3.3. Findings Regarding Third Sub-Problem

The third sub-problem of the study is "Is there a statistically significant difference between the pre-test-post-test scores of the scale of problem-solving skills for adults for the control group?". To understand whether there was a statistically significant difference between the pre-test scores of the scale of problem-solving skills for adults for the test and control groups, the data was analysed using dependent t-test, one of the parametric tests.

Table 8. Pre-test-post-test dependent t-test results for the scale of problem-solving skills for adults for the control group.

Test	N	X̄	t	df	p
Pre-test	22	66.45	.21	21	.84
Post-test		66			

Dependent t-test results in Table 8 show that since it was p>.05, no significant difference was found between the pre-test and post-test mean scores for the scale of problem-solving skills for adults for the control group**.**

3.4. Findings Regarding Fourth Sub-Problem

The fourth sub-problem of the study is "Is there a statistically significant difference between the post-test scores of the scale of problem-solving skills for adults for the test and control groups?". To understand whether there was a statistically significant difference between the post-test scores for the test and control groups, the data was analysed using dependent t-test, one of the parametric tests.

Table 9. Post-test independent t-test results for the scale of problem-solving skills for adults for the test and control groups.

Group	N	X̄	t	df	p
Test	22	68.36	.91	42	.37
Control	22	66			

Independent t-test results in Table 9 show that since it was p>.05, no significant difference was found between the post-test mean scores for the scale of problem-solving skills for adults for the test and control groups.

3.5. Findings Regarding Fifth Sub-Problem

The fifth sub-problem of the study is "Is there a statistically significant difference between the pre-test scores of the scientific reasoning skills test for the test and control groups?". To understand whether there was a statistically significant difference between the pre-test scores of the scientific reasoning skills test for the test and control groups, the data was analysed using independent t-test, one of the parametric tests.

Table 10. Pre-test independent t-test results for scientific reasoning skills test for the test and control groups.

Group	N	X̄	t	df	p
Test	22	12.36	2.81	42	.01
Control	22	9.59			

Independent t-test results in Table 10 show that since it was p<.05, a significant difference was found between the pre-test mean scores for the scientific reasoning skills test for the test and control groups. Therefore, ANCOVA test was conducted for the post-test mean scores. The findings obtained in ANCOVA test were given in Table 13.

3.6. Findings Regarding Sixth Sub-Problem

The sixth sub-problem of the study is "Is there a statistically significant difference between the pre-test-post-test scores of the scientific reasoning skills test for the test group?". To understand whether there was a statistically significant difference between the pre-test-post-test scores of the scientific reasoning skills test for the test group, the data was analysed using dependent t-test, one of the parametric tests.

Table 11. Pre-test-post-test dependent t-test results for the scientific reasoning skills test for the test group.

Test	N	X̄	t	df	p
Pre-test	22	12.36	-7.44	21	.00
Post-test		17.09			

Independent t-test results in Table 11 show that since it was p<.05, a significant difference was found between the pre-test-post-test mean scores for the scientific reasoning skills test for the test group.

3.7. Findings Regarding Seventh Sub-Problem

The seventh sub-problem of the study is "Is there a statistically significant difference between the pre-test-post-test scores of the scientific reasoning skills test for the control group?". To understand whether there was a statistically significant difference between the pre-test-post test scores of the scientific reasoning skills test for the control group, the data was analysed using dependent t-test, one of the parametric tests.

Table 12. Pre-test-post-test dependent t-test results for the scientific reasoning skills test for the control group.

Group	Test	N	X̄	t	df	p
Control	Pre-test	22	9.59	-8.38	21	.01
	Post-test	22	14.36			

Independent t-test results in Table 12 show that since it was p<.05, a significant difference was found between the pre-test-post-test mean scores for the scientific reasoning skills test for the control group.

3.8. Findings Regarding Eighth Sub-Problem

The eighth sub-problem of the study is "Is there a statistically significant difference between the post-test scores of the scientific reasoning skills test for the test and control groups?". Upon the revision of the scientific reasoning skills for the pre-test, since it was p<.05, to understand whether there was a statistically significant difference between the post-test scores of the scientific reasoning skills test for the test and control group, ANCOVA test was applied.

Table 13. Post-test ANCOVA test results for the scientific reasoning skills test for the test and control groups.

	Total Squares	df	Mean Squares	F	p
Group	2.53	1	2.53	.33	.57

ANCOVA test results in Table 13 show that p=.57 was found in the post-test data for the scientific reasoning skills test for the test and control group when a common pre-test variable was taken. The results in Table 13 show that since it was p>.05, no significant difference was found between the post-test mean scores for the scientific reasoning skills test for the test and control groups.

4. Discussion, Conclusion and Recommendations

In the study, as a result of the independent t-test results carried out between pre-test scores of the scale of the problem-solving skills for adults for the test and control groups it was found that the groups were equal. Regarding the pre-test and post-test scores of the scale of problem-solving skills for adults for the test group, a statistically significant difference was found. Problem-solving skills were affected positively at the prospective teachers who were applied verbal intelligence games in the test group. There are some studies supporting this result in the related literature. In a study by Güvenç Çalışkan (2024) it was pointed out that a significant difference was found between the pre-test and post-test scores for the problem-solving skills for the test group which was applied activities developed with verbal games in the unit of force and motion in the science course. Şahin and Tezci (2023) indicated in their studies that there was a significant difference between the pre-test and post-test scores for the problem-solving skills of the test group students playing with intelligence games containing verbal game as well. In a study by Özer (2017), it was pointed out that there was a significant difference between the pre-test and post-test scores for the problem-solving skill of the test group which was applied serious games used for the purpose of education in the science course. In another study by Kurupınar (2021), it was indicated that there was a significant difference between pre-test and post-test scores for the problem-solving skill of the test group for which intelligence game education program including verbal games was developed and to which this program was applied and that intelligence games education program were effective on the problem-solving skills of preschool education children. In a study by Güngör (2021), it was expressed that there was a significant difference between the pre-test and post-test data of the scale aiming at the problem-solving skills of the test group where mental and intelligence games were used and that mental and intelligence games are of effect on the development of problem-solving skills at preschool children. Özen (2023) pointed out in their study that mental and intelligence games affected problem-solving skills positively. It was found in the study that regarding the pre-test and post-test scores of the problem-solving skills scale for adults for control group, there was no statistically significant difference between them. In this sense, it is likely to say that the application of the current science education curriculum in the control group did not affect the problem-solving skills of the prospective teachers statistically. When it comes to the post-test scores for the scale of problem-solving skills for adults for the test and control groups, no statistically significant difference was found between them. Upon the revision of the data, even though the mean score of the test group was higher than that of the control group, this difference

could not be caught statistically. In this context, upon the comparison of the application of current science education undergraduate curriculum (intelligence games course) in the control group with the application of the activities supported wit verbal intelligence games in the test group, it was found that problem-solving skills were not affected at a significant level. Because the control group took precedence over the test group regarding the mean score in the pre-test data for the problem-solving skills for adults for the test and control groups, even though test group had a positive improvement, an adequate difference was not formed between the post-tests of the two groups.

In the current study, it was observed that since the groups were not equal at the end of independent t-test result carried out between the pre-test scores for the scientific reasoning skills test for the test and control groups, it was required to conduct ANCOVA test at the post-test. Regarding the pre-test and post-test scores of the scientific reasoning skills test for the test group, it was found that there was a significant difference between them. Scientific reasoning skills were affected positively at the prospective teachers who were applied verbal intelligence games in the test group. When it comes to the pre-test and post-test cores for the scientific reasoning skills test for the control group, it was found that there was a significant difference between them. It was observed that the application of the current science education undergraduate curriculum (intelligence games course) in the control group affected the reasoning skills of the prospective teachers statistically. As for the post-test scores of the scientific reasoning skills test for the test and control groups, it was found that there was no statistically significant difference between them. Because making an application with intelligence games regardless of the sub-dimension both in the test and control groups did not form a similar effect, scientific reasoning skills at the prospective teachers were positively affected. There are some researches supporting the idea of observing a positive effect in scientific reasoning skills with the application of intelligence games in the literature. In their studies, Bottino et al. (2013) indicated that digital intelligence games improved certain reasoning talents. In another study, Kurbal (2015) pointed out that intelligence games course affected reasoning skills positively. In their study, Baki (2022) expressed that game-based mathematics teaching developed reasoning skills at students.

The recommendations developed for the current study are as follows:

1. It was observed that science activities supported with verbal intelligence games affected the problem-solving skills and reasoning skills of the prospective teachers positively. In this sense, it is recommended that verbal intelligence games be used as a significant supportive in teaching different subjects and concepts in the science course.
2. In this study, verbal games, one of the six sub-dimensions of intelligence games, and the other five sub-dimensions were examined within the framework of scientific reasoning skills and problem-solving skills variables. It is likely that some researchers could be carried out with other variables to be able to see other probabilities in the future studies.
3. Verbal intelligence games were integrated into the science course in the research and investigated. It is recommended that similar studies be conducted in different disciplines and the results could be investigated.

Compliance with Ethical Standards

The research was discussed in the Ethical Commission of Gazi University Rectorship with a date of 09.10.2024 and no of 16 and ethically approved. The date and number of the related documents is 21.10.2024-E.1069674.

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Conflict of Interest

The authors have no conflict of interest to declare.

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RESEARCH ARTICLE

An Examination of Pre-Service Teachers' Awareness of Global Climate Change and Their Literacy on Renewable Energy Sources

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ABSTRACT

The aim of this study is to examine the literacy of pre-service teachers from different disciplines regarding renewable energy sources and their awareness of global climate change in terms of various variables. For this purpose, the research was conducted using a descriptive survey model. The study group consisted of 196 pre-service teachers selected through purposive sampling. According to the results, no significant difference was found between genders for either variable, whereas, a significant difference was found in favor of the primary education department. Furthermore, when the difference in global climate change awareness was examined according to the levels of literacy regarding renewable energy sources, it was found that those with higher literacy levels also had higher awareness of global climate change. Finally, when pre-service teachers' literacy regarding renewable energy sources was analyzed based on their awareness of global climate change, it was observed that there were significant differences between moderate and low levels, as well as between high and low levels of awareness. To conclude it is important to determine the current situation regarding pre-service teachers' awareness of global climate change and their literacy about renewable energy sources together, as such an examination contributes to addressing the increasingly destructive environmental problems of today.

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1. Introduction

Since the existence of humankind, people have continuously interacted with their environment. In order to solve problems encountered in daily life, meet their needs, and improve their level of welfare, they have inevitably consumed environmental resources. In recent years, however, both the scale and the pace of this consumption have increased dramatically (Erten, 2005). Particularly in the 21st century, the growing use of non-renewable energy resources has become one of the major environmental challenges, contributing significantly to global climate problems. The current dependence on non-renewable energy resources accelerates the depletion of energy supplies. In fact, there is no type of energy in nature that cannot be renewed; however, due to the nature of their formation processes, some energy sources require extremely long periods to regenerate. These sources, which take a long time to renew and are rapidly depleted, are referred to as non-renewable energy resources (Soral, 2020). Most energy needs today are met by fossil fuels. The rapid depletion of fossil fuels and other energy resources negatively affects both national economies and the environment (Göcük & Şahin, 2016). Therefore, the utilization of renewable rather than non-

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renewable energy sources is increasingly encouraged. Renewable energy sources are those that, within the natural cycle, are available the next day in the same form, exist within a continuous cycle, regenerate faster than their rate of consumption, and can be reused repeatedly (Gezer, 2013). The excessive and unconscious consumption of energy resources is among the primary causes of climate-related problems.

Climate is defined based on long-term averages of meteorological elements such as wind, precipitation, and temperature, accumulated over millions of years. The climate system is influenced not only by its internal components-such as the Earth's surface, atmosphere, snow and ice cover, and water bodies-but also by natural external factors, including solar radiation and volcanic activity. In addition, human activities are considered anthropogenic factors that significantly affect the climate system. Any change occurring in one element of the system sequentially influences other components as well (Dölek & Yazıcı, 2018; Le Treut et al., 2007).

Climate change has occurred throughout history; however, human impact and the rapid accumulation of carbon today have accelerated this process, negatively affecting all living beings. Raising awareness can help prevent these adverse effects (Deniz et al., 2021). In recent years, the impact of human activities on environmental systems has increasingly gained attention in research. Studies have shown that human-induced changes produce directly observable effects and occur at a much faster rate compared to natural processes (Schlesinger et al., 2007). These impacts are not limited to specific sectors; they can significantly disrupt ecosystem structure, function, and biodiversity (Yasuhara et al., 2012). Therefore, addressing environmental problems requires not only technological or biological solutions but also the implementation of multidisciplinary approaches that place human–environment interactions at the center (Mumtaz et al., 2022). The OECD also emphasizes that environmental education should aim to shift from "knowledge transmission to behavioral change" (OECD, 2021). Societies' concerns about the future have increasingly heightened their interest in environmental issues. Efforts to secure tomorrow have brought environmental problems to the forefront of public awareness (Keleş et al., 2012). However, while individuals attempt to address environmental issues, they may possess insufficient or incorrect knowledge regarding energy, energy resources, and energy consumption habits. These misconceptions hinder individuals from finding solutions to environmental phenomena such as global warming and discourage them from seeking alternative energy options. Education plays a crucial role in fostering literacy and awareness regarding these problems (Akitsu et al., 2017; Bodzin et al., 2013; Demirbağ, 2019). In the field of education, necessary knowledge, skills, and values can first be integrated into the teaching process through teachers to enable students to handle such situations in their daily lives (Liarakou et al., 2009). In particular, the goal of science education is to equip students with scientific process skills and fundamental scientific concepts, while also enabling them to apply these concepts in everyday life (Güven et al., 2019). Achieving these goals, however, requires that teachers and pre-service teachers-who play a pivotal role in education-possess adequate competencies and high levels of awareness in these areas (Cebesoy & Karışan, 2017). Several studies have examined teachers' and pre-service teachers' attitudes, knowledge, and awareness regarding energy resources and global climate change (Baysal & Daşdemir, 2023; Cebesoy & Karışan, 2017; Güven Yıldırım et al., 2022; Karabulut, 2023; Karakaya Cırıt, 2017; Koç et al., 2018; Yılmaz & Aydoğdu, 2020; Yiğit & Özel, 2023). However, no study in the literature has simultaneously addressed both variables. Considering that education begins with families during childhood and continues through teachers in later years, there is a need to examine more deeply the literacy of teachers regarding renewable energy sources and their awareness of global climate change. In this context, the purpose of the present study is to investigate pre-service teachers' literacy concerning renewable energy sources and their awareness of global climate change in relation to various variables. Based on this purpose, the sub-problems of the research were determined as follows.

1. Do pre-service teachers' literacy levels regarding renewable energy sources differ statistically according to their gender and department?
2. Do pre-service teachers' awareness of global climate change differ statistically according to their gender and department?
3. Is there a statistically significant difference in pre-service teachers' awareness of global climate change based on their literacy levels regarding renewable energy sources (low, medium, and high)?
4. Is there a statistically significant difference in pre-service teachers' literacy regarding renewable energy sources based on their awareness levels of global climate change (low, medium, and high)?

2. Method

This study was conducted with the approval of the Gazi University Ethics Committee, dated 13.12.2021, with protocol number 2021/1129.

2.1. Research Design

This study employed a descriptive survey design to examine pre-service teachers' literacy regarding renewable energy sources and their awareness of global climate change. Descriptive survey research aims to determine the existing situation as it is, without intervening in the past or present

conditions (Karasar, 2000).

2.2. Study Group

The study group of the research consisted of a total of 196 pre-service teachers from different disciplines who were enrolled at a state university in Ankara during the 2021–2022 academic year. This method was chosen to ensure the inclusion of participants from specific teaching disciplines relevant to the purpose of the study. The instruments used to collect data included. The demographic characteristics of the study group are presented in Table 1.

Table 1. Demographic characteristics of the participants.

		n	%
Gender	Female	175	89.3
	Male	21	10.7
	Total	196	100.0
Grade Level	2nd Year	123	62.8
	3rd Year	73	37.2
	Total	196	100.0
Department	Science Education	104	53.1
	Primary Education	62	31.6
	Biology	30	15.3
	Total	196	100.0

Among the participants in the study group, 89.3% were female and 10.7% were male. With respect to grade level, 62.8% of the participants were in the 2nd year, while 37.2% were in the 3rd year. Regarding the distribution of their departments, 53.1% were enrolled in Science Education, 31.6% in Primary Education, and 15.3% in Biology Education.

2.3. Data Collection Instruments

Two data collection instruments were used in this study. The first instrument is the "Renewable Energy Literacy Scale" developed by Güven Yıldırım and Önder (2021). The scale, which has been tested for validity and reliability, consists of 20 items on a 3-point Likert-type scale and has two sub-dimensions. The first sub-dimension, "literacy in terms of types of energy sources", consists of 11 items, while the second sub-dimension, "literacy in terms of country and environmental problems", consists of 9 items. The internal consistency coefficients were calculated to determine the reliability of the scale. The internal consistency coefficient of the first sub-dimension was .94, the second sub-dimension was .88, and the overall internal consistency coefficient of the scale was .91. The validity of the scale was ensured through expert opinions.

The second instrument used in the study is the "Awareness Scale of University Students About Global Climate Change" developed by Deniz et al. (2021). This 21-item, 5-point Likert-type scale consists of four sub-dimensions. The reliability coefficients of the sub-dimensions were calculated as follows: "awareness of the effects of global climate change on the natural and social environment", .87; "awareness of global organizations and agreements", .81; "awareness of the causes of global climate change", .814; and "awareness of the energy consumption relation of global climate change", .72. The overall Cronbach's Alpha value of the scale was calculated as .82, indicating good reliability. The validity of the scale was ensured through expert opinions.

2.4. Data Analysis

The data were analyzed using the SPSS 21 statistical software package. Descriptive statistical techniques were used to determine whether the data were normally distributed. Measures of central tendency (mean, mode, median) and measures of dispersion (standard deviation, variance, skewness, and kurtosis) were calculated for the scale scores. For the first and second sub-problems of the study, independent samples t-tests and one-way ANOVA tests were used together. For the third sub-problem, an independent samples t-test was applied, while for the fourth sub-problem, a one-way ANOVA test was conducted.

3. Findings

The normality of the research data was assessed using descriptive analyses. The descriptive statistics for the study data are presented in Table 2 and Table 3.

Table 2. Descriptive statistics of pre-service teachers' literacy regarding renewable energy sources.

Dimension	n	M	SD	Mode	Median	Kurtosis	Skewness	Variance
"Literacy in Terms of Types of Energy Sources"	196	17.76	2.69	20.00	19.00	-.03	-.84	7.26
"Literacy in Terms of Country and Environmental Problems"	196	16.43	1.66	18.00	17.00	.93	-1.12	2.78
"Total Literacy Regarding Renewable Energy Sources"	196	34.19	3.80	38.00	35.00	.11	-.91	14.47

For the data obtained from the Pre-service Teachers' Literacy Regarding Renewable Energy Sources Scale. the closeness of the mode, median, and mean values indicates that the data are normally distributed (Büyüköztürk et al., 2006). Examination of the skewness and kurtosis coefficients in Table 2 shows that both values fall within the ±1.5 range, suggesting

that the data conform to a normal distribution (Tabachnick & Fidell, 2013). Based on these findings, it was concluded that the data on pre-service teachers' literacy regarding renewable energy sources are normally distributed, and thus parametric tests were employed for data analysis.

Table 3. Descriptive statistics of pre-service teachers' awareness of global climate change.

Dimension	n	M	SD	Mode	Median	Kurtosis	Skewness	Variance
"Awareness of the Effects of Global Climate Change on the Natural and Social Environment"	196	40.29	4.38	45.00	41.00	-.11	-.73	19.24
"Awareness of Global Organizations and Agreements"	196	13.77	6.03	6.00	13.00	-1.09	.25	36.44
"Awareness of the Causes of Global Climate Change"	196	7.25	3.05	3.00	7.00	-0.76	.23	9.36
"Awareness of the Energy Consumption Relation of Global Climate Change"	196	13.42	1.84	15.00	14.00	-.00	-.95	3.39
"Total Awareness of Global Climate Change"	196	74.74	9.96	71.00	74.00	-.52	.10	99.31

For the data obtained from the Pre-service Teachers' Awareness of Global Climate Change Scale, the closeness of the mean, median, and mode values indicates that the data are normally distributed (Büyüköztürk et al., 2006). Furthermore, examination of the skewness and kurtosis coefficients in Table 3 shows that both values fall within the ±1.5 range, suggesting that the data conform to a normal distribution (Tabachnick & Fidell, 2013). Based on these findings, it was concluded that the data on pre-service teachers' awareness of global climate change are normally distributed, and parametric tests were therefore employed for data analysis.

3.1. Findings Related to the First Sub-Problem

Under the first sub-problem, the variation in pre-service teachers' literacy regarding renewable energy sources was examined according to gender and department.

First, the results of the independent samples t-test, conducted to determine whether pre-service teachers' literacy levels regarding renewable energy sources differ statistically according to gender, are presented in Table 4.

Table 4. Comparison of pre-service teachers' literacy levels regarding renewable energy sources by gender.

Dimension	Gender	n	M	SD	df	t	p
"Literacy in Terms of Types of Energy Sources"	Female	175	17.76	2.64	194	.08	.93
	Male	21	17.71	3.14			
"Literacy in Terms of Country and Environmental Issues"	Female	175	16.45	1.66	194	.56	.57
	Male	21	16.23	1.70			
"Total Literacy Regarding Renewable Energy Sources"	Female	175	34.22	3.73	194	.30	.75
	Male	21	33.95	4.46			

According to Table 4, there was no statistically significant difference in pre-service teachers' literacy levels regarding renewable energy sources based on gender. Specifically, no significant differences were found in the sub-dimension of literacy in terms of types of energy sources [$t_{(194)} = 0.08$, $p > .05$] or in the sub-dimension of literacy in terms of country and environmental issues [$t_{(194)} = 0.56$, $p > .05$], nor in the total literacy scores regarding renewable energy sources [$t_{(194)} = 0.30$, $p > .05$].

The results of the one-way ANOVA and Post Hoc tests, conducted to examine whether pre-service teachers' literacy levels regarding renewable energy sources differ statistically according to their department, are presented in Table 5.

As shown in Table 5, no statistically significant difference was observed in the sub-dimension of literacy in terms of types of energy sources [$F_{(2, 193)} = 2.25$, $p > .05$] according to the department. However, statistically significant differences were found in the sub-dimension of literacy in terms of country and environmental problems [$F_{(2, 193)} = 4.78$, $p < .05$] and in the total literacy scores regarding renewable energy sources [$F_{(2, 193)} = 4.02$, $p < .05$]. Post Hoc analysis revealed that, in the sub-dimension of literacy in terms of country and environmental issues, the significant differences were between Primary Education (M = 16.88, SD = 1.31) and Science Education (M = 16.34, SD = 1.73), and between Primary Education and Biology Education (M = 15.80, SD = 1.86). Considering the total literacy scores, the differences were observed between Primary Education (M = 35.22, SD = 3.42) and Science Education (M = 33.90, SD = 3.88), and between Primary Education and Biology

Education (M = 33.06, SD = 3.91). These results indicate that pre-service teachers in the Primary Education program have significantly higher literacy levels in terms of country and environmental problems as well as total literacy regarding renewable energy sources compared to those in the other programs.

Table 5. Comparison of pre-service teachers' literacy levels regarding renewable energy sources by department.

Dimension	n	M	SD	df	F	p	Post Hoc
"Literacy in Terms of Types of Energy Sources"							
Science Education (SE)	104	17.5	2.72	2	2.25	.10	-
Primary Education (PE)	62	18.3	2.60				
Biology Education (BE)	30	17.26	2.66				
Total	196	17.76	2.69				
"Literacy in Terms of Country and Environmental Problems"							
Science Education (SE)	104	16.34	1.73	2	4.78	.00	PE >SE
Primary Education (PE)	62	16.88	1.31				PE>BE
Biology Education (BE)	30	15.80	1.86				
Total	196	16.43	1.66				
Total Scale							
Science Education (SE)	104	33.90	3.88	2	4.02	.01	PE >SE
Primary Education (PE)	62	35.22	3.42				PE>BE
Biology Education (BE)	30	33.06	3.91				
Total	196	34.19	3.80				

3.2. Findings Related to the Second Sub-Problem

Under the second sub-problem, the variation in pre-service teachers' awareness of global climate change was examined according to gender and department. First, the results of the independent samples t-test, conducted to determine whether pre-service teachers' awareness levels of global climate change differ statistically according to gender, are presented in Table 6.

Table 6. Comparison of pre-service teachers' awareness levels of global climate change by gender.

Dimension	Gender	n	M	SD	df	t	p
"Awareness of the Effects of Global Climate Change on the Natural and Social Environment"	Female	175	40.44	4.22	194	1.38	.16
	Male	21	39.04	5.49			
"Awareness of Global Organizations and Agreements"	Female	175	13.70	6.01	194	-.45	.65
	Male	21	14.33	6.34			
"Awareness of the Causes of Global Climate Change"	Female	175	7.13	3.00	194	-1.56	.11
	Male	21	8.23	3.38			
"Awareness of the Energy Consumption Relation of Global Climate Change"	Female	175	13.46	1.81	194	.86	.38
	Male	21	13.09	2.07			
Total Awareness of Global Climate Change	Female	175	74.74	9.84	194	.01	.98
	Male	21	74.71	11.21			

As shown in Table 6, no statistically significant differences were observed in pre-service teachers' awareness of global climate change based on gender. Specifically, no significant differences were found in the sub-dimensions of awareness of the effects of global climate change on the natural and social environment [$t_{(194)} = 1.38$, $p > .05$], awareness of global organizations and agreements [$t_{(194)} = -0.45$, $p > .05$], awareness of the causes of global climate change [$t_{(194)} = -1.56$, $p > .05$], or awareness of the energy consumption relation of global climate change [$t_{(194)} = 0.86$, $p > .05$], nor in the total awareness scores [$t_{(194)} = 0.01$, $p > .05$].

Second, the results of the one-way ANOVA and Post Hoc tests, conducted to examine whether pre-service teachers' awareness levels of global climate change differ statistically according to their department, are presented in Table 7.

Table 7. Comparison of pre-service teachers' awareness levels of global climate change by department.

Dimension	n	M	SD	df	F	p	Post Hoc
"Awareness of the Effects of Global Climate Change on the Natural and Social Environment"							
Science Education (SE)	104	39.78	4.56	2	2.07	.12	
Primary Education (PE)	62	41.20	4.15				
Biology Education (BE)	30	40.16	4.03				
Total	196	40.29	4.38				
"Awareness of Global Organizations and Agreements"							
Science Education (SE)	104	13.51	5.97	2	7.07	.00	PE>SE, PE>BE
Primary Education (PE)	62	15.62	5.85				
Biology Education (BE)	30	10.80	5.41				
Total	196	13.77	6.03				
"Awareness of the Causes of Global Climate Change"							
Science Education (SE)	104	6.75	2.94	2	3.78	.02	PE>BE
Primary Education (PE)	62	8.08	3.15				
Biology Education (BE)	30	7.30	2.98				
Total	196	7.25	3.05				
"Awareness of the Energy Consumption Relation of Global Climate Change"							
Science Education (SE)	104	13.22	1.88	2	2.34	.09	
Primary Education (PE)	62	13.83	1.82				
Biology Education (BE)	30	13.26	1.61				
Total	196	13.42	1.84				
Total Awareness of Global Climate Change							
Science Education (SE)	104	73.27	9.88	2	8.28	.00	PE>SE, PE>BE
Primary Education (PE)	62	78.75	9.31				
Biology Education (BE)	30	71.53	9.25				
Total	196	74.74	9.96				

As shown in Table 7, no statistically significant differences were observed in pre-service teachers' awareness levels of global climate change according to department in the sub-dimensions of awareness of the effects of global climate change on the natural and social environment [$F_{(2, 193)} = 2.07$, $p > .05$] and awareness of the energy consumption relation of global climate change [$F_{(2, 193)} = 2.34$, $p > .05$]. However, statistically significant differences were found in the sub-dimensions of awareness of global organizations and agreements [$F_{(2, 193)} = 7.07$, $p < .05$], awareness of the causes of global climate change [$F_{(2, 193)} = 3.78$, $p < .05$], and in the total awareness scores [$F_{(2, 193)} = 8.28$, $p < .05$].

Post Hoc analysis revealed that, in the sub-dimension of awareness of global organizations and agreements, the significant differences were between Primary Education (M = 15.62, SD = 5.85) and Science Education (M = 13.51, SD = 5.97) as well as Biology Education (M = 10.80, SD = 8.41), with the Primary Education mean being significantly higher than those of the other programs. In the sub-dimension of awareness of the causes of global climate change, the significant difference was observed between Primary Education (M = 8.08, SD = 3.15) and Biology Education (M = 7.30, SD = 2.98). Regarding total awareness scores, significant differences were found between Primary Education (M = 78.75, SD = 9.31) and Science Education (M = 73.27, SD = 9.88) as well as Biology Education (M = 71.53, SD = 9.25), with the Primary Education mean being significantly higher than those of the other programs.

3.3. Findings Related to the Third Sub-Problem

In the third sub-problem, the differences in pre-service teachers' awareness of global climate change were examined according to their literacy levels regarding renewable energy sources (low, medium, and high). Since there were no pre-service teachers with low literacy levels based on the scores obtained from the Renewable Energy Sources Literacy Scale, the analysis was conducted only for those with medium and

high literacy levels. The results of the analysis are presented in Table 8.

Table 8. Comparison of pre-service teachers' awareness of global climate change by literacy levels regarding renewable energy sources.

Dimension	Literacy Level (RESL)	n	M	SD	df	t	p
"Awareness of the Effects of Global Climate Change on the Natural and Social Environment"	Medium	55	38.32	4.82	194	-4.07	.00
	High	141	41.06	3.96			
"Awareness of Global Organizations and Agreements"	Medium	55	13.78	6.46	194	.01	.98
	High	141	13.76	5.88			
"Awareness of the Causes of Global Climate Change"	Medium	55	7.41	2.97	194	.46	.64
	High	141	7.19	3.09			
"Awareness of the Energy Consumption Relation of Global Climate Change"	Medium	55	12.25	1.90	194	-6.03	.00
	High	141	13.87	1.60			
Total Awareness of Global Climate Change	Medium	55	71.78	10.33	194	-2.63	.00
	High	141	75.90	9.61			

As shown in Table 8, no statistically significant differences were observed in pre-service teachers' awareness of global climate change according to their literacy levels regarding renewable energy sources in the sub-dimensions of awareness of global organizations and agreements [$t_{(194)} = 0.01$, $p > .05$] and awareness of the causes of global climate change [$t_{(194)} = 0.46$, $p > .05$]. However, statistically significant differences were found in the sub-dimensions of awareness of the effects of global climate change on the natural and social environment [$t_{(194)} = -4.07$, $p < .05$], awareness of the energy consumption relation of global climate change [$t_{(194)} = -6.03$, $p < .05$], and in the total awareness scores [$t_{(194)} = -2.63$, $p < .05$].

3.4. Findings Related to the Fourth Sub-Problem

In the fourth sub-problem, differences in pre-service teachers' literacy regarding renewable energy sources were examined according to their awareness levels of global climate change (low, medium, and high). The results of the analysis are presented in Table 9.

Table 9. Examination of differences in pre-service teachers' literacy regarding renewable energy sources according to their awareness levels of global climate change (ALGCC).

Dimension	n	M	SD	df	F	p	Post Hoc
"Literacy Regarding Energy Source Types"							
Low (ALGCC)	49	16.97	2.74	2	3.27	.04	Medium > Low. High > Low
Medium (ALGCC)	96	17.86	2.48				
High (ALGCC)	51	18.31	2.90				
Total (ALGCC)	196	17.76	2.69				
"Literacy Regarding National and Environmental Problems"							
Low (ALGCC)	49	16.00	1.56	2	3.60	.02	High > Low
Medium (ALGCC)	96	16.41	1.81				
High (ALGCC)	51	16.88	1.36				
Total (ALGCC)	196	16.43	1.66				
Total Literacy Score							
Low (ALGCC)	49	32.97	3.65	2	4.44	.01	Medium > Low, High > Low
Medium (ALGCC)	96	34.28	3.75				
High (ALGCC)	51	35.19	3.78				
Total (ALGCC)	196	34.19	3.80				

As shown in Table 9, statistically significant differences were observed in pre-service teachers' literacy regarding renewable energy sources according to their awareness levels of global climate change in the sub-dimensions of literacy regarding energy source types [$F_{(2, 193)} = 3.27$, $p < .05$], literacy regarding national and environmental issues [$F_{(2, 193)} = 3.60$, $p < .05$], and in the total literacy scores [$F_{(2, 193)} = 4.44$, $p < .05$]. According to the Post Hoc test, in the sub-dimension of literacy regarding energy source types, significant differences were found between pre-service teachers with medium (M = 17.86, SD = 2.48) and low (M = 16.97, SD = 2.74) awareness levels, as well as between those with high (M = 18.31, SD = 2.90) and low (M = 16.97, SD = 2.74) awareness levels. In the sub-dimension of literacy regarding national and environmental problems, a significant difference was observed between pre-service teachers with high (M = 16.88, SD = 1.36) and low (M = 16.00, SD = 1.56) awareness levels. Considering the total literacy scores, significant differences were found between medium (M = 34.28, SD = 3.75) and low (M = 32.97, SD = 3.65) awareness levels, as well as between high (M = 35.19, SD = 3.78) and low (M = 32.97, SD = 3.65) awareness levels.

4. Discussion and Conclusion

The findings of the study initially demonstrated that pre-service teachers' literacy regarding renewable energy sources, as well as their awareness of global climate change, did not vary significantly by gender. A review of the existing literature shows that research on literacy related to renewable energy sources is limited and predominantly concentrates on attitudes and awareness toward renewable energy. For example, Genç (2019), in a study involving science and primary education teacher candidates, reported no significant gender-based differences in pre-service teachers' attitudes toward renewable energy. In contrast, Şen and Özer (2018), who examined university students' awareness of climate change and environmental issues, found that gender had a positive influence on students' attitudes toward environmental problems, with female students exhibiting more favorable attitudes than their male counterparts. Similarly, Ağıralan and Sadioğlu (2021) identified statistically significant gender differences, noting that women demonstrated higher levels of climate change awareness and societal consciousness compared to men.

When pre-service teachers' literacy levels concerning renewable energy sources and their awareness of global climate change were compared across departments, no statistically significant difference was identified in the sub-dimension related to literacy on types of energy sources. However, statistically significant differences emerged in the sub-dimension addressing literacy regarding national and environmental issues, as well as in the overall literacy scores on renewable energy sources, with the advantage favoring primary education. In terms of pre-service teachers' awareness of global climate change, no statistically significant differences were found across departments in the sub-dimensions pertaining to awareness of the effects of global climate change on the natural and social environment and awareness of the relationship between energy consumption and global climate change.

However, statistically significant differences were identified in the sub-dimensions related to awareness of global organizations and agreements, the causes of global climate change, and the overall awareness scores, with these differences favoring primary education. A review of prior research supports these findings. Genç (2019) compared the attitudes of primary education and science teacher candidates toward renewable energy sources and reported results in favor of primary education. Conversely, Balbağ and Balbağ (2019) found no statistically significant differences between primary education and science teacher candidates regarding their attitudes toward renewable energy. Similarly, Tiftikçi (2014) examined the awareness levels of senior university students from various departments, including science and biology education, concerning renewable energy sources, and determined that students in the science education department had significantly higher mean scores than those in other departments. Collectively, these studies indicate a general trend favoring students in science and primary education programs. In terms of awareness of global climate change, Tok et al. (2017) reported that primary education teacher candidates demonstrated high levels of climate change awareness. Likewise, in the study conducted by Demir et al. (2016) to assess students' attitudes, awareness, and interest regarding global climate change, it was revealed that the majority of university students, irrespective of their department, perceived global warming and climate change as major concerns.

Subsequently, the study investigated whether statistically significant differences existed in teacher candidates' awareness of global climate change based on their levels of literacy in renewable energy sources (low, medium, and high). As no teacher candidates were categorized under the low literacy level, the analysis was carried out using data from those with medium and high literacy levels. The findings revealed that there were no statistically significant differences in the sub-dimensions related to awareness of global organizations and agreements and the causes of global climate change. However, statistically significant differences were identified in the sub-dimensions concerning awareness of the effects of global climate change on the natural and social environment, awareness of the relationship between energy consumption and global climate change, as well as in the overall total scores.

Similarly, the study examined whether statistically significant differences in renewable energy literacy existed among teacher candidates based on their levels of awareness of global climate change (low, medium, and high). Statistically significant differences were identified in the sub-dimensions of

energy source literacy, country and environmental issues literacy, and in the total scores of the renewable energy literacy scale. Specifically, in the energy source literacy sub-dimension, significant differences were observed between medium and low, as well as high and low levels of climate change awareness; in the country and environmental issues sub-dimension, significant differences emerged between high and low levels of climate change awareness; and in the total scores, significant differences were found between medium and low, as well as high and low levels of climate change awareness. Based on these findings, it is recommended that comprehensive qualitative studies be conducted to explore strategies for enhancing teacher candidates' literacy regarding renewable energy sources and their awareness of global climate change. Furthermore, while this study examined literacy and awareness in relation to gender and departmental variables, future research could broaden the scope by investigating these constructs across additional variables. The study was limited to a single university sample and self-report instruments, which restricts generalizability.

Compliance with Ethical Standards

This study was conducted with the approval of the Gazi University Ethics Committee, dated 13.12.2021, with protocol number 2021/1129.

Conflict of Interest

The authors have no conflict of interest to declare.

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RESEARCH ARTICLE

Knowledge Levels and Safety Culture of Science Center Instructors in Laboratories: An Analytical Study from Türkiye*

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ABSTRACT

This study examines the laboratory safety culture levels of science center instructors in Türkiye by analyzing their knowledge, practices, and preparedness related to science laboratory activities. Using a qualitative single case study design, data were collected through pre-interviews, observations, and post-interviews with two science instructors who work at the science center. The data were analyzed using descriptive analysis, resulting in five main themes: general safety measures, educational level of the science center instructors, emergency planning, preparedness for potential incidents, and instructor roles. The findings show that instructors demonstrate strong awareness of basic safety procedures, including chemical handling, equipment control and classroom management during laboratory activities. Safety practices were effectively integrated into the teaching process before, during, and after experiments. However, the results also reveal significant limitations in terms of written safety guidelines, systematic emergency planning, and formal emergency training. Although instructors demonstrated proactive behavior and effective risk management during experimental applications, their preparedness for emergency situations—such as knowledge of emergency exits, fire equipment, and first aid materials—was insufficient. These findings highlight the need for structured safety training programs, improved emergency preparedness, and standardized safety protocols within science centers. The results are discussed in relation to existing research on science center instructors, emphasizing the importance of strengthening laboratory safety culture to enhance the quality and safety of science education in informal learning environments.

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1. Introduction

Children are naturally curious and tend to explore their surroundings and ask questions from an early age (Sawyer, 2014; Vygotsky, 1978). Schools provide structured education during this process, but it may not be sufficient for science education. Students need environments where they can directly experience science and find courage (Falk & Dierking, 2000; Hofstein & Lunetta, 2004; Singer et al., 2006). At this point, informal learning environments outside of school are becoming increasingly important (Sözer & Oral, 2016). Science centers are one of the most effective examples of these environments (Bozdoğan, 2008; Çığrık & Özkan, 2016; Heper, 2023; Pilo et al., 2011; Quistgaard & Højland, 2010; TÜBİTAK, 2022; TÜBİTAK Science and Technology, 2024).

Science centers are defined as institutions that support science, mathematics, technology, and engineering education through interactive exhibits, devices, and activities (Hülagü, 2018). These centers aim to raise curious generations and,

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unlike traditional education, encourage unplanned, individually controlled learning. Environments such as streets, parks, and museums also contribute to informal learning (Sözer & Oral, 2016). Science centers, with their innovative approach, attract visitors to the world of science through hands-on exhibits, science shows, and rich programs (Quistgaard & Hojland, 2010; TÜBİTAK Science and Technology, 2024).

These centers offer opportunities for scientific discovery without the pressure of grades and increase connections to school lessons (Bozdoğan, 2008; Pilo et al., 2011). They raise scientific awareness among visitors of all ages (children, adults, families, teachers) and make learning a way of life (Karadeniz, 2009; TÜBİTAK, 2022).

The number of science centers in Türkiye is increasing; TÜBİTAK has been providing support since 2008, with the first example being the Konya Science Center. There are currently 14 large-scale centers (TÜBİTAK Science Centers, 2024). Workshops (e.g., Design, Deneyap Technology, Mathematics, Astronomy, Natural Sciences Workshops) are heavily featured in these centers, and TÜBİTAK supports content development and equipment modernization (Heper, 2023; TÜBİTAK, 2022).

Science education is the area where out-of-school environments are most actively used (Çığrık & Özkan, 2016). Science lessons require discovery, observation, and analysis, but they are limited in schools due to a lack of laboratories, insufficient resources, and a heavy curriculum (Can et al., 2013; Ministry of National Education, 2018). Science centers fill this gap; students understand topics better by conducting experiments related to daily life (Coşkun, 2017; Keskin Geçer, 2018; Kırpık & Engin, 2009; Tekbıyık & Ercan, 2015). Laboratories enable active learning and develop scientific thinking (Şimşek & Çınar, 2013).

This research evaluates the level of science laboratory safety at a science center in Türkiye. Objectives:

- To determine the level of knowledge of instructors regarding laboratory safety.
- To identify the current safety situation during science applications.
- To examine the laboratory practices through observations and interviews were conducted by the researcher.
- To propose a laboratory safety training model to support the professional development of science center instructors.

Science laboratories encourage learning and increase motivation (Yalın, 2001). Safety is a critical element of the educational process (Hofstein & Lunetta, 2004). Most accidents result from inadequate precautions and instructor knowledge gaps (Sawyer, 2014; Sevian & Talanquer, 2014). Instructors' knowledge of current protocols and professional development are important (National Research Council, 2011; Singer, 2013). In Türkiye and globally, science center instructors are expected to possess competencies in laboratory safety, emergency preparedness, and effective science communication (National Research Council, 2011; Singer, 2013). Research indicates that while instructors generally have basic safety knowledge, gaps remain in emergency planning and hands-on preparedness (Singer, 2013).

This research will develop the safety culture in science centers, prevent accidents, and reveal the level of instructor knowledge. The results will guide strategies and improve the quality of science education.

This study aims to examine the safety level of science laboratory practices conducted in workshops at science centers and the level of knowledge of instructors involved in this process regarding laboratory safety. The main research question is stated as follows: “What is the level of science laboratory safety in workshops at science centers, and what is the level of knowledge of instructors?”

The research focused on the following sub-questions in order to answer the main research question:

- What is the level of knowledge of instructors working in science centers regarding general safety measures for science laboratory practices?
- What is the level of training received by instructors for science laboratory practices?
- What is the level of preparedness of instructors regarding emergency plan preparation?
- What is the level of preparedness of instructors for possible incidents?
- What are the roles assumed by instructors in science laboratory practices?

The research is based on the following assumptions: It is assumed that the instructors gave sincere and honest answers to the questions asked during the interviews. It is assumed that the researcher's observations were unbiased and impartial. It is assumed that the selected activities were appropriate for science laboratory applications. It is assumed that the laboratory environment provided the same physical conditions for each experiment. Furthermore, it is assumed that the science center instructors were of equal level in terms of laboratory training.

The research was conducted within certain limitations. The study was limited to only one science center. The study was restricted to the practices carried out in the Life Laboratory Workshop at this center, as it is the laboratory most frequently used by science teachers. Only two instructors were interviewed within the scope of the research, and one experiment conducted by each instructor was examined. Furthermore, the research was focused on activities included in

the science center's activity calendar for the specified month, since science centers implement laboratory applications within pre-determined weekly and monthly schedules.

2. Method

The study protocol was approved by Gazi University Ethics Committee with the decision number E993857 on 11.07.2024.

2.1. Research Design

This study aims to examine the level of knowledge of instructors regarding laboratory safety and the current status of safety measures during science applications at science centers. A qualitative research method was adopted in the study, and the data collection process was conducted through interview and observation forms developed by the researcher.

Qualitative research aims to deeply understand the meaning, process, and context of a phenomenon (Creswell, 2007; Seale, 1999). Accordingly, in this study, the knowledge levels of instructors were determined through pre-interviews, observations were made during the application, and short interviews were conducted after the application. The data obtained were evaluated using descriptive analysis methods; themes, categories, and codes were created.

A case study design was preferred in the research. According to Merriam (2009) and Yin (2009), a case study allows for an in-depth examination of a specific phenomenon within its real-life context. In this study, the knowledge and attitudes of two science instructors at a science center regarding laboratory safety practices were observed and analyzed in their natural environment.

A single case study (Creswell, 2007) was used among the types of case studies. This is because the research focused on the laboratory safety practices of two instructors working in the same context and aimed to understand this single case in depth. Data collection tools were developed based on expert opinions and finalized after a pilot application.

Consequently, this research was conducted using a single case study design to understand the current state of laboratory safety processes in science applications carried out in science centers, the knowledge levels of instructors, and their approaches to safety.

2.2. Study Group

The study group for this research consists of two science center instructors selected using purposive sampling. This method, frequently preferred in qualitative research, allows the researcher to select participants who best represent the phenomenon and can provide in-depth information (Creswell, 2007; Merriam, 2009; Patton, 2002).

In this study, two instructors were selected through criterion-based purposive sampling to ensure a clear understanding of the research question. Both participants work at a long-established science center in Türkiye and share similar qualifications: they are graduates of science education programs, have comparable coursework backgrounds, and have received similar professional development training at the science center. Additionally, during the study period, both instructors were responsible for chemistry-oriented laboratory activities, which ensured comparable instructional content and laboratory conditions.

However, the instructors differ in their levels of professional experience; one has several years of experience in laboratory-based activities, while the other is relatively new to the role. This difference provided diversity in understanding how laboratory safety practices are reflected in the science center. The science center was selected because it includes a dedicated life sciences laboratory—an uncommon facility in many centers—and is easily accessible to the researcher, enabling in-depth observations and interviews.

The reasons for selecting the science center included the continuity of laboratory activities, the availability of similar teaching materials and equipment, the researcher's easy access to the center, and the existence of a living workshop belonging to the laboratory. These conditions allowed data to be collected in a natural environment and under equal conditions.

Throughout the data collection process, the researcher did not intervene in any way, and the timing of the observations was not disclosed to the instructors in advance. The observations were conducted taking into account the science center's activity calendar. Furthermore, the objectivity of the data was evaluated by a TÜBİTAK researcher who specialized in chemistry education and had completed a doctorate.

As a result, the selection of this study group provided an information-rich and appropriate sample for thoroughly understanding the current state of laboratory safety practices in science centers, which was the primary objective of the research.

2.3. Data Collection Tools

In this study, data collection tools were designed to cover every stage of the evaluation process. Three main data collection tools were used in the study:

- Pre-Interview Form for Science Center Instructors Regarding Science Laboratory Applications in Workshops,
- Observation Form for Science Laboratory Applications Conducted at the Science Center,
- Post-Interview Form for Science Center Instructors in Science Laboratory Applications in Workshops.

These three different data collection forms were used in the study. The pre-interview form included 12 structured questions

aimed at determining the instructors' initial knowledge and perceptions regarding laboratory safety before the activities. The observation form consisted of 23 criteria designed to document instructors' actual safety practices during the laboratory sessions through naturalistic observation supported by video recordings. The post-interview form contained 23 semi-structured questions that allowed instructors to reflect on their behaviors after the activities and explain the reasons behind their practices.

Although all three forms were developed based on the same laboratory safety framework and focused on instructors' knowledge, behaviors, and responsibilities, they differed in timing, structure, and data type. The pre-interview collected self-reported knowledge prior to the activity, the observation form captured real-time behaviors during the activity, and the post-interview form provided reflective explanations after the activity. Additionally, while the pre-interview form was structured, the observation form was criterion-based, and the post-interview form was semi-structured, offering flexibility for further probing.

These forms were developed by the researcher in accordance with the qualitative data collection approach. The preparation process for each form was carried out in five stages:

1. Needs Assessment: Existing practices and needs related to laboratory safety were examined, and the information to be collected was determined.
2. Form Draft: Criteria, headings, and evaluation criteria were created for each form.
3. Expert Opinion: Feedback was obtained from three experts: a university research assistant, an academic with the title of professor in the field of science education, and an instructor working at a different science center. The content and design were adjusted based on the expert opinions.
4. Pilot Application: The forms were applied to six instructors working at a science center outside the center where the research was conducted; the findings were used to increase the validity and reliability of the forms.
5. Final Revisions: The forms have been finalized based on expert opinions and pilot application results.

During the preparation of the forms, the American Chemical Society (2016a)'s "Guide to Chemical Laboratory Safety in Academic Institutions", the Ministry of National Education (2018)'s science textbooks, and the existing safety procedures at the science center were utilized. These sources collectively address key laboratory safety themes such as hazard identification, use of personal protective equipment, emergency procedures, chemical handling protocols, and safe laboratory behavior.

As a result, these three forms are reliable tools developed to comprehensively assess laboratory safety in science applications conducted at science centers. These tools enable the systematic analysis of instructors' knowledge levels, safety behaviors during application processes, and overall safety culture.

2.4. Data Collection

Data for the study were collected using semi-structured interviews and direct observation methods. During these stages, two scientific activities were observed: the "Ocean Acidification" experiment, which aimed to demonstrate the effects of increased carbon dioxide on seawater pH, and the "Mysterious Structure of Water" experiment, which focused on exploring the physical and chemical properties of water through hands-on activities. These activities were selected because they involve chemical reactions, material manipulation, and hands-on procedures frequently presented in science centers, which makes them relevant for assessing laboratory safety practices.

The process was conducted in three stages: preliminary interview, observation, and final interview.

Table 1. Research schedule.

Steps	Data Collection Tool	Goal	Time
1	Pre-Interview Form	Determine the level of laboratory safety knowledge among instructors	Two hours with each instructor
2	Observation Form	Examine security behaviors during the application process	One hours with each instructor
3	Post-Interview Form	Evaluating awareness and experiences after implementation	Two hours with each instructor

In this study, three different data collection forms were utilized at each stage of the process. The pre-interview form included 12 structured questions focusing on key laboratory safety themes such as hazard identification, the use of personal protective equipment (PPE), emergency procedures, and prior safety training. These questions guided instructors to explain their existing knowledge and perceptions before conducting the activities. The observation form consisted of 23 criteria grouped under categories including PPE compliance, chemical and material handling, risk recognition, student management, and adherence to institutional safety protocols. These criteria enabled the systematic documentation of instructors' actual safety practices during the "Ocean Acidification" and "Mysterious Structure of Water" experiments, supported by naturalistic observation and video recordings. The post-interview form contained 23 semi-structured questions prompting instructors to reflect on their behaviors observed during the activities, articulate the reasons behind their safety decisions, and evaluate their awareness and challenges regarding safe laboratory conduct. Together, these three forms provided comprehensive data aligned with the study's objectives.

Interview forms were documented with audio recordings, while observations were documented through video recordings and note-taking. Each form was developed based on the input of 3 experts and finalized after a pilot application with 6 trainers.

To increase the validity and reliability of the study:

- The interview questions were developed in line with the research objectives and reviewed to ensure content validity.
- Data were collected through semi-structured interviews conducted in natural settings in order to increase credibility.
- All interviews were audio-recorded and transcribed verbatim to ensure dependability.
- The collected data were analyzed systematically, and consistency between the data and interpretations was checked.
- Data were stored securely and preserved to ensure confirmability and transparency of the research process.

This comprehensive process ensured that behaviors related to laboratory safety at the science center were analyzed reliably in terms of accuracy, consistency, and depth.

2.5. Data Analysis

The data obtained in this study were evaluated using qualitative data analysis methods. Interview and observation records were transcribed and examined in detail, and a descriptive analysis approach was followed during the analysis process (Creswell, 2017; Merriam, 2009). This approach allowed the data to be classified and interpreted under themes and categories.

The data analysis process was conducted in five stages: organizing the data, coding, creating themes, interpreting, and presenting the findings. In the coding process, analyses conducted by two independent researchers resulted in a reliability rate of 84% according to the Miles and Huberman (1994) formula, and 93% in the second round of analysis. These values indicate a high level of inter-coder consistency.

The coded data were organized under meaningful themes, and five main themes were identified:

1. General Safety Measures
2. Level of Education
3. Emergency Plan
4. Preparation for Potential Incidents
5. Trainer Roles

Each theme was supported by relevant categories and codes within itself; the findings were illustrated with direct quotations from participant statements. This thematic structure ensured a comprehensive assessment of knowledge, attitudes, and behaviors related to laboratory safety practices.

2.6. Validity and Reliability

Various measures were taken throughout the process to ensure the validity and reliability of the research. In qualitative research, validity refers to the researcher's continuous verification of the accuracy of the findings, while reliability refers to the consistency of the findings across different researchers (Gibbs, 2007; Yıldırım & Şimşek, 2018).

In this context, attention was paid to the principles of internal and external validity and reliability.

For internal validity and reliability, interview and observation data were compared, expert opinions were incorporated, and the themes were re-evaluated by an independent expert. During the coding process, two coders independently analyzed the data in two stages, following the procedures described by Miles and Huberman (1994) and Creswell (2007). In the first cycle, coder agreement was 84%, and in the second cycle it reached 93%. To provide a more robust statistical indicator of inter-coder reliability—defined as the degree of agreement or consistency between coders (Cohen & Swerdlik, 2018)—Cohen's kappa statistic was also calculated, resulting in $\kappa = .82$, which indicates a "substantial agreement" level according to Landis and Koch (1977)'s classification. This confirms that the coding process was highly reliable and consistent across coders.

In terms of external validity and reliability, participants were selected appropriately for the research purpose; the data

collection tools, analysis procedures, and implementation steps were detailed thoroughly. Additionally, all research documents, coding tables, and raw forms were securely archived to ensure transparency, traceability, and auditability of the entire research process.

As a result of all these practices, it is believed that the findings of the research are highly accurate, consistent, and reliable.

3. Findings

The purpose of this study is to determine and evaluate the safety level of science laboratory practices conducted at a science center in Türkiye. The study examined the current status of laboratory safety practices and the knowledge and application levels of instructors. During the data collection process, structured and semi-structured interviews were conducted with two instructors; laboratory practices were also monitored using an observation form. This section presents the key findings obtained from the analysis of the interview and observation data, along with comments on these findings.

3.1. General Safety Measures Knowledge Levels and Application Process of Instructors

The General Safety Measures theme, one of the five themes created as a result of data analysis, examines the safety measures taken in laboratory processes under three categories: pre-laboratory, application process, and post-application measures.

Table 2. Categories and codes related to the general safety measures theme.

Categories	Codes	Reviews
Pre-Laboratory	Control of Chemical Materials, Control of Equipment	*"...I look at the Material Safety Data Sheet (MSDS) for chemicals." "...all materials should be checked before each experiment."*
During Application	Information	*"...without taking any action, informing them at the door about all security measures..."*
After Application	Chemical Disposal	*"Place any extra materials in the appropriate boxes..."*

Before the lab session, both instructors emphasized the importance of chemical and equipment checks. Instructor 1 stated that they referred to the Material Safety Data Sheet (MSDS) for chemicals and tested their expiration dates and reaction conditions in advance. Instructor 2 paid attention to physical safety elements such as the placement of chemicals and the selection of appropriate containers. This situation demonstrates that the pre-experiment safety culture was adopted in a way that was both knowledge-based and application-oriented.

During the application, code information stood out. The instructors informed the students about the use of personal protective equipment, laboratory rules, and the correct use of tools and equipment. Instructor 1 provided the information before the experiment, while Instructor 2 did so during the experiment; both approaches ensured a safe and educational laboratory environment.

After the application, both instructors emphasized the need for proper disposal of chemicals. Instructor 1 disposed of the chemicals by separating them according to their types, while Instructor 2 poured the remaining materials back into the relevant containers. These practices demonstrate the adoption of environmentally conscious and safe laboratory management.

In general, the findings show that instructors working in science centers address safety not only as a rule but as part of the teaching process. This creates both a safe working environment and a lasting awareness of safety among students.

3.2. Educational Level of Instructors Working in Science Centers Related to Science Laboratory Applications

The findings related to the second theme identified in the analysis of the collected data, namely Educational Level, are presented in this section. The data obtained from the analysis were evaluated under two categories: subject knowledge and pedagogical knowledge of the instructors.

In terms of subject knowledge, safety protocols and chemical hazard class codes stood out. Instructor 1 verbally informed students about safety rules before the "Ocean Acidification" experiment, emphasizing the use of goggles, aprons, and gloves and the need to avoid direct contact with chemicals. Instructor 2 conveyed similar rules in the "Mysterious Structure of Water" experiment and also used a short video to support the process. Both instructors were careful in explaining safety protocols, but they only provided verbal instructions. The lack of written guidelines may prevent students from learning safety rules more permanently. Therefore, it is recommended that written instructions and

emergency procedures be provided to students before the application.

In the applications related to the hazard classes of chemicals, both instructors explained the names and usage forms of the substances they used and warned about correct dosage and separate dropper usage. It was observed that the instructors had sufficient knowledge about the safe use of chemicals and effectively directed the students' attention by using both visual and verbal explanations.

In terms of pedagogical knowledge, classroom layout stood out. Instructor 1 emphasized the advantage of gathering students at a single table, allowing them to observe the entire class and intervene quickly in the event of an accident. Instructor 2, on the other hand, aimed to get students to focus more on the experiments by placing them at separate tables. Both instructors adopted different approaches to create a safe and efficient learning environment. Considering the nature of the experiment, the materials used, and the age level of the students, it can be said that both arrangements are based on rational justifications within their own contexts.

3.3. Emergency Plans by Instructors Working in Science Centers Concerning Science Laboratory Practices

One of the five themes identified through the analysis of the collected data was determined to be an Emergency Plan. Findings related to this theme were evaluated under the category of emergency preparedness and management, with training needs and process management codes standing out.

Interviews with instructors revealed differences in awareness and preparedness levels for emergencies during laboratory applications. Although both instructors informed students about general safety rules prior to the application, it was observed that no systematic training process was conducted for emergency scenarios. Instructor 1 emphasized that both themselves and the students needed more training in the event of possible accidents; they stated that awareness needed to be raised on topics such as appropriate intervention methods for different types of fires, the effective use of personal protective equipment, and the selection of appropriate clothing. They also drew attention to the importance of showing students the exit points and safety equipment in the laboratory, but stated that this information was not provided on the day of the application.

Similarly, Instructor 2 also stated that they did not show the emergency exit points or the location of safety equipment during the experiment. Both instructors explained the properties of the chemical materials used in the experiments, but did not introduce equipment such as fire extinguishers, emergency showers, or first aid supplies. This situation demonstrates the need for systematic emergency information provision in the laboratory environment. Students should be shown the location of the laboratory's exit doors, emergency showers, and first aid supplies before the application, and this information should be supported not only verbally but also visually or in writing.

Process management, the second code defined in the emergency plan, reveals the reflexes of instructors in the face of possible accidents. Instructor 1 stated that they reminded students in advance that the emergency shower could be used in case of chemical contact and that they would notify the relevant unit supervisor if necessary. Instructor 2 stated that they intervened quickly in the event of small spills, ensured that students remained at a safe distance, and issued the necessary warnings immediately.

Both instructors demonstrated a proactive approach to process management, identifying potential risks in advance and taking actions to ensure student safety. However, a more systematic emergency management plan needs to be developed for the laboratory environment, and this plan should be supported by practical training sessions conducted by the instructors. This situation highlights the importance of training programs that go beyond mere knowledge transfer and also strengthen behavioral awareness.

3.4. Preparedness Level of Instructors Working in Science Centers for Potential Incidents Related to Science Laboratory Practices

This section presents findings regarding the preparedness level of instructors working in science centers for potential incidents in science laboratory practices. One of the themes identified through data analysis, “Preparedness for Potential Incidents,” includes two main codes: stress management and risk assessment.

Interviews with instructors were conducted before and after laboratory practices. In pre-laboratory interviews, it was observed that instructors' approaches to stress management were important for safe laboratory practices. Instructor 1 emphasized that the instructor must be physically and psychologically prepared before the experiment in terms of stress management before starting the “ocean acidification” experiment. The instructor stated that factors such as low morale or fatigue could lead to distraction in the laboratory, and therefore constant attention was required during the experiment. They also noted that working standing up in the laboratory environment provided advantages in terms of both safety and ease of movement.

Instructor 2 assessed stress management in terms of inner calm and immediate reactions before the “mysterious structure of water” experiment. He stated that in the event of a possible accident, he would first focus on calming himself down and try to balance his emotional reactions quickly. This approach emphasizes the importance of intervening effectively and in a controlled manner without panicking in the event of a possible incident.

The approaches of both instructors to stress management are complementary in terms of laboratory safety. Instructor 1 focused more on preparation, physical conditions, and awareness, while Instructor 2 concentrated on inner balance and calmness during the incident. When these two approaches are evaluated together, it is seen that they support both the preventive and reactive dimensions of laboratory safety.

Findings related to the second code, risk assessment, were obtained from interviews conducted after the laboratory applications. Instructor 1 has an understanding of risk assessment based on experience and observation. He stated that risks should be anticipated in advance according to the age and skill level of the participants, emphasizing the importance of considering the developmental differences among students. The instructor stressed that potential risks cannot be completely eliminated, but it is possible to intervene immediately in these risks through experience.

Trainer 2 approached risk assessment more from the perspective of enforcing rules and providing constant reminders. He emphasized that occupational health and safety measures should not remain theoretical but should be continuously reinforced in practice. He particularly highlighted the importance of repeating safety warnings related to the materials used during the experiment at the beginning and throughout the experiment.

These findings show that risk assessment in laboratory practices must be carried out holistically, based on both professional experience and observation-based approaches and the implementation of systematic safety rules. Instructor 1's experience-based approach and Instructor 2's rule-based approach offer two different but complementary strategies that support each other in terms of laboratory safety. The combination of these two perspectives contributes significantly to the safe and efficient conduct of laboratory activities carried out in science centers.

3.5. Roles of Instructors Working in Science Centers in Science Laboratory Applications

This section presents findings regarding the roles of instructors working in science centers in science laboratory applications. One of the themes identified through data analysis, “Instructor Roles,” comprises three main categories: instructor roles before the laboratory, instructor roles during the laboratory, and instructor roles after the laboratory.

Regarding the instructor role before the laboratory, the code “preparation of a reliable environment” stood out. Instructor 1 emphasized systematic preparations such as arranging materials on trays and placing personal protective equipment on tables before starting the “ocean acidification” experiment. This approach contributes to the laboratory process being carried out in a planned, organized, and safe manner. Instructor 2 emphasized the need to eliminate hazardous elements in the laboratory environment and create a safe atmosphere for students. By focusing on the physical safety of the environment and establishing a sense of security for students before the experiment, both instructors ensured that the laboratory started safely.

During the laboratory session, the “classroom management” code came to the fore in relation to the role of the instructor. Instructor 1 created a safe working environment by ensuring that students wore gloves and providing one-on-one support when necessary. Instructor 2 quickly identified dangerous situations and intervened directly, guiding students in working safely with chemicals. Both instructors reminded students to follow laboratory rules and meticulously monitored the use of protective equipment. These observations highlight the importance of classroom management for laboratory safety.

After the laboratory session, instructor roles were grouped under the “workshop cleaning” code. Instructor 1 ensured hygiene by placing all materials in the dishwasher after the experiment and returning any remaining chemicals to their designated containers. They also replaced the protective covers on the tables and cleaned the surfaces. Instructor 2 took responsibility for general cleaning, washing the dishes, and completely removing any chemical residues. Both instructors took care to maintain hygiene and order after the experiment, ensuring that the laboratory was safe for its next use.

These findings indicate that three stages—pre-laboratory preparation of a safe environment, effective classroom management during the application process, and workshop cleanup after the application—are critical for maintaining laboratory safety in a comprehensive manner. The roles that instructors assume throughout the process not only ensure safety but also enable students to experience scientific process skills in safe conditions.

Table 3. Summary of findings related to the theme of instructor roles.

Laboratory Stage	Approach of Instructor 1	Approach of Instructor 2	Common Points
Pre-Laboratory	Arranging materials on trays, placing personal protective equipment	Eliminating hazardous elements, creating a safe environment	Preparing a safe environment, prioritizing student safety
During the Laboratory	Monitoring glove usage, assisting students when necessary	Responding immediately to hazardous situations, ensuring chemical safety	Effective classroom management, monitoring the use of protective equipment
Post-Laboratory	Place chemicals in appropriate containers, clean surfaces, ensure hygiene	Washing materials, checking for chemical residues, ensuring order	Workshop cleaning, maintaining hygiene and order

4. Discussion and Conclusion

4.1. General Safety Measures Knowledge Levels and Application Process of Instructors

This study was conducted to determine the general safety measures taken by instructors working in science centers during science laboratory applications. The findings were grouped into three main categories: safety measures taken before, during, and after the laboratory session.

Before the laboratory session, it was found to be important for instructors to review the Material Safety Data Sheets (MSDS) of chemical materials to take chemical safety precautions in advance and to perform regular equipment checks in order to create a safe working environment. These practices are consistent with standard safety procedures outlined in the literature (American Chemical Society, 2016b; OSHA, 2011).

During laboratory sessions, practices that enhance safety include instructors informing students about safety rules and personal protective equipment, ensuring students remain at their stations, and explaining the functions of materials used in the experiment. These findings are consistent with studies showing that laboratory safety is related to the effectiveness of the learning process (Hofstein & Lunetta, 2004; Singer et al., 2006).

After the laboratory session, the proper disposal of chemicals reflects the instructors' sustainable safety approach. Separating chemicals according to their reaction states and disposing of them appropriately is a critical practice for environmental and human health (National Research Council, 2011; U.S. Environmental Protection Agency, 2023).

Beyond procedural safety measures, the findings also indicate that instructors perceive laboratory safety as an integral part of their instructional role. This result is consistent with previous studies emphasizing that instructors in informal learning environments often prioritize hands-on safety management and situational awareness over formalized procedures (Falk & Dierking, 2013; Tran & King, 2011). The emphasis on classroom management, continuous supervision, and proactive intervention observed in this study supports the view that instructor roles in science centers extend beyond content delivery to include responsibility for maintaining a safe and supportive learning environment.

Overall, the safety measures implemented by instructors before, during, and after the laboratory were found to be consistent with the standards outlined in the literature. This indicates that instructors working in science centers demonstrate a conscious and systematic approach to laboratory safety.

4.2. Educational Level of Instructors Working in Science Centers Related to Science Laboratory Applications

This study reveals that instructors' subject matter knowledge and pedagogical knowledge play a significant role in ensuring laboratory safety and supporting effective learning in science laboratory applications. The findings indicate that instructors are conscious and proactive in applying safety protocols and addressing the hazard classes of chemicals within the scope of their subject knowledge. Verbal safety instructions provided by instructors were found to be effective in ensuring immediate student safety; however, the absence of written and visual materials supporting these instructions was identified as a factor limiting long-term retention. This finding is consistent with the literature, which emphasizes that safety training supported by written and visual materials enhances students' knowledge levels and safety awareness (Abrahams & Millar, 2008; Hofstein & Lunetta, 2004; Toplis & Allen, 2012).

In addition, the findings suggest that instructors' training should be expanded to include safety-related topics such as emergency procedures and first aid information. While instructors demonstrated a high level of awareness regarding chemical hazard classifications and rapid responses to minor

spill incidents—aligning with safe laboratory practices reported in the literature (Cornell University, 2024)—the limited emphasis on emergency preparedness points to a need for more comprehensive safety education.

From a pedagogical perspective, classroom arrangement emerged as an important factor influencing both safety and learning. Instructors' preferences for organizing students at a single table or at separate tables offered different advantages in terms of collaborative learning and individual responsibility. Collaborative arrangements promote knowledge sharing and social interaction (Johnson & Johnson, 1999; Vygotsky, 1978), whereas individual work arrangements support sustained attention and strengthen students' sense of personal safety responsibility (Slavin, 1983). These findings highlight the role of pedagogical decision-making in shaping safe and effective laboratory learning environments.

Overall, the results demonstrate that the effective integration of subject knowledge and pedagogical approaches contributes to students' safe, conscious, and meaningful learning experiences in science laboratories. A comprehensive educational approach supported by written and visual safety materials, and enriched with emergency preparedness and first aid training, is likely to further strengthen laboratory safety culture in science center settings.

4.3. Emergency Plans by Instructors Working in Science Centers Concerning Science Laboratory Practices

This study examined the level of implementation of emergency plans in science laboratory practices conducted at science centers. Based on interviews and observations with instructors, two main codes were identified within this theme: training needs and process management.

The findings indicate that instructors' knowledge and awareness of emergency situations were insufficient in several critical areas. In particular, the lack of systematic introduction of safety equipment—such as fire extinguishers, emergency exit routes, and emergency shower stations—to students was identified as a significant shortcoming in terms of laboratory safety. The literature emphasizes that familiarizing students with emergency exits and safety equipment is a fundamental component of effective laboratory safety practices (Harvard University, 2024; Minnesota University, 2024). Failure to provide this information may lead to inadequate or incorrect responses during potential emergency situations.

Within the scope of the training needs code, the findings highlight the necessity of systematic and comprehensive training programs aimed at improving instructors' emergency preparedness and laboratory safety knowledge. Similar studies have reported that educators require additional training in laboratory management, emergency response, and the safe implementation of experimental activities (Coştu et al., 2005; Çepni et al., 2005). These results suggest that emergency preparedness should be addressed not only through individual experience but also through structured professional development opportunities.

In contrast, findings related to the process management code indicate that instructors demonstrated effective on-site responses during minor emergency situations. Instructors were observed to intervene quickly in incidents such as chemical spills and to continue managing the process while maintaining the use of personal protective equipment. These behaviors reflect the application of practical safety awareness and experiential knowledge in real laboratory settings.

However, despite instructors' demonstrated competence in managing routine safety situations, notable deficiencies remain in terms of written safety guidelines, systematic emergency training, and explicit instruction regarding emergency equipment and procedures. Consistent with previous research, informal science education environments often lack standardized emergency protocols when compared to formal school laboratories (Rennie & Johnston, 2004; Tal et al., 2014). The absence of structured emergency planning may reduce the effectiveness of safety practices in high-risk situations. Therefore, strengthening laboratory safety culture in science centers requires not only individual instructor awareness but also institutional support through written procedures, regular emergency drills, and continuous professional development focused on emergency management.

In conclusion, the findings indicate that emergency planning in science center laboratory practices needs to be more comprehensive and systematic. Expanding continuous safety training programs and implementing regular practical drills for instructors will contribute significantly to improving emergency preparedness and enhancing overall laboratory safety.

4.4. Preparedness Level of Instructors Working in Science Centers for Potential Incidents Related to Science Laboratory Practices

This study aimed to evaluate the preparedness levels of instructors for potential incidents in science laboratory applications conducted at science centers. Findings obtained through interviews and observations were grouped around two main codes in terms of laboratory safety: Stress Management and Risk Assessment.

Findings related to stress management indicate that instructors' physical and emotional readiness plays a decisive role in maintaining safety in the laboratory environment. Being mentally focused and emotionally regulated enables instructors to minimize distractions, respond promptly to unexpected situations, and create a controlled learning atmosphere. While one instructor emphasized the importance of physical preparation and maintaining focus before entering the

laboratory, the other highlighted inner calm and rapid response as critical factors. These findings are consistent with the literature, which emphasizes that effective stress and time management strategies in laboratory settings enhance both safety and operational efficiency (Carchman, 2019; Harvard University, 2024; Minnesota University, 2024).

In terms of risk assessment, instructors were found to adopt an approach that combines experiential knowledge with systematic safety considerations. One instructor underscored the importance of conducting risk analyses aligned with students' age and skill levels, whereas the other emphasized strict adherence to occupational health and safety regulations. These results suggest that effective laboratory safety depends on the integration of individual experience-based judgments and institutional safety protocols (Houston University, 2024; Richmond & Nesby-O'Dell, 2024).

Overall, the findings related to instructors' preparedness for potential incidents highlight the complementary roles of stress management and risk assessment in laboratory safety. Consistent with previous research, instructors' emotional regulation, situational awareness, and decision-making abilities were found to directly influence their capacity to respond effectively to unforeseen incidents during laboratory activities (Gess-Newsome et al., 2019). The different yet complementary approaches observed among instructors—one focusing on pre-emptive physical preparation and the other on calmness and rapid intervention—reflect multiple dimensions of safety competence. Previous studies emphasize that effective laboratory safety requires a balance between anticipatory risk assessment and adaptive responses during practice (Kelley & Knowles, 2016).

In conclusion, stress management and risk assessment emerge as fundamental components in strengthening instructors' preparedness for potential incidents in science center laboratories. The findings suggest that a holistic approach to laboratory safety should integrate individual coping strategies with systematic safety practices and professional development programs that address not only technical competencies but also psychological readiness and decision-making skills in high-risk situations.

4.5. Roles of Instructors Working in Science Centers in Science Laboratory Applications

This study aimed to examine the roles assumed by instructors during science laboratory applications conducted at science centers. Data obtained from structured and semi-structured interviews with two instructors, along with observations of laboratory activities, revealed that instructors' roles can be categorized into three main stages: pre-laboratory roles, roles during the laboratory, and post-laboratory roles.

In the pre-laboratory stage, instructors' primary responsibility is to prepare a safe and organized learning environment. This includes arranging experimental materials, checking equipment, and ensuring the availability and appropriate use of personal protective equipment. Such preparation is critical for minimizing potential risks and preventing accidents before laboratory activities begin. Consistent with this finding, the literature emphasizes that pre-laboratory planning and hazard elimination are decisive factors in maintaining laboratory safety (Harvard University, 2024). Organizing the laboratory environment in advance allows instructors to manage the experimental process more effectively and reduces the likelihood of unexpected safety issues.

During laboratory sessions, instructors play a key role in maintaining effective classroom management and continuous safety supervision. Instructors monitor students' behaviors, ensure the correct use of personal protective equipment, and intervene immediately when safety rules are not followed. These proactive and timely interventions are essential for sustaining a safe laboratory environment and preventing potential accidents (Richmond & Nesby-O'Dell, 2024). Previous studies also highlight that constant observation and active guidance by instructors constitute a core component of laboratory safety culture, particularly in hands-on learning environments.

In the post-laboratory stage, instructors' responsibilities focus on maintaining cleanliness, hygiene, and order. This includes the proper cleaning of materials, safe storage of chemicals, and preparation of the laboratory for subsequent use. Such practices support the continuity of safety and reinforce hygiene standards. Studies conducted by the University of Houston (2024) similarly emphasize that post-laboratory cleaning and organization are integral elements of comprehensive laboratory safety practices.

Overall, the findings demonstrate that science center instructors assume multifaceted roles throughout the laboratory process, encompassing preparation before the activity, active supervision during experimentation, and systematic organization after the laboratory session. These results align with previous research indicating that instructors in informal science learning environments function not only as content experts but also as facilitators, safety supervisors, and role models for safe scientific practices (Bevan et al., 2010; Falk & Dierking, 2013). The proactive behaviors observed in this study—such as advance material preparation, continuous monitoring of student safety practices, and prompt intervention in risky situations—underscore the importance of instructor presence in ensuring laboratory safety.

Furthermore, the emphasis placed on post-activity cleaning and material management reflects an often-overlooked dimension of laboratory safety highlighted in the literature. Research suggests that safety culture is reinforced not only during experimental procedures but also through routine

practices that model responsibility and care for the laboratory environment (Hofstein & Lunetta, 2004). By actively engaging in cleanup and organization processes, instructors contribute to the sustainability of safe laboratory practices and demonstrate professional responsibility to learners.

In conclusion, the findings indicate that the roles assumed by instructors in science centers during pre-laboratory, laboratory, and post-laboratory stages should be addressed within a holistic framework to ensure laboratory safety. Planned preparation, active guidance during experimentation, and systematic organization after laboratory activities collectively play a critical role in establishing a safe and effective laboratory culture. These findings are consistent with the literature and highlight the need for a comprehensive understanding of instructor responsibilities in supporting laboratory safety.

Based on the identified needs related to emergency preparedness, written safety procedures, and systematic training, this study proposes a laboratory safety training model to support both pre-service and in-service educators working in science centers. One of the main contributions of this research is the development of a training model grounded in empirical findings, offering a practical framework for strengthening safety culture and supporting instructors' roles across all stages of laboratory practice in informal science learning environments.

5. Recommendations

5.1. Recommendations for Research

- Expanding the working group: Since the research was limited to a single science center, comparative studies with different centers could increase the generalizability of the results.
- Working with instructors from different fields: Not limiting the study to science education graduates; including instructors from different disciplines could offer new perspectives.
- Studies on chemical safety management: The safe storage and use of chemicals could be a separate research topic.
- Environmental impact assessments: By examining the environmental effects of the chemicals used, laboratory safety can be addressed in terms of environmental responsibility.

5.2. Recommendations for Educators

- Development of laboratory practical training: Educators should be provided with specialized training to develop practical safety skills; pre- and post-training evaluations should be conducted.
- Monitoring knowledge level: The knowledge development of instructors should be monitored; areas of deficiency should be identified and supported with additional training.
- Emergency plans and training: Plans to be implemented in situations such as fire or chemical spills should be taught, and the preparedness level of instructors should be increased through regular drills.

5.3. Recommendations for Science Center Management

- Preparation of safety instructions: Detailed and guideline-based written instructions regarding laboratory safety should be created.
- Continuity of training: Theoretical and practical safety training for managers and instructors should be conducted regularly.
- Measuring student awareness: Safety awareness tests should be administered to students to evaluate the effectiveness of the training provided.

5.4. Laboratory Safety Training Model Proposal

This model aims to enhance the laboratory safety knowledge and skills of educators working in science centers. It covers both pre-service and in-service training processes and is built on the principles of theoretical knowledge, practical experience, and continuous evaluation. The model integrates interactive and applied learning methods supported by updated content.

Table 4. Laboratory safety training and implementation model.

Stage / Component	Objective	Content	Method / Practice	Evaluation
1. Pre-Service Training (New Educators)	To provide new educators with essential knowledge and skills in laboratory safety	-	-	-
Introductory Seminar (2–3 days)	Understanding the importance of laboratory safety and general rules	Introduction to lab environment, safety rules, emergency procedures, PPE usage	Presentations, videos, case studies	Observation, short quizzes
Interactive Training Workshops (3–4 days)	Reinforcing theoretical knowledge through practice	Chemical/biological hazards, safe working techniques, emergency scenarios	Simulations, group work, role-playing	Practical assessment
Evaluation and Certification (1 day)	Assessing training effectiveness	Written and practical evaluations	Tests, observation	Certificate awarded
2. In-Service Training (Current Educators)	To update educators' knowledge and ensure awareness of new safety protocols	-	-	-
Renewal Seminars (every 6 months)	Providing updated information on safety standards	Current regulations, new equipment, lessons from past incidents	Presentations, discussions, interactive sessions	Surveys, short tests
Practical Workshops (Annually)	Improving hands-on safety skills	Emergency drills, safety inspection management, risk assessment	Simulations, case analysis, teamwork	Performance observation
3. Training Content and Methodology	Integrating theoretical and practical learning	Basic safety rules, emergency procedures, risk management, pedagogical methods	Participant-centered, practical, reflective learning	Ongoing evaluation
4. Evaluation and Feedback	Measuring overall training effectiveness	Pre- and post-tests, open-ended questionnaires, observations, performance review	Data collection, analysis, reporting	Feedback for training improvement

The primary goal of this training model is to strengthen laboratory safety practices in science centers across Türkiye by supporting the professional development of educators and promoting safer learning environments. Through integrated pre-service and in-service training programs, educators are expected to acquire both theoretical knowledge and hands-on experience, thereby fostering a more effective and safety-oriented instructional process. Overall, the proposed model aims to establish a comprehensive and sustainable training framework that systematically enhances laboratory safety in science centers.

Compliance with Ethical Standards

The study protocol was approved by Gazi University Ethics Committee with the decision number E993857 on 11.07.2024.

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Conflict of Interest

The authors have no conflict of interest to declare.

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RESEARCH ARTICLE

Evaluation of Social Studies Teachers' Distance Education Experiences During the Covid-19 Pandemic*

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ABSTRACT

Distance education can be defined as a continuing educational process through communication via technology, despite students and teachers being in different physical locations. In Türkiye, due to the impact of the COVID-19 pandemic, educational activities were carried out through distance education methods. This study explores social studies teachers' experiences regarding distance education during the COVID-19 pandemic. A qualitative research approach, phenomenological design, is used in this research. The study group consisted of 12 social studies teachers. Data were collected using a semi-structured interview form developed by the researchers. Content analysis was employed to examine the gathered data. The findings show that teachers were able to define the concepts of the pandemic and distance education accurately. It was also seen that while there was an increase in teachers' use of technology during COVID-19, they faced challenges in adapting to distance education. As a result, it was observed that their professional satisfaction was negatively affected. Additionally, teachers expressed that they were unable to teach social studies courses at the desired level through distance education during the pandemic. Furthermore, teachers encountered a variety of challenges during this time, including issues related to computer and internet access, the Directorates of National Education, school administrations, colleagues, students and their parents, teaching methods, assessment, and evaluation practices. Based on the research findings, handbooks for teachers on appropriate methods and techniques for distance education can be prepared. The development of teaching programs suitable for the model can also be suggested.

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1. Introduction

The COVID-19 pandemic, which emerged in Wuhan city in China's Hubei Province, affected the whole world in a short time. This process has also caused humanity to encounter new concepts and practices. One of these concepts is pandemic, and the other is distance education. The pandemic is an infection that affects the whole world and spreads rapidly (Turkish Academy of Sciences, 2020). The World Health Organization declared the COVID-19 pandemic on March 11, 2020 (World Health Organization, 2020). After the World Health Organization declared the COVID-19 pandemic, countries had to stop face-to-face education activities to prevent the spread of the epidemic. Thus, the whole world became acquainted with the distance education model. One day after March 11, 2020, when the first COVID-19 case was detected in our country, it was decided to close all schools. On March 16, 2020, it was announced that face-to-face education would be suspended, and distance education would be switched (Ministry of National Education, 2020).

Distance education can be defined as students and teachers in different places continuing their education and training by communicating via the Internet, video conference, e-mail, and

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other communication tools (Turkish Language Association, 2020). Before the pandemic, distance education was used in our country to teach standard courses in open education faculties or undergraduate/associate degree programs (Turan & Çolakoğlu, 2008). As the COVID-19 pandemic began to affect the world, countries worldwide, including Turkey, had to move education and training to emergency distance education at all levels (Bozkurt, 2020). With the COVID-19 pandemic, distance education has become necessary for the world. Teachers, students, and parents had to adapt quickly to distance education in this process. During this period, the distance education model was considered an essential solution for students to continue their education (Turan & Karasu Avcı, 2022). However, distance education is not a model that can only be used in emergencies. The distance education model can also be used within the scope of lifelong learning (Bozkurt & Sharma, 2020).

It is seen that many of the teachers and students in our country encountered distance education for the first time during the COVID-19 pandemic. Teachers must adapt to this process for the learning and teaching process to be carried out effectively and for meaningful learning experiences to emerge. This research examines social studies teachers' distance education experiences during the COVID-19 pandemic.

The COVID-19 pandemic has directly affected social studies teachers. During this period, teachers faced technical difficulties, struggled to reach students due to insufficient communication, and were unable to utilize the methods and techniques they used in face-to-face teaching. Therefore, it can be said that social studies teachers did not experience an effective teaching and learning process (Karabudak, 2020; Kılıç & Beldağ, 2021; Turan & Karasu Avcı, 2022).

In the relevant literature, it is seen that there are various studies on distance education such as (Ağaoğlu, 2020; Aldemir, 2020; Aras, 2019; Balaman, 2015; Baki, 2016; Begimbetova, 2015; Bozkurt, 2019; Bulutlu, 2018; Çengel, 2014; Demirci, 2018; Demirtaş, 2020; Deveci, 2019; Erfidan, 2019; Gürkan, 2017; Kaya, 2020; Koloğlu, 2016; Mercan, 2018; Özcan, 2019; Sığın, 2020; Sinecen, 2019; Üstün, 2020; Yavuz, 2016; Yeşilfidan, 2019). However, it can be said that these studies are concentrated mainly at the university level. It discussed the opinions of first-grade teachers about distance education at the primary school level (Karabudak, 2020; Karabudak & Karasu Avcı, 2025). At the secondary school level (Akça, 2020; Akça, 2022; Uyar, 2020; Yeşilyurt, 2021), they determined the opinions of social studies teachers regarding distance education. In addition, studies have examined student and teacher opinions regarding distance education at the secondary school level (Akgül & Oran, 2020; Korkut & Memişoğlu, 2021). In this context, it can be said that there is a limited number of studies examining the opinions of social studies teachers regarding distance education. The key feature that distinguishes this research from previous studies is its multi-dimensional approach to the unique remote education experiences of social studies teachers during the COVID-19 pandemic. While there are many studies on remote education in the literature, most of them focus on the opinions of university students or general teachers. Research focusing on social studies teachers at the middle school level is quite limited. This study analyzes the strengths and weaknesses of social studies teachers' pedagogical, technological, and affective experiences during the pandemic in a holistic way by presenting their own accounts. Thus, it offers a unique contribution to the literature by examining both the challenges specific to the interdisciplinary nature of the subject and the reflections of extraordinary circumstances on teaching processes. This research examines social studies teachers' distance education experiences during the COVID-19 pandemic. In this regard, the problem statement of the research is “What are the distance education experiences of social studies teachers during the COVID-19 pandemic?” It was determined as.

2. Method

The study protocol was approved by Kastamonu University Social and Human Sciences Research and Publication Ethics Committee on 25.03.2021 (Decision no: 87).

2.1. Model of the Research

In the model of the research, the qualitative research model was preferred. Qualitative research is a type of research in which data is collected through methods such as observation and interview (Yıldırım & Şimşek, 2018). The qualitative research model was preferred because the opinions of social studies teachers were used in the research. Phenomenology, one of the qualitative research models, was used. Phenomenology is a research model in which participants’ personal experiences regarding phenomena are examined in depth (Yıldırım & Şimşek, 2018). This model was used in the research because teachers’ opinions about distance education were discussed in line with their personal experiences.

2.2. Study Group

The study group of the research consisted of 12 social studies teachers working in secondary schools affiliated with the Ministry of National Education in Kastamonu City Center. Convenience sampling type was used in the research. Appropriate sampling is the type of sampling through which the researcher can reach their goal most easily and quickly (Creswell, 2014). The study used appropriate sampling to access the data more rapidly and efficiently.

Table 1. Information on demographic characteristics of social studies teachers.

	Frequency (f)	Percentage (%)
Gender		
Male	8	66.6
Female	4	33.3
Age		
25-30 years old	2	16.6
31-35 years old	6	50
36-40 years old	3	25
41-45 years old	1	8.3
Years of Service		
1-5 years	4	33.3
6-10 years	5	41.6
11-15 years	1	8.3
16-20 years	2	16.6
Have you attended any in-service training programs on distance education?		
Yes	3	25
No	9	75
Do you have an active internet connection at your home?		
Yes	12	100
No		
Do you have a personal computer?		
Yes	10	83.3
No	2	16.6

When the table is examined, 8 (66%) teachers are male, and 4 (33.3%) are female. The length of service of teachers, whose ages vary between 25 and 45, varies between 1 and 20 years. While 3 (25%) of the teachers received in-service training on distance education, 9 (75%) did not receive in-service training. All teachers have Internet at home. While 10 (83.3%) of the teachers have a personal computer, 2 (16.6%) do not have a personal computer.

2.3. Data Collection Process

Data collection in the study started with the approval of the ethics committee and the permission of the Directorate of National Education. Some of the teachers were interviewed face to face, and some were contacted by phone, and an appointment was requested to fill out the semi-structured interview form. Then, they were asked to fill out the semi-structured interview form using WhatsApp or email. It was stated that the data obtained in the research would be used in a scientific study, and personal information would not be used with anyone.

2.4. Data Collection Tool

To collect data for the study, the researchers prepared a semi-structured interview form. This form is an interview technique that allows participants to express their thoughts freely (Patton, 2018). This research used this data collection tool because teachers' opinions about the distance education process were discussed. Before preparing the questions within the scope of the study, the relevant literature was scanned, and the questions were prepared accordingly. After the questions were prepared, they were presented to the evaluation of four social studies education experts, one assessment expert, and one grammar expert. Necessary corrections were made in line with the feedback received from experts, and then the pilot implementation phase began. Initially, researchers prepared 15 questions. With expert input, similar questions were combined into a single item, reducing the number of questions to 12. The pilot application was made to three social studies teachers. As a result of the application, corrections were made to some questions. Following the pilot program, the way question 1 was formulated was reviewed and revised. No changes were made to the interview format. Teachers who participated in the pilot application were excluded from the research process. The research questions are given below:

1. What does the pandemic mean to you?
2. What does distance education mean to you?
3. Has the distance education process affected your use of educational technologies? If so, how did it affect you?
4. Did the distance education process affect your professional satisfaction? If so, how did it affect you?

5. What do you think about secondary school students' adaptation to distance education?
6. What methods and techniques do you use in the social studies course during distance education? What are your reasons for choosing these methods and techniques?
7. What materials do you use in the social studies course during distance education? From where?
8. What are your opinions about teaching the subjects in the social studies course during the distance education process?
9. What assessment and evaluation tools did you use in the social studies course during the distance education process? From where?
10. What are the problems you experienced in the social studies course during the distance education process?
11. Do you find distance education or face-to-face education more efficient? From where?
12. What are your suggestions to make the social studies course more productive during distance education?

2.5. Analysis of Data

The content analysis method was used to analyze the data obtained in the research. Content analysis is the process of organizing, classifying, and comparing the data received and reaching theoretical conclusions (Cohen et al., 2007). Before the data were analyzed, the interview forms were coded as (T-1, T-2, … T-10). After coding, the answers to each question were read one by one and conceptualized. Then, these concepts were arranged, and categories were created.

2.6. Reliability and Validity of the Research

Reliability and validity are two fundamental dimensions that enhance the robustness of scientific research. Reliability means that the data obtained can be interpreted similarly by other researchers (Yıldırım & Şimşek, 2018). Accordingly, in this study, an additional analysis was conducted by an independent researcher to ensure the reliability of the data, and disagreements among researchers were discussed and resolved into a common decision. This practice is described in the literature as analyst triangulation and corresponds to the process of comparing results by analyzing the same data by multiple researchers (Patton, 2014). In qualitative research, validity refers to presenting the research process as objectively and transparently as possible (Yıldırım & Şimşek, 2018). In this research, validity was strengthened by explaining all stages in detail and supporting the findings with participant statements. In the analysis of qualitative data, the Miles and Huberman (1994) reliability formula (Reliability = Agreement / (Agreement + Disagreement)) was used. In this context, the data was found to be reliable at a rate of 72/72+12=0,85.

3. Findings

In the study, teachers were asked what the pandemic meant to them. Teachers' opinions on this question are given in Table 2.

Table 2. Teachers' opinions about the pandemic.

Categories	f
The epidemic that affected the whole World	10
Complexity	1
Uncertainty	1
Quarantine	1
Global health problem	1
Suspension of many activities in the country	1
TOTAL	15

Teachers described the pandemic as "the epidemic that affected the whole world" (f=10). This category was divided into "complexity" (f=1), "uncertainty" (f=1), "quarantine" (f=1), "worldwide health problem" (f=1), and "suspension of many activities in the country" (f=1), followed by the categories. Accordingly, it is understood that their teachers are knowledgeable about the pandemic. Teachers' opinions regarding this question are given below:

Sample comment for the category "The epidemic that affected the whole World":

T-1: "An epidemic that starts in a certain region and affects the whole world, and causes negative consequences in many areas."

Sample comment for the category "Uncertainty":

T-2: "Epidemic, chaos, uncertainty."

Sample comment for the category "Worldwide health problem":

T-3: "Global health problem."

Sample comment for the category "Suspension of many activities in the country"

T-4: "Long-term epidemic spreading over a wide area."

Based on these views, it is understood that teachers define COVID-19 as a significant global health problem and believe it affects human lives.

In the research, teachers were asked what distance education meant to them. Teachers' opinions regarding this question are shown in Table 3.

Table 3. Teachers' opinions about distance education.

Categories	f
Online Education	5
An alternative method is used when face-to-face education cannot be applied	2
Training during the pandemic period	2
Education under any circumstances and at any time	1
It is better than nothing	1
Education without direct interaction with students	1
TOTAL	12

Teachers mainly express the concept of distance education as "online education" (f=5). This category is divided into "alternative method used when face-to-face education cannot be applied" (f=2), "Training during the pandemic period" (f=2), "education under any circumstances and at any time" (f=1), "it is better than nothing" (f=1) and "education without direct interaction with students" (f=1) categories were followed. Accordingly, teachers are knowledgeable about distance education. Teacher opinions regarding the research question are given below:

Sample comment for the category "Online education":

T-6: "It is a precaution to prevent educational activities from being disrupted when human health is in danger."

Sample comment for the category "Alternative method used when face-to-face education cannot be applied":

T-7: "Education is education carried out in an internet-based classroom environment."

Sample comment for the category "Training during the pandemic period":

T-11: "Continuing education via video over the internet in cases where it is impossible to go to school."

Sample comment for the category "Education under any circumstances and at any time":

T-12: "Providing education through mass media (television, computer, etc.) in extraordinary situations."

It is understood from this research question that teachers view distance education as an alternative method, internet-based education, and education utilized in extraordinary circumstances.

Within the scope of the research, teachers were asked whether the distance education process affected the use of educational technologies and, if so, how teachers' opinions on this question are presented in Table 4.

Table 4. Teachers' opinions on how the distance education process affects their use of technology.

Categories	f
Learning online tools and apps	8
Having knowledge about Information Technologies	2
Positively affected	1
Negatively affected	1
TOTAL	12

Teachers think that the category of "learning online tools and applications" (f=8) affects their technology use the most. This category was followed by the categories "knowing information technologies" (f=2), "positively affected" (f=1), and "negatively affected" (f=1). Accordingly, it is understood that the participants are trying to improve themselves regarding technology use during the distance education process. Teachers' opinions within the scope of the research question are given below:

Sample comment for the category "Learning online tools and apps":

T-1: "It showed that we need to know more about information technologies and software and that we need to use them actively during the education process."

Sample comment for the category "Learning online tools and apps":

T-7: "Of course it affected me. Our country had no experience in distance education. We had this experience during the epidemic. I learned how to use various programs in the educational environment."

Sample comment for the category "Learning online tools and apps":

T-8: "It affected me. We installed and used programs we had not used before. We discovered and used features that we had not used in computers."

Sample comment for the category "Positively affected":

T-10: "Yes, it affected me. My computer usage rate has increased."

The teachers' responses indicate that they were affected by the distance learning process, particularly noting that they improved their technological skills and learned new things.

In the research, teachers were asked whether the distance education process affected their professional satisfaction and, if so, how it affected them. Teachers' opinions on this question are presented in Table 5.

Table 5. Teachers' opinions on the impact of the distance education process on their professional satisfaction.

Categories	Code	f
Affected	Negatively affected	8
Did not affect	It was inferior to face-to-face education	1
TOTAL		9

It is seen that the opinions of the teachers are collected under the categories of "affected" (f=8) and "did not affect" (f=1). Teachers who thought the distance education process affected their professional satisfaction expressed their opinion as "negatively impacted" (f=8). In contrast, the teacher who believed the distance education process did not affect their professional satisfaction expressed their opinion: "It was inferior to face-to-face education" (f=1). Accordingly, it is seen that the distance education process negatively affects teachers' professional satisfaction. Within the scope of this research question, teachers' opinions are as follows:

Sample comment for the category "Did not affect":

T-1: "Although distance education has useful parts, I think it is insufficient to provide the professional satisfaction of face-to-face education."

Sample comment for the category "Did not affect":

T-2: "Not being able to reach all students and not receiving effective feedback from the students reached had a negative impact on our professional satisfaction."

Sample comment for the category "Did not affect":

T-5: "As the distance education process got longer, professional fatigue and reluctance began."

Sample comment for the category "Did not affect":

T-7: "It affected student participation in distance education, which was not at the desired level. Student mastery was very low compared to face-to-face education. Therefore, it had a negative impact."

Teachers who believe that distance learning has not affected them state that distance learning is not a substitute for face-to-face education, that effective communication with students is not possible, and that it increases professional fatigue and lack of motivation.

Teachers were asked what they thought about secondary school students' adaptation to distance education. Teachers' opinions regarding this question are presented in Table 6.

Table 6. Opinions of students on their adaptation to the distance education process, according to teachers.

Categories	f
Students were negatively affected	6
The age group was not suitable for distance education	2
While students with high self-discipline adapted, students with low self-discipline had difficulty adapting	1
Equality of opportunity could not be achieved due to internet access	1
Had difficulty focusing	1
Reluctance and a tendency to get bored quickly were observed	1
TOTAL	12

Teachers mostly expressed their opinions regarding students' adaptation to distance education as "students were negatively affected" (f=6). This category was divided into "the age group was not suitable for distance education" (f=2), "while students with high self-discipline adapted, students with low self-discipline had difficulty adapting" (f=1), "equality of opportunity could not be achieved due to internet access" (f=1), "had difficulty focusing" (f=1) and "reluctance and a tendency to get bored quickly were observed" (f=1). Accordingly, teachers think students have difficulty adapting to distance education. Teachers' opinions regarding this question of the research are given below:

Sample comment for the category "Equality of opportunity could not be achieved due to internet Access":

T-3: "It was not easy. Since there is no internet everywhere in our country, our students could not benefit from equal educational opportunities."

Sample comment for the category "Had difficulty focusing":

T-8: "They had a hard time, it was difficult for them to focus on the technological device for a long time outside of the game."

Sample comment for the category "While students with high self-discipline adapted, students with low self-discipline had difficulty adapting":

T-11: "Even if it adapts, its effectiveness is less than face-to-face education."

Sample comment for the category "Had difficulty focusing":

T-12: "It would be correct to say he is more successful than primary school students. But it wasn't completely productive."

Teachers generally believe that students are struggling to adapt to this process. They state that distance learning is not

sufficiently effective due to problems such as students not having internet access at home and difficulty focusing.

Teachers were asked which methods and techniques they used in the social studies course during the distance education process and why they preferred these methods and techniques. Teachers' opinions on this question are presented in Tables 7 and 8.

Table 7. Opinions of teachers about the methods and techniques they prefer in the distance education process.

Categories	f
Teaching through presentation	9
Computer-based instruction	4
Argument	3
Question and answer	3
Game	1
Teaching through discovery	1
Problem solving	1
Case study	1
TOTAL	23

It was determined that teachers mostly used the "teaching through presentation" method (f=9) during the distance education process. This category was divided into "computer-based teaching" (f=4), "argument" (f=3), "question-answer" (f=3), "game" (f=1), "teaching through discovery" (f=1), "case study" (f=1) and "problem solving" (f=1) categories. In this regard, it is seen that teachers benefit from different methods and techniques in the distance education process.

Table 8. Teachers' opinions on the reasons for choosing the methods and techniques they use in the distance education process.

Categories	f
Appropriateness to the course and subject	3
Involving students in the learning process	2
Making the lesson enjoyable	2
Providing easy access to materials	1
TOTAL	8

Teachers mostly answered why these methods and techniques were chosen as "appropriateness to the course and subject" (f=3). This category was followed by the categories of "involving students in the learning process" (f=2), "making the lesson enjoyable" (f=2), and "providing easy access to materials" (f=1). In this regard, it can be said that teachers use these methods and techniques because they are more suitable for the lesson and the subject. Teacher opinions regarding this question in the research are given below:

Sample comment for the category "Involving students in the learning process":

T-5: "Question and answer, discussion, brainstorming, explanation, illustration. I generally used these methods to make the student active and participate in the lesson."

Sample comment for the category "Appropriateness to the course and subject":

T-9: "Presentation, question, and answer method because this is the most appropriate method and technique in this process."

Sample comment for the category "Appropriateness to the course and subject":

T-10: "Lectures, maps, and slides. Because other methods and techniques are not very suitable for online education."

It appears that teachers have utilized various methods and techniques in the distance education process. These methods and techniques are preferred for reasons such as engaging students in the process and suitability for the subject matter.

Teachers were asked what materials they used in the social studies course during the distance education process and why they made these choices. Teachers' opinions on this question are presented in Tables 9 and 10.

Table 9. Teachers' opinions about the materials they prefer during the distance education process.

Categories	f
Slide	7
Video	4
Map	2
Textbook	2
Computer	2
Telephone	2
Three-dimensional software	1
Z boks	1
Worksheet	1
Zoom	1
EIN	1
TOTAL	24

Teachers said they primarily used "slides" (f=7) as material in the distance education process. We divided this category into "video" (f=4), "map" (f=2), "textbook" (f=2), "computer" (f=2), "telephone" (f=2). The categories are "three-dimensional software" (f=1), "z books" (f=1), "working papers" (f=1), "Zoom" (f=1), and "EIN" (f=1). Accordingly, teachers benefit from different materials in this process.

Table 10. Teachers' opinions on the reasons for choosing the materials they use in the distance education process.

Categories	f
Grab students' attention	1
Simplifying the narrative	1
Ensuring that the information learned is permanent	1
TOTAL	3

The reasons why teachers prefer materials are "grab students' attention" (f=1), "simplifying the narrative" (f=1), and "ensuring that the information learned is permanent" (f=1). However, most teachers (f=9) did not state their reasons for choosing the materials they used in the distance education process. Teachers' opinions regarding this question of the research are given below:

Sample comment for the category "Grab students' attention":

T-5: "I mostly used slides, videos, websites, and visuals. I took care to use materials that would attract students' attention."

Sample comment for the category "Simplifying the narrative":

S-10: "Textbooks, maps. To make it easier to explain."

Teachers have been observed to utilize various materials during the distance learning process. It appears they primarily use these materials to attract students' attention and simplify the explanations.

Teachers were asked about their thoughts on teaching the subjects of the social studies course during the distance education process. Teachers' opinions on this issue are presented in Table 11.

Table 11. Opinions of teachers about teaching subjects in the distance education process.

Categories	f
The expected level of teaching the subjects could not be reached	8
There were no problems	3
TOTAL	11

It is seen that teachers' opinions regarding the teaching of social studies course subjects during the distance education process are collected under the categories of "the expected level in teaching the subjects was not reached" (f=8) and "there was no problem" (f=3). In this regard, it can be said that most teachers think they cannot reach the desired level in teaching social studies course subjects related to the distance education process. Teachers' opinions regarding this question of the research are as follows:

Sample comment for the category "The expected level in teaching the subjects could not be reached":

T-2: "Even if I used activities such as slides, videos, and animations, more systematic and effective solutions could be made."

Sample comment for the category "There were no problems":

T-5: "I had no difficulties teaching the subjects because many materials related to the social studies course were accessible."

Sample comment for the category "The expected level in teaching the subjects could not be reached":

T-8: "There is no problem in the explanation phase, but the heavy topics caused a decrease in success."

Sample comment for the category "The expected level in teaching the subjects could not be reached":

T-10: "Especially students studying for the exam and new fifth-grade students had difficulty understanding the topics."

Teachers generally state that lessons cannot be delivered at the desired level of effectiveness during the distance learning process.

In the research, teachers were asked which assessment and evaluation tools they used in the social studies course during the distance education process and the reasons for these preferences. Teachers' opinions on this question are presented in Tables 12 and 13.

Table 12. Opinions of social studies teachers about the assessment and evaluation tools they prefer during the distance education process.

Categories	f
Multiple choice	7
Student portfolio	3
Worksheets	2
I did not use an assessment tool	2
Matching	2
Criterion dependent	1
Gain comprehension test	1
Oral	1
Research paper	1
Fishbone	1
TOTAL	21

Teachers stated that they mostly used "multiple choice tests" (f=7) as an assessment and evaluation tool in the distance education process. This category was divided into "student portfolio" (f=3), "worksheets" (f=2), "I did not use an assessment tool" (f=2), "matching" (f=2), "criterion

dependent" (f= 1), "gain comprehension test" (f=1), "oral" (f=1), "research paper" (f=1) and "fishbone" (f=1) categories. In this regard, it can be said that teachers benefit from different assessment and evaluation tools during the distance education process.

Table 13. Teachers' opinions on the reasons for choosing the assessment and evaluation tools they use in the distance education process.

Categories	f
Suitable for distance education	2
Limited assessment and evaluation options	1
TOTAL	3

The reasons why teachers prefer assessment and evaluation tools are "suitable for distance education" (f=2) and "limited assessment and evaluation options" (f=1), respectively. Many teachers (f = 9) did not explain their reasons for choosing the assessment and evaluation tools they used in this process. Teacher opinions regarding this question of the research are given below:

Sample comment for the category "Suitable for distance education":

T-5: "I used assessment and evaluation via Google form. I used verbal assessment tools. I also included multiple-choice questions."

Sample comment for the category "Limited assessment and evaluation opportunities":

T-12: "I used the student portfolio and various research assignments. There were already many problems in teaching, especially in the first semester. That's why I resorted to such an evaluation method."

Teachers have utilized various assessment and evaluation tools during the distance education process. They explain their preference for these tools by stating that they are suitable for distance education.

Teachers were asked about the problems they encountered in the social studies course during the distance education process. Teachers' opinions regarding this question are included in Table 14.

Table 14. Teachers' opinions about the problems they encountered in the social studies course during the distance education process.

Categories	Code	f
Problems with the computer (software, hardware, etc.)	I did not encounter any problems	4
	Sound	4
	Microphone	2
	Security vulnerabilities in applications	1
	Programs are of foreign origin	1
	EIN's failure to respond	1
	Zoom is in English	1
	Lack of technological tools among students	1
	Software not suitable for use	1
Internet connection disruptions	I did not encounter any problems	6
	Disconnections and hangs	4
	Students not being able to access the Internet	2
	EIN (Education Information Network) not responding	2
	Electrical fault	1
Problems with school administration	I did not encounter any problems	12
Issues with the Directorate of National Education	I did not encounter any problems	12
Issues with the subject teacher	I did not encounter any problems	11
	Incompatibility in the use of the shared system	1
Problems with the student	Difficulty adapting	5
	Lack of order	4
	Participation is low	3
	Hardware failure	1
	I did not encounter any problems	1
	Inability to access the connection	1
	High noise level at home	1

Table 14. (continued).

Categories	Code	f
Problems with parents	Not getting any feedback	6
	Indifferent parent	5
	I did not encounter any problems	2
Problems with method and technique	I did not encounter any problems	6
	Insufficient method and technique	4
	Failure to carry out events	1
	I did not encounter any problems	6
Problems with assessment and evaluation	I did not encounter any problems	4
	Assessment and evaluation could not be carried out	3
	Limited assessment and evaluation were applied	2
	The process is unclear and constantly changing	1
	I had difficulty until I learned appropriate assessment and evaluation tools	1
	Not providing face-to-face education	1
Other (if any other problems)	I did not encounter any problems	9
	Health-related problem	1
TOTAL		140

The problems experienced by teachers in the social studies course during the distance education process were "problems with the computer (software, hardware, etc.)" (f=16), "Internet Problems with the Directorate of National Education (f=12), "Problems with the subject teacher" (f =16), "Problems with the student" (f=21), "Problems with parents" (f=13), "Problems with method and technique" (f=17), Problems with assessment and evaluation (f=12) and other (if any other problems are experienced) (f=10) divided into categories. When the problems encountered by teachers are examined, it is seen that they mostly experience student-related problems (f=21). This category is followed by problems related to method and technique (f=17), computer problems for students (f=16), and internet connection problems for students (f=15). Teachers' opinions about the problems they experience are listed below:

Sample comment for the category "Internet connection disruptions":

T-1: "There are power outages in the village, and there are no students with internet connections in most places."

Sample comment for the category "Problems with the student":

T-4: "Indifference."

Sample comment for the category "Problems with the subject teacher":

T-5: "I experienced health problems (headache, backache, fatigue, insomnia). As the time spent in front of the computer has increased, these problems have also increased."

Sample comment for the category "Problems with method and technique":

T-6: "I could not use many methods and techniques because there was no face-to-face education with the students."

T-10: "I generally had to use the narrative technique. I had difficulty using other techniques due to a lack of resources."

T-11: "Inability to use techniques such as modeling and demonstration."

It appears that teachers' opinions regarding the problems they encountered in social studies lessons during distance education fall under general headings such as internet connection, students, teachers, methods, and techniques.

Teachers were asked to compare distance education and face-to-face education, which one they thought was more efficient, and the reasons for their preferences. Teachers' opinions on this question are presented in Table 15.

Table 15. Teachers' opinions about the reasons why they find distance education or face-to-face education productive.

Categories	Code	f
Face to face education	Social studies course should be interaction-oriented	6
	More effective and efficient implementation of distance education	5
	Failure to provide equal opportunities in distance education	1
	Inability to observe emotions and behaviors in distance education	1
	Achieving professional satisfaction	1
TOTAL		14

The most common reason teachers find face-to-face education productive is "the social studies course is interaction-oriented" (f=6). This category is divided into "more effective and efficient implementation of distance education" (f=5), "failure to provide equal opportunities in distance education" (f =1), "failure to observe emotions and behaviors in distance education" (f=1) and "achieving professional satisfaction" (f=1) categories are followed. Teachers' opinions regarding this question of the research are given below:

Sample comment for the category “Inability to observe emotions and behaviors in distance education”:

T-3: “Face to face. At least we can see the human expressing his actions and emotions.”

Sample comment for the category “Social studies course should be interaction-oriented”:

T-4: “I find face-to-face education useful. Because social studies is a course that requires mutual interaction.”

Sample comment for the category “Social studies course should be interaction-oriented”:

T-8: “Face-to-face education is more efficient. I think mutual exchange with the student is at the forefront.”

Sample comment for the category “Social studies course should be interaction-oriented”:

T-11: “I think face-to-face education is more efficient. I think distance education cannot provide enough interaction.”

Teachers differ in their perception of whether remote or in-person teaching is effective. Those who find remote teaching effective cite convenience in terms of time and accessibility; however, they believe that in-person teaching, with its interactive approach, is more effective.

Table 16. Teachers’ opinions on increasing the efficiency of social studies courses during distance education.

Categories	**f**
Improving EIN and similar platforms	4
Preparation of appropriate materials	3
Providing in-service training	2
Animation, video, game, etc., development of content	2
I do not have any suggestions	2
Students are provided with computers, internet access, etc., providing technological opportunities	2
Application of methods and techniques to the needs of students	1
Teachers and students can be involved in the process without time restrictions	1
TOTAL	17

Teachers mostly suggested “improving EIN and similar platforms” (f=4) to make distance education more efficient. This category is divided into “preparation of appropriate materials” (f=3), “presentation of in-service trainings” (f=2), “animation, video, game, etc. improving the content” (f=2), “I do not have any suggestions” (f=2), “Students are provided with computers, internet access, etc. providing technological opportunities” (f =2), “application of methods and techniques to the needs of students” (f =1) and “involvement of teachers and students in the process without time restrictions” (f =1). Teachers’ opinions regarding this question of the research are given below:

Sample comment for the category “Providing in-service training”:

T-1: “To be more efficient in the distance education process, more training should be provided through in-service training, and EIN should be used in the social studies course. More interactive materials can be found on the platforms.”

Sample comment for the category “Preparation of appropriate materials”:

T-4: "Materials suitable for distance education should be developed. Students' lack of Internet and computers should be eliminated."

Sample comment for the category “Improving EIN and similar platforms”:

T-9: “The contents on EIN need to be enriched.”

Sample comment for the category “Students are provided with computers, internet access, etc., providing technological opportunities”:

T-11: “Increasing the internet speed, eliminating infrastructure problems, and producing more content models and applications related to the subjects in the course increase efficiency.”

Teachers have expressed opinions on providing in-service training to increase the effectiveness of social studies lessons in distance education, preparing appropriate materials, and improving digital platforms.

4. Discussion, Conclusion and Suggestions

The research discussed social studies teachers' experiences with distance education during the COVID-19 pandemic. In the study, it was determined that the majority of teachers had the correct definitions of the concept of pandemic. However, some teachers also confuse the concept of pandemic with epidemic diseases. The main reason why some social studies teachers confused the concept of pandemic with epidemic during the COVID-19 period is the differences in health literacy levels and the insufficient coverage of epidemiological terms in educational programs. The literature shows that teachers may have difficulty understanding scientific concepts related to health, and the frequent interchangeability of these terms in the

media and everyday language increases misconceptions (Nutbeam, 2008). In Karabudak (2020)'s study, classroom teachers correctly defined the concept of pandemic. This situation coincides with the findings of this research. Bakioğlu and Çevik (2020) revealed in their study that science teachers confused the concept of pandemic with epidemic diseases and viruses. This result also supports the result obtained from this research.

In the research, teachers also defined the concept of distance education correctly. However, some teachers think distance education is only carried out during extraordinary periods, such as the pandemic. However, the distance education model can be applied under normal conditions (Altun, 2020).

The findings of the study suggest that teachers described a noticeable increase in their use of technology during the COVID-19 distance education period. Similarly, Akça (2020) reported that social studies teachers recounted greater engagement with technological tools throughout the process. In this respect, both studies highlight comparable experiences regarding teachers' expanded reliance on technology in distance education. In addition, Karabudak (2020) found in his research that classroom teachers' computer use increased during the distance education process, teachers tried to learn new programs, and spent more time on the Internet. In their study, Mulenga and Marban (2020) found that teachers had to use more technology during the distance education process. All these results obtained from the literature support this conclusion of the research. Accordingly, it can be said that teachers' use of technology increased during the pandemic period.

The findings of the study indicate that distance education during the COVID-19 pandemic adversely influenced social studies teachers' sense of professional fulfillment. Teachers' descriptions of feeling inadequate and undervalued in the distance education environment, as reported in Bakioğlu and Çevik (2020)'s study, similarly illustrate how the process weakened their professional well-being. Parallel interpretations were also noted in the studies of Akça (2020) and Karabudak (2020), where teachers expressed that the demands and constraints of distance education diminished their motivation and reduced the sense of meaning they derived from their work. These converging accounts show that, across studies, teachers experienced distance education as a process that strained their professional identities and reduced their overall sense of professional fulfillment during the pandemic.

Teachers stated that students had difficulty adapting to distance education during the COVID-19 pandemic. According to the study of Akgül and Oran (2020), low motivation in students results in getting bored easily, staying away from the social environment, etc. It has been determined that these situations cause students difficulty adapting to distance education. In his study, Akça (2022) concluded that students experienced a lack of motivation in the distance education process and did not get much efficiency from this process. The results of these studies in the literature are similar to those of this research. In this regard, according to the teachers' opinions, it can be said that the students have difficulty adapting to the distance education process.

The analysis of the qualitative data indicates that social studies teachers relied predominantly on the "presentation/explanation" and "computer-assisted teaching" methods during the COVID-19 distance education period. This finding differs from Bakioğlu and Çevik (2020)'s study, which revealed that science teachers tended to use "question–answer," "problem solving," and "explanation" methods. This divergence can be attributed to the differences in subject area characteristics. Consistent with the present research, Akça (2020) also found that social studies teachers most frequently employed the "presentation/expression" method in distance education. These findings collectively suggest that the presentation/explanation method was the primary instructional approach used by social studies teachers during the pandemic.

The study also shows that social studies teachers made extensive use of slides, videos, and maps as instructional materials throughout the distance education process. This result is supported by Bakioğlu and Çevik (2020), who reported similar material use among teachers, as well as by the study of Basilaia and Kvavadze (2020), which found that teachers abroad also relied on comparable digital materials. Taken together, these studies demonstrate that the distance education context tended to channel teachers toward similar material choices.

Participants further reported that they were unable to achieve the desired level of success in teaching social studies content through distance education. This perception aligns with the findings of Aydemir (2021), Ceylan and Çoban (2021), and Elçi and Tünkler (2022), all of whom concluded that social studies learning outcomes were not sufficiently achieved. Similarly, Akça (2020) found that distance education was generally inefficient for students. These converging findings indicate that effective instructional outcomes in social studies were difficult to attain during the pandemic period.

Findings also show that teachers used a range of assessment and evaluation tools during distance education. Most teachers reported using multiple-choice tests, a result consistent with those of Ceylan and Çoban (2021) and Elçi and Tünkler (2022). In addition, teachers assessed verbal skills, class participation, and research assignments, noting that these forms of assessment were more compatible with distance education conditions.

The research reveals that social studies teachers encountered various challenges during the distance education process, including computer-related issues (software, hardware), internet connection problems, difficulties with

school administration and the Directorate of National Education, classroom group dynamics, student engagement, parental involvement, teaching methods, and assessment and evaluation practices. Computer-related difficulties reported in this study parallel the findings of Akça (2020), Ceylan and Çoban (2021), Elçi and Tünkler (2022) and Karabudak (2020). Frequent internet disconnections and freezing problems, as identified in the present study, also mirror the results of Akgül and Oran (2020), Doğan and Temir (2022), and Kılıç and Recepoğlu (2022). While some studies (Akça, 2020; e.g., Bakioğlu & Çevik, 2020; Karabudak, 2020) reported that teachers did not face significant issues with school administration or educational authorities, this research found that problems in these areas were present. Moreover, similar to findings reported by Akça (2020), Akgül and Oran (2020), Doğan and Temir (2022) and Karabudak (2020), the teachers emphasized parental indifference as a major obstacle. Studies by Korkut and Memişoğlu (2021) and Sığın (2020) also support the conclusion that teaching methods commonly used in face-to-face instruction could not be fully implemented in the distance education environment. Consistent with the present study, research by Balaman and Hanbay Tiryaki (2021), Kılıç and Beldağ (2021) and Özdoğan and Berkant (2020) shows that assessment and evaluation practices were insufficient during the pandemic. Overall, the literature indicates that the challenges encountered by teachers during COVID-19 were largely similar across studies.

Teachers in this study stated that face-to-face education was more efficient than distance education. This finding is supported by the results of Akça (2020), Alkan (2023), Doğan and Temir (2022), Karabudak (2020), Karabudak and Karasu Avcı (2025), Kılıç and Beldağ (2021), Korkut and Memişoğlu (2021), and Özdoğan and Berkant (2020), all of whom concluded that face-to-face instruction yields higher levels of educational effectiveness. These results strengthen the conclusion that distance education was less efficient for social studies teaching during the pandemic.

Finally, teachers recommended several strategies for making social studies instruction more effective through distance education, such as improving platforms like EIN (EBA), developing suitable instructional materials, providing in-service training for teachers, and enriching content with animations, videos, and games. These recommendations correspond with those offered by Akça (2020) and Karabudak (2020), who similarly suggested enhancing distance education platforms, designing appropriate digital materials, and increasing teacher training opportunities. These parallels indicate strong alignment between the findings of the present study and the broader literature.

In line with the results of the study, the following suggestions can be put forward:

- Handbooks supported by introductory and examples can be prepared for teachers regarding methods and techniques suitable for distance education.
- Teachers can be given in-service training to introduce the distance education model.
- Curriculum programs suitable for the distance education model can be prepared.
- The content of the EIN platform can be developed and enriched to be suitable for distance education.
- Free Internet, computers, tablets, etc. for teachers. Hardware support that they can use in distance education can be provided.

Compliance with Ethical Standards

The study protocol was approved by Kastamonu University Social and Human Sciences Research and Publication Ethics Committee on 25.03.2021 (Decision no: 87).

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Conflict of Interest

The author has no conflict of interest to declare.

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RESEARCH ARTICLE

Fourth Grade Primary School Students' Self-Efficacy and Engagement Levels in Social Studies Course*

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ABSTRACT

Students' perceptions of self-efficacy and their levels of engagement can be considered important factors affecting the effectiveness and quality of the teaching process. This study aims to describe the self-efficacy of fourth-grade primary school students regarding the social studies course and their levels of engagement in the course, as well as to explain the relationship between these two variables. The descriptive survey model and the explanatory correlational model were employed together in the study. The study population consisted of fourth-grade students attending schools in Kırşehir province during the 2024–2025 academic year. The sample comprised 488 students from schools with different socioeconomic levels, selected using stratified and typical sampling methods. Data were collected using the Social Studies Self-Efficacy Scale and the Social Studies Engagement Scale. The collected data were analyzed using parametric statistical methods. The findings revealed that students' self-efficacy and engagement in social studies were at a high level. While no significant difference was found in students' self-efficacy in terms of gender, female students were found to have significantly higher levels of engagement in the social studies course. Significant differences were found between the two dependent variables (self-efficacy and engagement) and the educational levels of students' parents, as well as the socioeconomic levels of the schools attended by the students. Moreover, a high, positive, and statistically significant correlation was found between students' self-efficacy and their engagement in the social studies course. Students' self-efficacy was found to be a significant predictor of their engagement and explained 49% of the variance in engagement. This result indicates that elementary school students' perceptions of self-efficacy influence their engagement in the social studies course. Therefore, it is recommended that educational environments be structured in ways that support students' self-efficacy in order to enhance their active engagement in social studies courses.

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1. Introduction

Social studies is a multidisciplinary field of education that aims to equip individuals with the knowledge, skills, and values they need in social issues in a changing and evolving world. Accordingly, the 2024 Social Studies Curriculum adopts a holistic approach to skills, attitudes, values, and literacies, aiming to effectively support students' multidimensional development (Ministry of National Education [MoNE], 2024). The self-efficacy construct and social participation skills included in the curriculum can be regarded as fundamental elements that support individuals' personal development and their participation in social life as active and responsible citizens. It can be suggested that individual variables such as students' attitudes toward the course, their perceptions of self-efficacy, and their levels of engagement in the course may have significant effects on the learning process. Therefore, understanding the dynamics that facilitate students' active

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participation in achieving the objectives of the social studies course can be considered important in terms of identifying and enhancing students' levels of self-efficacy and improving the quality of learning environments.

One of the most fundamental concepts of Social Learning Theory, the concept of self-efficacy, is defined by Bandura (1997) as 'an individual's personal belief in their ability to plan and execute the actions necessary to achieve specified goals' (p. 3). Schunk (1989) referred to the educational manifestation of self-efficacy as "learning self-efficacy" and defined it as students' beliefs in their own capabilities to effectively use their existing knowledge and skills and, through this process, to acquire new cognitive skills (p. 14). Based on these definitions, it can be suggested that self-efficacy determines an individual's belief in their ability to accomplish a task and, through this belief, plays an influential role in the initiation, persistence, and completion of behavior. Research findings indicate that individuals with high levels of self-efficacy exert greater effort to accomplish a task, persist and remain resilient in the face of adversity rather than giving up easily, and that students with high levels of learning self-efficacy demonstrate greater effort in academic tasks, show higher resilience in the face of failure, and participate more willingly and effectively in the learning process (Aşkar & Umay, 2001; Cassidy, 2015; Ekici, 2009; Qamar & Akhter, 2020; Wulandari & Istiani, 2021). Considering these findings, it can be suggested that self-efficacy is a fundamental disposition that determines both the quality of learning processes and students' academic achievement, and therefore should be given priority in educational practices. Students' perceptions of self-efficacy may vary depending on variables such as gender, age, subject area, culture, and socio-economic factors (Huang, 2013; Sakız, 2013). For example, some studies indicate that male students have higher levels of self-efficacy in subjects such as mathematics and science, while female students demonstrate higher self-efficacy in language and social sciences (Huang, 2013). This situation demonstrates that self-efficacy is not only individual but also a dynamic structure shaped by cultural and environmental factors. From this perspective, it can be suggested that self-efficacy is continuously shaped by individual's past experiences, environmental conditions, and the characteristics of the learning environment in which they are situated. Therefore, it may be argued that structuring instructional processes in ways that support students' self-efficacy perceptions and enhance their engagement through direct learning experiences are of great importance. Indeed, it is emphasized that one of the most influential factors in the development of students' self-efficacy perceptions is direct experiences (Sakız, 2013). It is observed that positive learning experiences acquired at an early age—particularly during primary school education—through direct experience support the development of self-efficacy beliefs and, as indicated by research findings (Aşkar & Umay, 2001; Cassidy, 2015; Ekici, 2009; Qamar & Akhter, 2020; Wulandari & Istiani, 2021), contribute to students' more active participation in educational processes. From this perspective, the primary school period is considered a critical developmental stage during which students' characteristics such as learning attitudes, collaboration skills, sense of achievement, academic self-confidence, and self-efficacy are shaped. Indeed, Erikson (1968), in his Psychosocial Development Theory, defines this period as the stage of 'industry versus inferiority.' During this period, the sense of achievement helps children develop a positive attitude toward themselves and their abilities, laying the foundation for their future academic self-confidence (Senemoğlu, 2012). Therefore, a strong sense of self-efficacy acquired during this period also facilitates students' ability to cope more effectively with academic and emotional challenges they may encounter in subsequent educational stages (Sakız, 2013). In the social studies course, which is introduced from the fourth grade of primary school, creating learning environments that support the development of students' self-efficacy is considered to contribute to the early acquisition of these positive effects emphasized in the literature. Accordingly, describing students' self-efficacy levels toward the social studies course in terms of various variables is thought to enhance the quality of instructional processes as well as provide a meaningful contribution to the literature.

One of the key concepts that positively influences student development and contributes to the learning process is engagement in the course (Furrer & Skinner, 2003). In the educational context, engagement refers to the level of attention, curiosity, interest, and motivation that students demonstrate during the learning process (URL-1, 2025). In this regard, Fredricks et al. (2004) conceptualized engagement in three main dimensions: cognitive, emotional, and behavioral, emphasizing that effective engagement requires the fulfillment of all three dimensions. Within this framework, it can be argued that one of the factors influencing students' engagement in the course is self-efficacy, which can be considered part of the emotional dimension. According to Bandura (1997), an individual's belief in their own competence determines whether they will take advantage of a learning opportunity. From this perspective, students with high self-efficacy are expected to be more willing to engage in learning opportunities and to demonstrate higher engagement in the learning process. Furthermore, Ocakcı and Samancı (2024) emphasize that, for instruction to be effective, students' levels of engagement in the course should be identified and, when necessary, enhanced through appropriate interventions. Therefore, understanding the relationship between students' self-efficacy and their levels of engagement in the course can be argued to contribute to the more effective structuring of learning environments. In this context, examining primary school students' self-efficacy toward the social studies course and their levels of engagement

in the course is of importance in both theoretical and practical terms.

A review of the literature reveals that the majority of studies on the concept of self-efficacy in social studies focus on social studies teachers (Akhan, 2015; Aydın, et al., 2022; Daş, 2021; Dönmez & Uslu, 2014; Sözcü, et al., 2016; Tatlieşme & Gürgil, 2025; Tekin, 2019; Üztemur & Metin, 2015) and social studies teacher candidates (Akkuş, 2013; Ateş, 2018; Karadeniz, 2005; Koçak, 2023; Şahin & Katılmış, 2016; Üçarkuş & Yeşilbursa, 2024; Ünlü et al., 2017). However, the number of studies that directly focus on students' self-efficacy perceptions is limited (Al Demerdash, 2020; Taş et al., 2024). Furthermore, some studies have addressed the relationship between self-efficacy perception and students' metacognitive awareness levels (Kurtuluş & Öztürk, 2017; Oğuz & Kutlu Kalender, 2018). In the field of social studies, Zimmerman et al. (1992) examined the relationship between self-efficacy and goal setting in high school students; Doğan et al. (2012) examined students' self-efficacy towards social studies; Özkal (2013) examined the relationship between attitudes and self-efficacy; Tünkler (2019) examined competence expectations; and Akcan and Çakmak (2024) examined digital security self-efficacy. It has been identified that studies focusing on engagement in the social studies field are limited in number; however, existing research has addressed issues such as the development of measurement instruments, the effects of learning environments, the role of digital methods, and the views of teachers and preservice teachers (Coşkun et al., 2022; Ocakcı & Samancı, 2021, 2024; Öğdür & Uzunöz, 2023; Sarıtepeci, 2012; Sarıtepeci & Çakır, 2015; Uygun & Günhan, 2025; Ünal, 2006). However, no study has been identified that simultaneously examines students' self-efficacy levels toward the social studies course and their levels of engagement in the course. In this context, the present study fills a unique gap in terms of both subject matter and sample level. The fact that the relationship between self-efficacy and class engagement has not been examined at primary school level, particularly in the context of social studies, increases the importance of this research. This research is expected to contribute to the field by revealing the effect of students' self-efficacy perceptions and their level of engagement in the course on the process of achieving the objectives of active citizenship, social engagement and democratic awareness, which form the basis of social studies course. The findings are expected to provide guidance to teachers, education policy developers, and researchers, contributing to the development of practices that increase student engagement and self-efficacy in social studies teaching, the evaluation of programme effectiveness, and the organisation of learning environments. In this context, this study, which examines the relationship between primary school students' self-efficacy perceptions and their levels of engagement in class, is considered an important step towards improving the quality of social studies teaching and developing active citizenship awareness at an early age.

The primary objective of this study was to determine fourth-grade primary school students' perceived self-efficacy and levels of engagement in social studies, to examine the relationship between these two variables, and to identify whether significant differences exist based on gender, parental education level, and the socioeconomic status of the school. To this end, the following research questions were addressed:

1) What are the levels of self-efficacy and engagement in social studies among 4th grade primary school students?
2) Do 4th grade primary school students' self-efficacy and engagement levels in social studies significantly vary based on different variables (gender, family education level, and school socio-economic status)?
3) Is there a significant relationship between 4th grade primary school students' self-efficacy and engagement levels in social studies?
4) Do 4th grade primary school students' self-efficacy significantly predict their engagement levels in social studies?

2. Method

The study protocol was approved by the Kırşehir Ahi Evran University Social and Human Sciences Scientific Research and Publication Ethics Committee with a decision dated 28/05/2025 and numbered 2025/10/10.

2.1. Research Design

In this study, two quantitative research designs—the descriptive survey model and the predictive correlational model—were employed together. The descriptive survey model aims to describe an existing situation as it is and seeks to reach general conclusions about the population based on data collected from the entire population or a selected sample (Karasar, 2023). Accordingly, the descriptive survey model was used to determine primary school fourth-grade students' self-efficacy perceptions toward the social studies course and their levels of engagement in the course, and to generalize these findings to the population.

In predictive correlational research, the aim is to determine the relationship between two or more variables and to predict the status of one variable based on another (Fraenkel & Wallen, 2006). In this study, this model was employed to examine the relationship between fourth-grade primary school students' self-efficacy perceptions toward the social studies course and their levels of engagement in the course, as well as to determine whether self-efficacy perceptions predict engagement in the course.

The combined use of these two models enabled both the description of the current status of the research variables and the examination of the relationships and predictive effects

among them, thereby allowing the research objectives to be addressed in a comprehensive and holistic manner.

2.2. Population and Sample

The population of this study consisted of fourth-grade primary school students enrolled in schools in Kırşehir Province during the 2024–2025 academic year. Stratified sampling was employed in order to obtain homogeneous subgroups and to ensure better representation of subgroups with different characteristics (Creswell, 2014).

Schools in Kırşehir province were classified into three strata— lower, middle, and upper —by the researchers based on their geographical location, socioeconomic characteristics, and student population, using information obtained from the Provincial Directorate of National Education and school administrations. In accordance with the stratified sampling approach, an effort was made to balance the number of students within each stratum. Accordingly, in order to ensure an equal distribution of the sample across strata, four schools from the upper stratum, four schools from the middle stratum, and five schools from the lower stratum were included in the study. However, due to reasons such as student absenteeism on the day of data collection, participation in extracurricular activities, and incomplete completion of the measurement scales by some participants, data loss occurred across all three strata, resulting in differences in the final distribution of participants among the groups.

In addition, typical case sampling, one of the purposive sampling methods, was employed in determining the classes to be included in the study. Within this framework, classes considered to be representative of the lower, middle, and upper strata were included in the research. As a result, a total of 488 fourth-grade primary school students enrolled in the schools selected through stratified and typical sampling methods constituted the sample of the study. demographic characteristics of the study sample are presented in Table 1.

Table 1. Demographic characteristics of the sample.

Variable	Group	f	%
Gender	Female	256	52.5
	Male	232	47.5
Mother's Education Level	Primary School	93	19.1
	Secondary School	79	16.2
	High School	165	33.8
	University	151	30.9
Father's Education Level	Primary School	54	11.1
	Secondary School	65	13.3
	High School	145	29.7
	University	224	45.9
Socio-Economic Status of the School	Lower	175	35.9
	Middle	122	25.0
	Upper	191	39.1
Total		**488**	**100**

2.3. Data Collection Tools

In this study, conducted to describe fourth-grade primary school students' self-efficacy perceptions toward the social studies course and their levels of engagement in the course, and to determine whether a significant relationship exists between these variables, two scales were employed.The first scale used in the study is the *Social Studies Course Self-Efficacy Scale*, developed by Doğan et al. (2012), which aims to determine students' self-efficacy perceptions toward the social studies course. This scale was preferred because the literature review revealed that there is no scale specifically designed to measure self-efficacy in social studies at the primary school level, and it is the scale most appropriate for primary school students. The scale consists of 25 items in a single dimension and is structured on a five-point Likert-type format. The reliability coefficient (Cronbach's alpha) of the scale was reported as $\alpha = .95$, indicating that the scale is valid and reliable (Doğan et al., 2012). In the present study, the Cronbach's alpha coefficient was calculated as $\alpha = .88$. .

The second dimension of the study focuses on determining students' engagement in the social studies course. For this purpose, the *Social Studies Course Engagement Scale* developed by Ocakcı (2022) was employed, as it is the only scale in the literature specifically designed for fourth-grade primary school students. The scale consists of 12 items structured on a four-point Likert-type format and comprises two factors. Although the scale was used as a whole in this study, the first factor represents individual engagement, while the second factor represents interactive engagement. The overall reliability coefficient (Cronbach's alpha) of the scale was

reported as α = .81, indicating that the scale is valid and reliable (Ocakcı, 2022). In the present study, the scale was used as a single measure, and the Cronbach's alpha coefficient was calculated as α = .77.

2.4. Data Collection Process and Analysis of Data

After obtaining parental consent forms from the 488 fourth-grade students included in the study sample, the Social Studies Self-Efficacy Scale and the Social Studies Course Engagement Scale were administered to the students. The data obtained from the research were analysed using a statistical programme. First, the data were tested for normal distribution. For this purpose, the distribution of the data for each independent variable was examined using skewness and kurtosis values, histograms, the coefficient of variation, detrended plots, and the Kolmogorov–Smirnov and Shapiro–Wilk tests. The skewness and kurtosis coefficients and the histogram graphs are presented in Table 2 and Figures 1 and 2.

Table 2. Normality analysis of the self-efficacy and course engagement scales.

Variables	N	M	SD	df	Skewness	Kurtosis
Social Studies Self-Efficacy Scale	488	3.96	.54	487	-.353	-.554
Social Studies Course Engagement Scale	488	3.01	.50	487	-.136	-.447

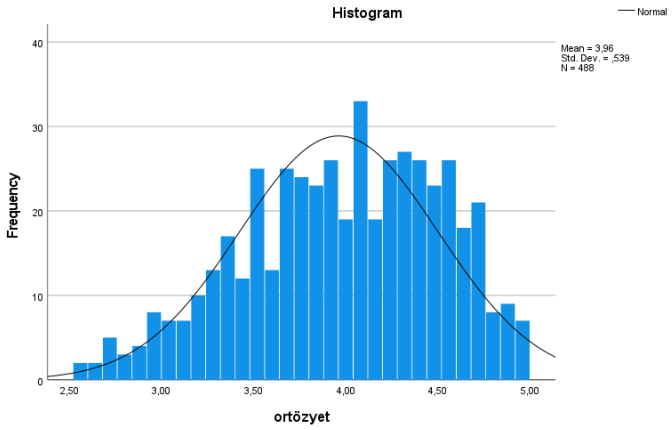

Figure 1. Histogram of the social studies course self-efficacy scale.

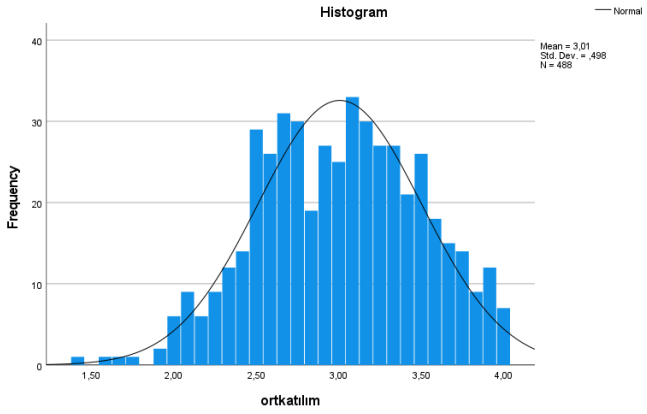

Figure 2. histogram of the social studies course engagement scale.

According to Table 2, the skewness and kurtosis values fall within the range of -1.96 to +1.96 (Can, 2021), and the distributions shown in Figures 1 and 2 indicate that the data obtained from the Social Studies Course Self-Efficacy Scale and the Social Studies Course Engagement Scale conform to a normal distribution. Additionally, the coefficient of variation, detrended plots, and the results of the Kolmogorov–Smirnov and Shapiro–Wilk tests further confirm that the data from both scales are normally distributed. Accordingly, parametric tests were employed in the analysis of the data. To determine students' self-efficacy perceptions and engagement levels in social studies course, a one-sample t-test was used, and an independent samples t-test was used to determine whether the variables showed a significant difference according to the students' gender. A one-way analysis of variance was used to test whether students' self-efficacy perceptions and levels of engagement in the course showed a significant difference in terms of parental education levels and the socio-economic region in which the school was located. Furthermore, Pearson's Correlation test was applied to determine the relationship between students' self-efficacy perceptions towards social studies and their level of engagement in the course, and Simple Linear Regression Analysis was applied to determine whether self-efficacy perception predicted the level of engagement in the course. The analysis results were presented through frequency graphs and tables.

3. Findings

3.1. Findings Related to the First Sub-Problem

3.1.1. What is the level of self-efficacy of 4th grade primary school students towards social studies course?

It was determined that the responses of the 4th grade primary school students participating in the study to the Social Studies Course Self-Efficacy Scale showed a normal distribution, and the data were subjected to the Single Sample T-test, a parametric test, to determine the students' self-efficacy levels. The relevant data are presented in Table 3.

Table 3. Self-efficacy levels of 4th grade primary school students.

	N	M	SD	Expected Average	*df*	*t*	*p*	Cohen's d
Social Studies Self-Efficacy Scale	488	3.96	.54	3	487	39.428	.000	1.785

An examination of Table 3 indicates that students' self-efficacy levels toward the social studies course are significantly high and positive ($t_{(487)} = 39.428$; $p < .05$). In addition, the effect size, as indicated by Cohen's d value of 1.785, falls within the "large effect" category (Cohen, 1988), revealing that students' self-efficacy levels toward the social studies course are remarkably strong.).

3.1.2. What is the engagement level of 4th grade primary school students in social studies course?

It was determined that the responses of the 4th grade primary school students' engagement in the study to the Social Studies Course Engagement Scale showed a normal distribution, and the data were subjected to a parametric Single Sample T-test to determine the students' level of course engagement. The relevant data are presented in Table 4.

Table 4. Engagement levels of 4th grade primary school students.

	N	M	SD	Expected Average	*df*	*t*	*p*	Cohen's d
Social Studies Course Engagement Scale	488	3.01	.50	2.5	487	22.476	.000	1.017

As shown in Table 4, fourth-grade primary school students' levels of engagement in the social studies course are statistically significantly high and positive ($t_{(487)} = 22.476$; $p < .05$). The effect size (Cohen's d = 1.017) falls within the "large effect" category, indicating that students' engagement in the social studies course is notably strong.

3.2. Findings Related to the Second Sub-Problem

3.2.1. Is there a significant difference between the gender of 4th grade primary school students and their self-efficacy towards social studies course?

An Independent Samples t-test was conducted to examine whether there was a significant difference in social studies self-efficacy levels between female and male fourth-grade primary school students. According to the results of Levene's test, one of the assumptions of the analysis, the p-value was greater than .05 ($p = .586$), indicating that the assumption of homogeneity of variances was met (Pallant, 2020). Accordingly, the results of the Independent Samples t-test are presented in Table 5.

Table 5. Independent samples t-test results of self-efficacy scores by gender.

Gender	N	M	SD	*df*	*t*	*p*	Cohen's d
Female	256	4.00	.52	486	1.672	.09	.152
Male	232	3.92	.56				

The findings revealed no statistically significant difference between female and male students' self-efficacy perceptions toward the social studies course ($t_{(486)} = 1.672$; $p > .05$). In addition, the effect size was quite small, as indicated by Cohen's d = .152.

3.2.2. Is there a significant difference between the education levels of families and the students' self-efficacy perceptions towards social studies courses?

To determine whether there is a significant difference in social studies self-efficacy levels based on the mothers' educational attainment of fourth-grade primary school students, the data were analyzed using One-Way Analysis of Variance (ANOVA). The Scheffé test was employed for post-hoc comparisons. The results are presented in Table 6.

Table 6. ANOVA Results of self-efficacy scores by mothers' educational level.

Variable								
			N		***M***		***SD***	
Mother's Education Level	**(1) Primary School**		79		3.88		.51	
	(2) Secondary School		79		3.88		.51	
	(3) High School		165		3.90		.51	
	(4) University		151		4.17		.51	
	Source of Variance	**Sum of Squares**	***sd***	**Mean Squares**	***F***	***p***	**η2**	**Significant Difference**
	Intergroup	10.149	3	3.383	12.455	.000	.072	4>1
	Within Groups	131.461	484	.272				4>2
	Total	141.610	487					4>3

According to Table 6, there is a statistically significant difference between fourth-grade primary school students' self-efficacy levels toward the social studies course and their mothers' educational levels ($F_{(3, 484)} = 12.455$, $p < .05$). The effect size of mothers' educational level is at a moderate level ($\eta^2 = .072$). The results of the Scheffé post hoc test indicating the groups between which the significant differences occurred are presented in Table 7.

Table 7. Scheffé test results according to mothers' educational levels.

(I) Mother's Educational Level	**(J) Mother's Educational Level**	**Mean Difference (I-J)**	***p***
(1) Primary School	(4) **University**	-.36907*	.000
(2) Secondary School	(4) **University**	-.29014*	.001
(3) High School	(4) **University**	-.27178*	.000

A statistically significant difference was found between students whose mothers had a primary, middle, or high school level of education and those whose mothers were university graduates. This difference was in favor of students whose mothers had completed higher education.

To determine whether there was a significant difference in fourth-grade primary school students' social studies self-efficacy levels based on their fathers' educational levels, the data were analyzed using a one-way analysis of variance (ANOVA). The Scheffé test was employed for post-hoc analyses. The results are presented in Tables 8 and 9.

Table 8. Results of the ANOVA on self-efficacy scores by fathers' educational level.

Variable								
			N		***M***		***SD***	
Father's Education Level	**(1) Primary School**		54		3.80		.54	
	(2) Secondary School		65		3.86		.51	
	(3) High School		145		3.89		.50	
	(4) University		224		4.08		.55	
	Source of Variance	**Sum of Squares**	***sd***	**Mean Squares**	***F***	***p***	**η2**	**Significant Difference**
	Intergroup	5.958	3	1.986	7.086	.000	.042	4>1
	Within Groups	13.652	484	.280				4>2
	Total	141.610	487					4>3

According to Table 8, a statistically significant difference was found between fourth-grade primary school students' self-efficacy levels in the social studies course and their fathers' educational levels ($F_{(3, 484)} = 7.086$, $p < .05$). The calculated effect size ($\eta^2 = .042$) indicates that fathers' educational level has a small effect on students' self-efficacy scores.

Table 9. Scheffé test results according to fathers' educational levels.

(I) Father's Education Level	(J) Father's Education Level	Mean Difference (I-J)	*p*
(1) Primary School	**(4) University**	-.28302*	.006
(2) Secondary School	**(4) University**	-.22196*	.032
(3) High School	**(4) University**	-18588*	.006

As presented in Table 9, a significant difference was found between the self-efficacy levels of students whose fathers had primary, secondary, or high school education and those whose fathers were university graduates. This finding indicates that the difference is in favor of students whose fathers have a university-level education.

3.2.3. Is there a significant difference between the self-efficacy perceptions of 4th grade primary school students towards social studies course according to the socio-economic region variable where the schools are located?

To determine whether there is a significant difference between the socioeconomic status of the schools attended by the participating students and their self-efficacy levels toward the social studies course, the data were analyzed using One-Way Analysis of Variance (ANOVA). The results are presented in Table 10.

Table 10. ANOVA Results of self-efficacy scores by socioeconomic status.

Variable				*N*		*M*	*SD*	
Socio-Economic Status of the School	**(1) Lower**			175		3.79	.51	
	(2) Middle			122		4.00	.52	
	(3) Upper			191		4.09	.54	
	Source of Variance	**Sum of Squares**	***sd***	**Mean Squares**	***F***	***p***	**η2**	**Significant Difference**
	Intergroup	8.349	2	4.175	15.193	.000	.058	3>1 2>1
	Within Groups	133.261	485	.275				
	Total	141.610	487					

A statistically significant difference was found between the socioeconomic status of the schools attended by fourth-grade primary school students and their self-efficacy levels toward the social studies course ($F_{(2, 485)} = 15.193$, $p < .05$). The calculated effect size ($\eta^2 = .058$) indicates that the socioeconomic status of the schools has a moderate effect on students' self-efficacy scores. To identify the source of this difference, post-hoc analyses were conducted using the Scheffé test, and the results are presented in Table 11.

Table 11. Scheffé test results according to school socioeconomic status.

(I) School Socioeconomic Status	(J) School Socioeconomic Status	Mean Difference (I-J)	*p*
(1) Lower	**(2) Middle**	-,20725*	,004
	(3) Upper	-,29788*	,000

This difference is in favor of students attending schools in middle socioeconomic regions compared to those in lower socioeconomic regions. Likewise, a significant difference was found between students attending schools in upper socioeconomic regions and those in lower socioeconomic regions, favoring students in upper socioeconomic regions.

3.2.4. Is there a significant difference between the gender of 4th grade primary school students and their engagement in social studies course?

Levene's test indicated that the assumption of homogeneity of variances was met for the scores obtained from the Social Studies Engagement Scale by fourth-grade female and male students, as the p value was greater than .05 (p = .096) (Pallant, 2020). Accordingly, the results of the Independent Samples t-test are presented in Table 12.

Table 12. Independent samples t-test results of engagement scores by gender.

Gender	N	M	SD	*df*	*t*	*p*	Cohen's d
Female	256	3.08	.47	486	3.381	.000	.306
Male	232	2.93	.52				

Accordingly, it was found that there was a significant difference between the engagement of female and male students in social studies course ($t_{(486)}$=3.381; p<.05). It was understood that the engagement level of female students (M= 3.08) was higher than that of male students (M=2.93). The calculated Cohen's d value of .306 indicates that the effect of gender on students' engagement in the course is small.

3.2.5. Is there a relationship between families' level of education and students' engagement in social studies course?

The Social Studies Engagement Scale and the demographic information form were used to determine the educational levels of students' mothers and fathers. The collected data were analyzed using One-Way Analysis of Variance (ANOVA). The relationships between students' engagement in the social studies course and their parents' educational levels are presented in Tables 13 and 15.

Table 13. Independent samples t-test results of engagement scores by gender.

Variable			*N*	*M*	*SD*			
Mother's Education Level	**(1)**	**Primary School**	93	2.83	.46			
	(2)	**Secondary School**	79	2.99	.42			
	(3)	**High School**	165	3.00	.55			
	(4)	**Primary School**	151	3.13	.47			
	Source of Variance	**Sum of Squares**	***sd***	**Mean Squares**	***F***	***p***	**η2**	**Significant Difference**
	Intergroup	5.298	3	1.766	7.403	.000	.044	
	Within Groups	115.465	484	.239				4>1
	Total	120.763	487					

The results presented in Table 13 indicate a statistically significant difference between students' engagement in the social studies course and their mothers' education levels ($F_{(3, 484)}$ = 7.403, p < .05). The calculated effect size (η^2 = .044) suggests that mothers' education level has a small effect on students' engagement scores. To identify the source of this significant difference, post hoc analyses were conducted using the Scheffé test, and the results are presented in Table 14.

Table 14. Scheffé test results according to mothers' educational levels.

(I) Mother's Educational Level	(J) Mother's Educational Level	Mean Difference (I-J)	*p*
(1) Primary School	**(4) University**	-,30229*	.000

A statistically significant difference was found between the engagement levels of students whose mothers had a university degree and those whose mothers had a primary school education. This difference was in favor of students whose mothers were university graduates.

Table 15. ANOVA Results of students' engagement scores by father education level.

Variable			*N*	*M*	*SD*			
Father's Education Level	(1)	**Primary School**	54	2.86	.48			
	(2)	**Secondary School**	65	2.96	.45			
	(3)	**High School**	145	2.97	.51			
	(4)	**University**	224	3.08	.50			
	Source of Variance	**Sum of Squares**	***sd***	**Mean Squares**	***F***	***p***	**η2**	**Significant Difference**
	Intergroup	2.716	3	.905	3.712	.012	.022	
	Within Groups	118.047	484	.244				4>1
	Total	120.763	487					

The results presented in Table 15 indicate a statistically significant difference between students' engagement in the social studies course and their fathers' education levels ($F_{(3, 484)} = 3.712$, $p < .05$). The calculated effect size ($\eta^2 = .022$) suggests that fathers' education level has a small effect on students' engagement scores. To determine the source of this significant difference, post hoc analyses were conducted using the Scheffé test, and the results are presented in Table 16.

Table 16. Scheffé test results according to fathers' educational levels.

(I) Father's Education Level	(J) Father's Education Level	Mean Difference (I-J)	*p*
(1) **Primary School**	(4) **University**	-.22042*	.035

A significant difference was found in the engagement levels of students whose fathers are university graduates compared to those whose fathers are primary school graduates. This difference favors students whose fathers have a university education.

3.2.6. Is there a significant difference in the level of engagement in social studies course among fourth-grade primary school students based on the socio-economic status of the area where the schools are located?

Students' engagement levels in the social studies course were examined according to the socioeconomic status of the schools they attended. A one-way analysis of variance (ANOVA) was conducted to determine the relationship between the socioeconomic status of schools, categorized as low, medium, and high, and students' engagement levels. Scheffe post-hoc tests were used to identify the source of any significant differences. The results are presented in Tables 17 and 18.

Table 17. ANOVA Results of students' engagement scores by socioeconomic status.

Variable			*N*	*M*	*SD*			
Socio-Economic Status of the School	**(1)**	**Lower**	175	2.93	.43			
	(2)	**Middle**	122	3.04	.55			
	(3)	**Upper**	191	3.06	.52			
	Source of Variance	**Sum of Squares**	***sd***	**Mean Squares**	***F***	***p***	**η2**	**Significant Difference**
	Intergroup	1.799	2	.900	3.667	.026	.015	
	Within Groups	118.964	485	.245				3>1
	Total	120.763	487					

As shown in Table 17, the findings indicate a statistically significant difference between students' engagement levels in the social studies course and the socioeconomic status of their schools ($F_{(2,485)} = 3.667$; $p < .05$). The calculated effect size ($\eta^2 = .015$) suggests that the socioeconomic status of schools has a small effect on students' engagement levels.

Table 18. Scheffe test results by school socioeconomic status.

(I) School Socioeconomic Status	(J) School Socioeconomic Status	Mean Difference (I-J)	*p*
(1) Lower	(3) Upper	-.13358*	.037

This difference favors students attending schools in the high socioeconomic status group compared to those in the low socioeconomic status group.

3.3. Findings Related to the Third Sub-Problem

3.3.1. Is there a relationship between fourth-grade primary school students' self-efficacy perceptions regarding social studies lessons and their level of engagement in the lesson?

Using data obtained from the social studies self-efficacy scale and the social studies course engagement scale, a Pearson correlation test was conducted to determine the relationship between fourth-grade primary school students' perceptions of self-efficacy and their levels of course engagement.

Table 19. The relationship between self-efficacy and engagement in the social studies course.

		Course Engagement
Self-efficacy	Pearson Correlation	.701
	p	.000
	N	488

According to Table 19, there is a high level of positive and significant correlation between fourth-grade primary school students' self-efficacy perceptions regarding social studies course and their engagement in the course (r=.701; p<.01). Accordingly, it can be said that as fourth-grade primary school students' self-efficacy perceptions increase, their level of engagement in the course also increases. In other words, it can be said that students who feel competent participate more actively in the course.

3.4. Findings Related to the Fourth Sub-Problem

3.4.1. Do fourth-grade primary school students' perceptions of self-efficacy in social studies course significantly predict their level of engagement in the course?

A simple linear regression model was established to determine whether 4th grade primary school students' self-efficacy in the social studies course is a significant predictor of their engagement levels in the course. The model is presented in Figure 3.

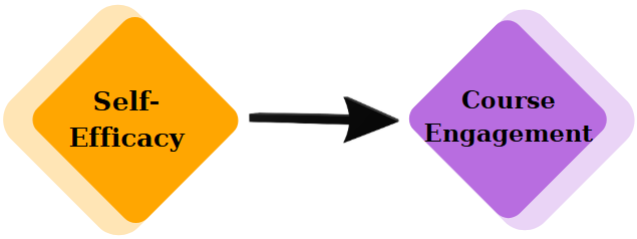

Figure 3: Simple linear regression model.

In the model established based on the hypothesis that self-efficacy significantly predicts course engagement, it was examined whether a linear relationship exists between the variables and whether the assumptions required for regression analysis are met. First, it was confirmed that both variables are continuous, interval-scaled, and normally distributed. The linear relationship between the variables is illustrated in Figure 4.

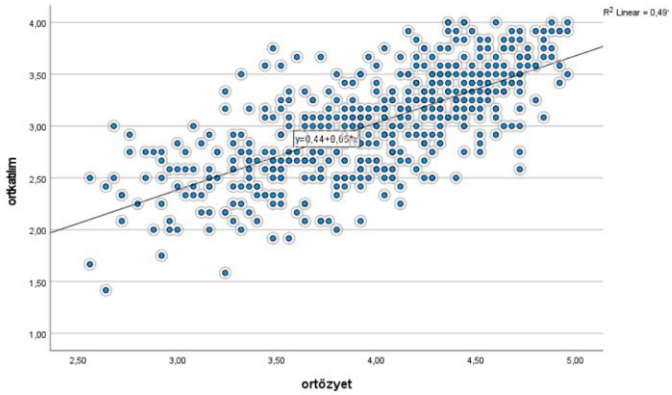

Figure 4. Linear relationship between the variables.

An examination of the presence of outliers indicated that the standardized residuals ranged from -2.696 to 2.975, and the Cook's Distance value was .038. These findings suggest that there are no outliers in the dataset that could adversely affect the regression analysis (George & Mallery, 2010). The normality of the errors was assessed, showing that the histogram exhibited a bell-shaped distribution, and the points in the Normal P-P Plot were aligned along the diagonal line. This indicates that the assumption of normally distributed errors was satisfied. The homoscedasticity assumption was evaluated by examining the scatterplot, and the residuals were observed to be spread in a rectangular pattern, confirming that this assumption was also met. Finally, the independence of errors was assessed, with a Durbin-Watson statistic of 1.30. According to George and Mallery (2010), this value indicates an acceptable level of independence among errors. Once these assumptions were confirmed, a simple linear regression

analysis was conducted. The results of the analysis are presented in Table 20.

Table 20. Regression analysis results for the effect of self-efficacy on course engagement .

Independent Variable	Dependent Variable	B	β	sh	*t*	R	R^2	F	*p*
Self-efficacy	**Course Engagement**	.647	.701	.030	21.667	.701	.491	469.453	000

The table shows that primary school students' self-efficacy perceptions regarding social studies courses positively and significantly predict their level of engagement in the lesson (β=.701; R2 =.491; $F_{(1-486)}$==469.453; t=21.667; p< .01). This indicates that 49.1% of the variation in the course engagement variable in the model is explained by the self-efficacy variable. This result shows that primary school students' perceptions of self-efficacy in social studies influence their engagement in the course.

4. Discussion and Conclusion

It was determined that the self-efficacy levels of 4th grade primary school students toward the social studies course were significantly high and positive. A review of the literature indicates that no study has directly examined the self-efficacy levels of primary school students specifically for the social studies course. However, Uçak and Bağ (2012) found that primary school students exhibited high levels of self-efficacy in the science and technology course. Although the subjects of the courses differ, it can be argued that primary school students generally demonstrate high self-efficacy in their respective subjects. On the other hand, it has been reported that while middle school students show high self-efficacy in social studies, their self-efficacy levels tend to decrease as grade level increases (Doğan et al., 2012; Koç & Arslan, 2017; Özkal, 2013). The findings of the present study support the notion that 4th grade primary school students possess high levels of self-efficacy.

The self-efficacy levels of 4th grade primary school students toward the social studies course do not differ based on gender. Studies in the literature indicate that gender is not a determining factor for students' self-efficacy perceptions (Doğan et al., 2012; Er & Hayran, 2021; Kurbanoğlu & Takunyacı, 2012; Kurtuluş & Öztürk, 2017; Özkal, 2013; Pajares & Graham, 1999; Uçak & Bağ, 2012). For instance, Vardarlı (2005) found that general self-efficacy levels of middle school students were not predicted by gender. Similarly, research conducted in Spain on the relationships among emotional intelligence, social skills, and self-efficacy among secondary school students revealed no significant effect of gender on these variables (Salavera et al., 2017). These findings indicate that self-efficacy perceptions do not vary according to gender across different subject areas and educational levels. This observation is consistent with the results of the present study.

The educational level of parents influences the self-efficacy levels of 4th grade primary school students toward the social studies course. Students whose parents have higher educational attainment exhibit higher self-efficacy levels compared to their peers. Families with higher educational levels tend to participate more actively and consciously in their children's education, including monitoring and guiding academic performance, providing academic support, understanding and addressing learning needs, and communicating with teachers (Baker & Stevenson, 1986; Crosnoe, 2010; Guryan et al., 2008; Kotaman, 2008; Moreno & Lopez, 1999; Taşer & Demirkasımoğlu, 2021). These practices are likely to positively influence students' educational experiences and, consequently, their self-efficacy. Based on these findings, it can be inferred that as the educational level of parents increases, students' self-efficacy levels also rise. Studies conducted in various subjects and educational levels support this conclusion, showing that students with highly educated parents tend to have higher self-efficacy (Aktürk & Aylaz, 2013; Koç & Arslan, 2017; Mayer & Kim, 2000; Uçak & Bağ, 2012; Vardarlı, 2005; Yürüdür, 2014). These findings indicate that parental education is a determining factor in students' self-efficacy toward the social studies course. Overall, it can be concluded that as parental educational levels increase, parents place greater emphasis on their children's education, which in turn can foster enriched learning environments that support students' self-efficacy and learning processes.

When maternal and paternal education levels are considered separately, maternal education level has a moderate effect on students' self-efficacy, whereas paternal education level has a low-level effect. Depending on parents' gender roles and the meanings attributed to these roles, their effects on children's lives may differ (Gökler & Atamtürk, 2021). According to Kuzucu (2011), in traditional social structures, it is commonly observed that fathers primarily assume the role of meeting the family's economic needs and therefore spend a limited amount of time with their children. However, various factors such as the child's age, the family's socioeconomic status, the occupations of the mother and father, the family structures in which parents were raised, and the traditional values they adopt determine the level of fathers' participation in childcare. Within this framework, the fact that responsibility for childcare is largely concentrated on mothers in traditional societies can be considered one of the main reasons why maternal education level has a more pronounced effect on children's self-efficacy

perceptions. In contrast, Şerifoğlu (2019) argues that there is no significant difference between students' self-efficacy and parental education status. This situation is thought to stem from differences in the socioeconomic and demographic characteristics of the participant groups. Indeed, the factors that determine parents' level of participation in childcare—such as family structure, parents' occupational status, and cultural values (Kuzucu, 2011) —may differentiate the effects of maternal and paternal education levels, and consequently, their effects on students' self-efficacy. In addition, families' socioeconomic positions, determined by indicators such as economic income, education level, health, and occupational status (Myer et al., 2008), also shape the socioeconomic characteristics of the schools that students attend. From this perspective, similar results are also observed between schools' socioeconomic positions and students' self-efficacy perceptions.

There is a significant difference between the socioeconomic status of the schools attended by 4th grade primary school students and both their self-efficacy toward the social studies course and their engagement levels in the course. Students attending schools in socioeconomically upper regions were found to have higher self-efficacy and engagement in the social studies course. This finding indicates that the socioeconomic environment in which students are situated influences their perceived self-efficacy in learning processes. However, while socioeconomic status has a moderate effect on students' self-efficacy, its impact on their engagement levels is relatively low. Individuals living in regions with higher welfare and educational levels tend to have higher perceptions of their own competence (Gür & Kurt, 2011). Qamar and Akhter (2020) reported that students living in urban areas (which can be considered as upper-level regions) have higher mean self-efficacy scores compared to students residing in rural areas (lower-level regions). Sezer et al. (2006) found that high school students living in apartment buildings have higher self-efficacy levels than those living in detached houses; similarly, youths raised in cities exhibited higher self-efficacy perceptions compared to those raised in districts and villages, while students from districts had higher levels than those from villages. Parents' socioeconomic status influences children's perceived family efficacy and academic self-efficacy, and these variables are significantly associated with children's own self-efficacy perceptions (Bandura et al., 2001). Vardarlı (2005) indicated that perceived high income is a predictor of middle school students' self-efficacy, and there is a positive significant relationship between overall self-efficacy levels and perceived high income. As family income increases, students' self-efficacy levels also increase (Aktürk & Aylaz, 2013). In classrooms where the majority of students come from families belonging to different socioeconomic levels, it is observed that as socioeconomic status improves, parents show greater involvement with their children (Vural, 2007). Taken together, these findings suggest that the socioeconomic environment in which students are situated affects their beliefs about the learning process, and consequently, their self-efficacy toward the social studies course and their engagement in the course. The obtained results are also consistent with Bandura (1986)'s principle of reciprocal determinism, which posits that an individual's environment and behaviors mutually influence each other, shaping subsequent actions. In this context, students studying in environments with higher socioeconomic status are likely to have advantages in terms of access to educational resources, family support, and learning opportunities. These advantages can be argued to contribute to the strengthening of their self-efficacy perceptions and to their more active engagement in the learning process.

The fourth-grade primary school students' engagement levels in the social studies course were found to be significantly high and positive. This result indicates that students actively participate in class and that their engagement in the social studies course is notably strong. Although no study has directly examined primary school students' engagement in social studies, research on middle school students has shown that their engagement across all dimensions—cognitive, affective, behavioral, and social—in science and mathematics courses is high, reflecting multidimensional participation (Fırat & Açıkgül Fırat, 2021). Similar findings in other subject areas indirectly support this study and suggest that students generally exhibit an active participation tendency in their courses.

When gender was considered in the study, a significant difference was observed between male and female students' engagement levels in the social studies course. Although the effect size of gender on engagement was low, female students demonstrated higher engagement levels compared to their male peers. While no significant difference was detected in self-efficacy levels according to gender, the higher engagement levels of female students remain noteworthy. This finding suggests that gender-based differences may emerge in students' affective and social participation in class. Supporting evidence exists in the literature. Kayabaşı et al. (2019) reported a significant gender difference favoring female students in 8th-grade middle school students' engagement in science and technology courses, indicating that girls participated at higher levels than boys. Similarly, Fırat and Açıkgül Fırat (2021) found significant differences favoring female students across cognitive, affective, behavioral, and social dimensions of engagement in science and mathematics courses. Other studies also support these findings (Güvenç & Koç, 2016; Kindermann, 2007; Rimm-Kaufman et al., 2015; Wang et al., 2011). Accordingly, it can be inferred that female students tend to participate more actively in learning processes, whereas male students exhibit lower engagement. Overall, the results of this study indicate that students' engagement in the social studies course is high and that gender has a significant but low-level effect on engagement.

The results of the study indicate that there is a significant difference between students' engagement levels in the social studies course and their parents' educational levels. Students whose parents hold a university degree demonstrated significantly higher engagement compared to those whose parents have only completed primary education. These findings suggest that as parental education levels increase, students' engagement in social studies is positively affected. In contrast, Kayabaşı et al. (2019) found that, among 8th-grade middle school students, maternal education did not significantly affect engagement in science and technology courses, while paternal education had a strong effect on students' engagement. This discrepancy may be attributed to the modernization of societal life, which has led to relatively increased paternal involvement in childcare (McHale & Huston, 1984), differences in the courses examined, and variations in the demographic characteristics of the samples studied.

There is a strong, positive, and significant relationship between 4th grade primary school students' self-efficacy perceptions toward the social studies course and their engagement in the course. Accordingly, it can be stated that as students' self-efficacy perceptions increase, their engagement levels in the course also increase. In other words, students who perceive themselves as competent in social studies are more likely to participate actively and become more involved in the learning process. Moreover, it was found that 4th grade students' self-efficacy perceptions significantly and positively predict their engagement in the social studies course. The results indicate that 49.1% of the variance in course engagement is explained by self-efficacy. This finding demonstrates that students' self-efficacy perceptions have a considerable impact on their engagement in social studies. Bandura (1986) defines self-efficacy as an individual's belief in their capacity to successfully perform a specific task. A high level of self-efficacy in performing a particular activity leads individuals to engage more actively in that activity and to develop more positive attitudes toward it. Conversely, individuals with low self-efficacy are less likely to undertake specific tasks, which may contribute to the development of negative attitudes (Bandura et al., 1977). Accordingly, students with low self-efficacy in social studies may exhibit hesitation or reluctance toward engaging in the course. This finding aligns with previous research. Özkal (2013) reported that students' self-efficacy in social studies strongly predicted their positive attitudes toward the course. This suggests that self-efficacy influences not only cognitive performance but also students' affective approaches to the course. Moreover, the significant relationship between positive attitudes toward the course and course engagement (Vural, 2019) further supports the link between self-efficacy and engagement in social studies. Thus, it can be suggested that students with high self-efficacy in social studies are more likely to show greater interest in the course, demonstrate higher levels of engagement, and develop positive attitudes toward learning. Conversely, when students' engagement levels are low, the course may be perceived as insufficiently engaging, which can negatively affect classroom management and discipline (Gülüm & Ulusoy, 2008). Fırat and Açıkgül Fırat (2021) reported that in science courses, students who perceived themselves as competent in designing projects exhibited significantly higher overall engagement, as well as greater cognitive, affective, and behavioral engagement. Compared to these findings, the results of the present study suggest that self-efficacy significantly predicts engagement; students with higher self-efficacy tend to engage more actively in the course, which in turn makes the course more appealing, fosters positive attitudes toward learning, and contributes to more effective classroom management.

The findings of the study indicate that primary school students' self-efficacy perceptions toward the social studies course have a decisive effect on their level of engagement in the course. This study fills a significant gap in the literature, as it is the first to examine the relationship between self-efficacy and course engagement in social studies at the primary school level. Furthermore, the results suggest that fostering students' self-efficacy in primary social studies education plays a crucial role in enhancing their engagement in the course, providing valuable guidance for both practitioners and researchers.

5. Recommendations

In line with the findings obtained from the research, recommendations were presented to teachers, education policy makers and researchers to increase students' self-efficacy perceptions and engagement levels in the social studies course:

According to the findings of the study, students' self-efficacy perceptions and engagement levels in the social studies course are significantly high. Considering the strong and positive relationship between self-efficacy and engagement, it is recommended that teachers plan their instruction in ways that positively support students' self-efficacy perceptions and, consequently, their engagement in the course.

Although no significant difference was found in self-efficacy perceptions based on gender, the higher engagement levels of female students suggest that teachers should develop strategies to increase male students' active participation and plan their instruction accordingly. Incorporating activities, materials, and examples that appeal to male students into the course content is recommended.

Differences in self-efficacy and engagement levels were observed based on students' socioeconomic status. Therefore, it is suggested that teachers create supportive learning environments tailored to students from different socioeconomic backgrounds.

The findings indicate that parental education level and the school's socioeconomic status influence students' self-efficacy

and engagement levels. Accordingly, it is recommended that education policymakers increase resources, materials, and guidance support for schools in disadvantaged areas and expand parent education programs, enriching their content in this regard.

This study explains the relationship between students' self-efficacy perceptions and engagement levels. Future research could incorporate additional variables such as learning motivation, academic achievement, or teacher attitudes to conduct more comprehensive analyses.

The sample of this study is limited to the primary school level. Similar studies conducted in different educational levels could reveal how the relationship between self-efficacy and engagement varies according to age and developmental stage.

This study employed a quantitative research design. In future research, qualitative studies could be conducted to provide a more detailed understanding of the factors affecting students' self-efficacy perceptions and engagement levels.

Compliance with Ethical Standards

The study protocol was approved by the Kırşehir Ahi Evran University Social and Human Sciences Scientific Research and Publication Ethics Committee with a decision dated 28/05/2025 and numbered 2025/10/10.

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Conflict of Interest

The authors have no conflict of interest to declare.

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Preparation of Manuscripts

Papers must be written in English. Prepare your text using a word-processing software and save in ".doc" or ".docx" formats. Manuscripts must be structured in the following order:

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  - Acknowledgements (if applicable. Keep these to the absolute minimum)
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    - ❖ Conflict of Interest Statement
    - ❖ Statement on the Welfare of Animals (if applicable)
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• ***Main File***
  - Title
  - Abstract (Should be between 100 and 350 words. References and abbreviations should be avoided)
  - Keywords (Minimum 3, Maximum 6 keywords)
  - Introduction
  - Materials and Methods/Methods
  - Results/Findings
  - Discussion (Can be combined with Results section if appropriate)
  - Conclusion (Can be combined with Discussion section if appropriate)
  - References
  - Table(s) with caption(s) (on appropriate location in the text)
  - Figure(s) with caption(s) (on appropriate location in the text)
  - and appendices (if any)

Manuscript Formatting

Use a 12-point Times New Roman font, including the references, table headings and figure captions, double-spaced and with 25 mm margins on all sides of A4 size paper throughout the manuscript. The text should be in single-column format.

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• Use only SI (international system) units.

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• Use italics for species name.

References

Bulletin of Educational Studies uses APA style (7th edition). Accordingly, authors must format their references as per the guidelines below. Please ensure that each reference cited in the text is also presented in the reference list. Authors should always supply DOI or URL of the work cited if available.

In-text citation (Narrative):

…The results of Bliss (2022) support…
…Sönmez and Taştan (2020) indicated that…
…According to the method of Öztürk et al. (2021)…

In-text citation (In parenthesis):

…It was found to be isometric (Öztürk, 2018)…
…is highly susceptible to diseases (Doma & Craig, 2019)…
…have been studied (Kale et al., 2020)…

Two or more works in the same parenthesis:

…extremely toxic for the environment (Sönmez, 2018, 2019; Öztürk et al., 2020a; Kadak & Taştan, 2021)…

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Article:

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Tort, S. (1998). Stress and immune modulation in fish. *Developmental & Comparative Immunology*, *35*(12), 1366-1375. https://doi.org/10.1016/j.dci.2011.07.002

Kasumyan, A. O., & Døving, K. B. (2003). Taste preferences in fishes. *Fish and Fisheries*, *4*(4), 289-347. https://doi.org/10.1046/j.1467-2979.2003.00121.x

Özçelik, H., Taştan, Y., Terzi, E., & Sönmez, A. Y. (2020). Use of onion (*Allium cepa*) and garlic (*Allium sativum*) wastes for the prevention of fungal disease (*Saprolegnia parasitica*) on eggs of rainbow trout (*Oncorhynchus mykiss*). *Journal of Fish Diseases*, *43*(10), 1325-1330. https://doi.org/10.1111/jfd.13229

Article by DOI (early access):

Salem, M. O. A., Salem, T. A., Yürüten Özdemir, K., Sönmez, A. Y., Bilen, S., & Güney, K. (2021). Antioxidant enzyme activities and immune responses in rainbow trout (*Onchorhynchus mykiss*) juveniles fed diets supplemented with dandelion (*Taraxacum officinalis*) and lichen (*Usnea barbata*) extracts. *Fish Physiology and Biochemistry*. https://doi.org/10.1007/s10695-021-00962-5

Book:

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Oidtmann, K., Xao, Q., & Lloyd, A. S. (2018). *The food need by the year 2050*. Elsevier.

Book Chapter:

Lastname, N., Lastname, M., & Lastname, O. (Year). Title of the chapter. In N. N. Lastname, A. Lastname & B. Lastname (Eds.), *Title of the book* (pp. Page numbers). Publisher.

Pickering, A. D. (1993). Growth and stress in fish production. In G. A. E. Gall & H. Chen (Eds.), *Genetics in Aquaculture* (pp. 51-63). Elsevier. https://doi.org/10.1016/b978-0-444-81527-9.50010-5

Dissertation or Thesis:

Lastname, N. (Year). *Title of dissertation/thesis* (Doctoral dissertation/Master's thesis, Name of Institution).

Sönmez, A. Y. (2011). *Karasu ırmağında ağır metal kirliliğinin belirlenmesi ve bulanık mantıkla değerlendirilmesi* (Doctoral dissertation, Atatürk University).

Taştan, Y. (2018). *Tatlısu kerevitindeki (Astacus leptodactylus) siyah solungaç hastalığı etkeni mantar Fusarium oxysporum'un PCR yöntemi ile teşhisi* (Master's thesis, Akdeniz University).

Conference Proceedings:

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Ken, A., & Kumar, S. (2020). *A new statistical model for fuzzy logic evaluation*. 3rd International Congress on Statistics. İstanbul.

Institution Publication:

Institution name. (Year). *Title of the work*. URL

FAO. (2020). *Fishery and aquaculture statistics 2018*. http://www.fao.org/3/cb1213t/CB1213T.pdf

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Lastname, N. (Year). *Title of the work*. Retrieved May 15, 2020, from URL

Perreault, L. (2019). *The future of agriculture: Polyculture*. Retrieved January 12, 2020, from https://www.agriculture.com

Table(s)

Tables, numbered in Arabic, should be in separate pages with a short descriptive title at the top. Place footnotes to tables below the table body and indicate them with superscript lowercase letters (or asterisks for significance values and other statistical data).

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All illustrations should be labelled as 'Figure' and numbered in consecutive Arabic numbers, Figure 1, Figure 2 etc. in the text. If panels of a figure are labelled (a, b, etc.) use the same case when referring to these panels in the text. Figures are recommended to be in electronic formats such as PNG, JPEG, TIFF (min. 300 dpi). All figures or tables should be presented in the body of the text.

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