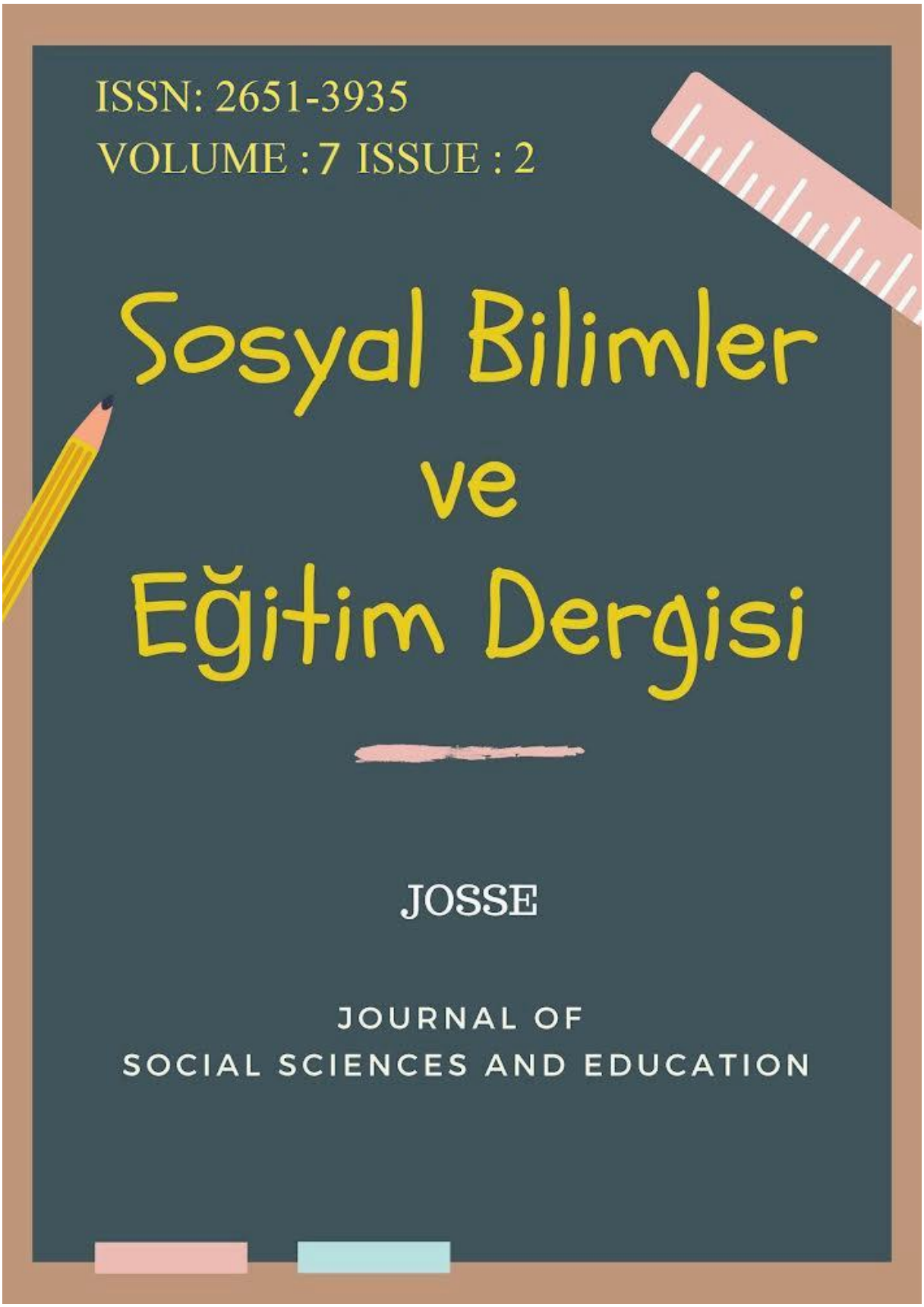
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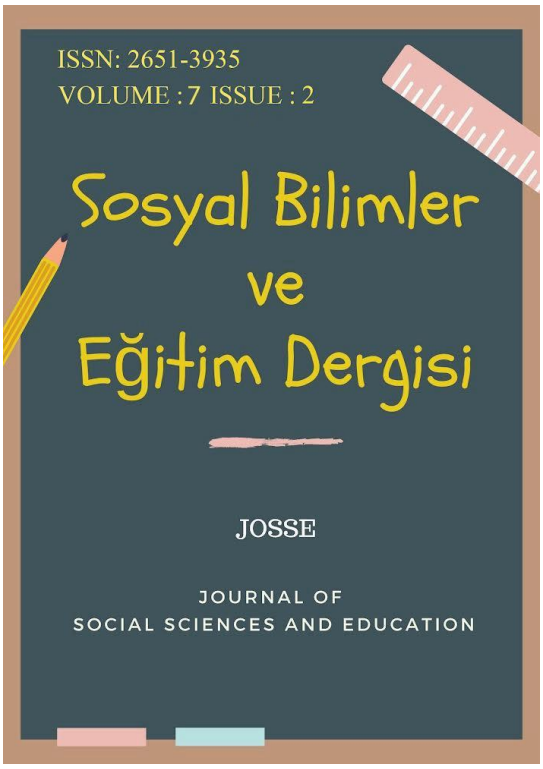

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Investigation of Higher Education Students' Computational Thinking Skill Levels

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Investigation of Higher Education Students' Computational Thinking Skill Levels

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Abstract

Computational thinking skill is a skill that has its origins in ancient times but has gained importance today. The competences provided to individuals by computational thinking skills are also of great importance for the education system. Therefore, it is important for students to acquire and develop these skills in order to adapt to the requirements of the modern world. Based on this, in this study, the level of information processing thinking skills of higher education students was examined and the level of this skill was investigated in line with different variables. 'Computational Thinking' scale was used as a data collection tool in the study. Cronbach Alpha internal consistency coefficient of the scale. 96 was calculated as. Demographic characteristics such as gender, department, class and education level were taken into consideration. Quantitative research method was used in the study. The research was conducted with 298 participants studying in higher education. In the analysis of the data, independent t-test and ANOVA analyses were applied to determine the score differences between the groups. As a result of the study, higher education students were found to have high levels of computational thinking skills. Gender was found to be effective on computational thinking skills. As the level of education increased, it was determined that computational thinking skills increased. It was seen that the education given in different departments had an effect on computational thinking skills. Finally, it was found that there were significant changes in students' computational thinking skills as their grade level increased.

Keywords: Computational thinking skills, computerised thinking, higher education students.

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Introduction

Along with the effects of technology, there have been significant changes in the knowledge and skills that people should possess. In the so-called information age, technological literacy has become increasingly important. In this period, competencies such as the ability to solve problems with computers and the ability to use computers effectively are expected from learners. Using computational thinking skills by adopting a systematic and planned approach to generate solutions to problems helps us to benefit more from technological tools and processes. In this context, it is extremely important for individuals who grow up with technology from a young age to develop computational thinking skills (Bocconi, 2016).

Computational thinking is one of the abilities that has its origins in ancient times but is nowadays recognized as a new learning skill. This skill has gained importance in line with the requirements of the 21st century and is frequently emphasized in international standards, curricula, research and projects (Voogt et al., 2015). Computational thinking skill involves the integration of cognitive processes and information technologies. This ability includes the capacity to organize complex information, establish relationships between data, and evaluate information from various perspectives. In addition, this skill develops algorithmic thinking and logical reasoning skills in the problem solving process. In this way, the individual gains the ability to solve complex problems by dividing them into parts. In addition, they have the ability to apply the acquired skill in real life situations (Einhorn, 2012).

In this context, it is critical for students to acquire and develop computational thinking skills in order to gain the ability to solve complex problems that individuals face in today's world more effectively. In a world where digitalisation is accelerating and artificial intelligence and automation are increasingly used in the workplace, these skills not only teach students how to use technology, but also provide them with the basic skills of the 21st century such as critical thinking, creative problem solving, algorithmic thinking and data-driven decision making (Wing, 2006; Yadav, Hong, & Stephenson, 2016). It is predicted that individuals with these skills will be more successful not only in the fields of informatics but also in a wide range of fields from medicine to engineering, from social sciences to arts (Grover & Pea, 2013; Brennan & Resnick, 2012). However, the literature review (Çetin & Toluk Uçar, 2017; Çınar & Tüzün, 2017; Demir & Seferoğlu, 2017) shows that there is a limited number of studies on the level of computational thinking skills of university-level students (Özden, 2015; Maden, Önal, & Maden, 2022; Akın & Yıldız, 2021; Yılmaz & Güven, 2023). This situation does not provide sufficient data on which strategies are more effective to improve the computational thinking

skills of individuals at higher education level. Understanding to what extent computational thinking skills are acquired in higher education and how these skills contribute to individuals' professional lives is important for both developing educational policies and making improvements in curriculum designs.

Computational Thinking Skills

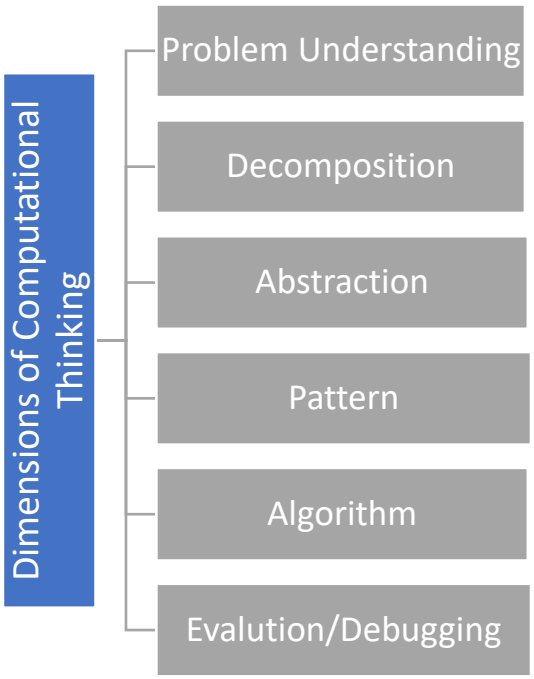
In today's digital age, critical and strategic thinking skills are more important than ever in accessing information technologies, analyzing data and making decisions. In a world dominated by data abundance and complex problems, computational thinking skills have become an indispensable tool for individuals and organizations. Therefore, computational thinking plays a critical role in solving modern problems and developing innovative systems.

A review of the international literature reveals that the concept of computational thinking was first used by Papert in 1996 (Wing, 2006). Wing (2008) refers to the ability of computational thinking as "computational thinking". In studies conducted in Turkey, this skill has been referred to with different terms. For example, computational thinking (Yecan et al., 2017), computer-based thinking (Oluk & Korkmaz, 2016; Korkmaz et al., 2017), computational thinking (İlic et al., 2016; Demir & Seferoğlu, 2017; Demir et al., 2016; Barut et al., 2016), computational thinking (Şahiner & Kert, 2016) and computer thinking (Çınar & Tüzün, 2017).

Wing (2006) defines computational thinking skill as problem solving, system design and understanding human behavior by using the concepts of computer science. In other words, computational thinking skill is the ability of people to access, analyze, process and internalize information using information technologies (Türk & Bilge, 2018; Akkoyun, 2021). Hidayat et al. (2020) define computational thinking skill as the ability to think logically and systematically to access information, analyze information, solve problems and make decisions using information technologies. It also emphasizes that this skill is developed by understanding and applying methods used in computing, data analysis, algorithms and problem solving. Because computational thinking skill includes the ability to think intelligently, communicate effectively, analyze data and make decisions in situations where information technologies are used (Yücel, 2017; Wing, 2006).

ISTE (International Society for Technology in Education) and CSTA (Computer Science Teachers Association) state that computational thinking includes some characteristics. Computational thinking includes several characteristics and skills. First, it is necessary to formulate problems in order to solve them with the help of computers or other tools. This process involves organizing and analyzing data in a logical way. Data are also presented

through models and simulations. Solutions are automated with algorithmic thinking in mind. These skills include finding, analyzing and implementing the most appropriate solution using available resources efficiently. Finally, the ability to transfer and generalize the solution to various problems is also an important part of computational thinking (ISTE 2011; Barr et al., 2011).



The sub-dimensions of computational thinking skills in Figure 1 are explained below.

• **Understanding the Problem:** It means identifying the problem.

• **Disassembly:** It is the process of dividing a complex or multi-component structure into smaller parts. The reason for failure in unsolvable problems may be that the problem is not divided into small enough parts (Üzümcü & Bay, 2018).

• **Abstraction:** It means focusing on one point to reveal the qualities sought and ignoring other situations (CSTA, 2016). It is emphasized as the basic condition of problem solving. By establishing the connection between problems, it enables the solution to the problem to be re-evaluated (Togyer & Wing, 2017).

• **Pattern:** It is defined as a set of repeating operations.

• **Algorithm:** It defines the process of reaching a solution by showing the steps one by one in solving a problem or implementing a plan. Algorithmic thinking is defined as performing a task step by step not only in computer science but also in other disciplines (Selby & Woollard, 2013).

• **Evaluation Debugging:** One of the most common steps in the process of creating algorithms or preparing a computer program is testing. This step involves testing and evaluating the program or algorithm. For good problem solving, regular evaluation of solutions is extremely important (Liu et al., 2017).

Considering all these sub-dimensions, the importance of information processing skills in today's world is undeniable (Berisha-Namani, 2011). Because having strong information processing skills allows individuals to analyze complex situations and make informed decisions (John et al., 2021).

With the increasing dependence on technology and the abundance of information available, being able to filter and evaluate information is crucial to avoid misinformation and make sound decisions. Therefore, developing information processing skills is essential for individuals to navigate the complexities of the modern world and be successful in various areas of life (Pratiwi et al., 2022). In this context, the study aimed to examine the level of information processing thinking skills of higher education students. The level of this skill in students was investigated in line with different variables. This study aims to provide an in-depth analysis to understand and evaluate students' computational thinking skills. It is aimed that the findings of the study will contribute to university education and students' academic achievement. In this direction, the sub-research questions of the study are as follows:

1. What is the level of computational thinking skills of higher education students?
2. Do higher education students' computational thinking skill levels differ according to gender factor?
3. Do higher education students' computational thinking skill levels differ according to their level of education?
4. Do the computational thinking skill levels of higher education students differ according to the department they study?
5. Do higher education students' computational thinking skill levels differ according to class?

Method

Model

Quantitative research method was used to answer the research questions of this study. Quantitative research is a systematic and structured approach to collecting and analyzing data to understand and explain phenomena. The collected data are then quantified and analyzed

using statistical methods. Quantitative research is accepted as a reliable method in research by allowing precise measurement and objective analysis of data (Kurnaz & Nas 2022). Among quantitative research methods, the survey model was used. The survey model is a research method used to describe a specific situation or event using a large sample group. This model is widely used especially in the fields of education and social sciences. The survey model is used to examine a situation in its current state and to collect data about this situation (Karasar, 2014). In this model, it is usually possible to obtain information using data collection tools such as questionnaires, tests or observations and to make a general evaluation about a particular group or situation with the data obtained. The survey model is used to analyze data using descriptive statistics and to help researchers understand the basic characteristics of the data (Büyüköztürk, 2011). The survey model was preferred to ensure the reliability and generalizability of the findings to larger populations and to understand broad trends.

Sample and Population

According to Yıldırım and Şimşek (2018), the population represents a comprehensive concept that includes objects, individuals, communities and countries. A sample is a group selected from the population and expected to adequately represent the population (Gravetter & Forzano, 2012). Stratified sampling, which is a probability sampling method, was preferred for this study. This sampling method is based on the concept of a homogeneous population (Neuman & Robson, 2014). The principle of sub-stratification is taken as a basis for stratification sampling. Sub-strata can generally be determined according to demographic characteristics in the context of the subject being studied (Onwuegbuzie & Collins, 2007). In this study, gender, department, grade and education level were selected as demographic information.

The research was conducted with 298 participants studying in higher education. Demographic information about the participants is presented in the tables. Table 1 shows the distribution of the participants according to their gender, Table 2 according to their level of education, Table 3 according to their department of study and Table 4 according to their grade level.

Table 1.

Distribution of Participants According to Gender

Gender	***f***	**%**
Woman	142	47,7
Male	156	52,3
Total	298	100

According to the data in Table 1, there were 298 participants in total. 47.7% (142) of the participants were female and 52.3% (156) were male. This distribution shows that the number of female and male participants in the sample is almost equal, but the number of male participants is slightly higher. This kind of gender distribution suggests that the research has largely maintained a balance between genders and the results can be generalized for both genders.

Table 2

Distribution of the Participants According to their Level of Education

Education Levels	***f***	**%**
Associate degree	162	54,3
License	136	45,7
Total	298	100

According to Table 2, 54.3% of the participants (n=162) were associate degree graduates and 45.7% (136) were bachelor's degree graduates. This distribution shows that the majority of the participants in the sample are associate degree graduates. Since associate degree graduates are more than bachelor's degree graduates, it is thought that the findings of the study can be generalized more for individuals with this level of education. However, the fact that bachelor's graduates also have a significant proportion shows that the results are suitable for making meaningful inferences for both levels of education. In the evaluation of the findings of the study, it can be said that more balanced and comprehensive interpretations can be made by taking into account the effect of educational level.

Table 3

Distribution of the Participants according to their Department of Education

Department of Education	***f***	**%**
Business	34	11,4
Logistics Management	32	10,7
Computer Programming	58	19,4
Information Security Technology	61	20,4
Digital Game Design	43	14,4
Public Relations and Advertising	38	12,7
Interior Architecture	32	10,7
Total	298	100

When Table 3 is examined, the highest percentage of participants come from the fields of Information Security Technology (20.4%) and Computer Programming (19.4%). Digital Game Design (14.4%) and Public Relations and Advertising (12.7%) also have a significant proportion. The proportion of respondents from Business Administration (11.4%), Logistics Management (10.7%) and Interior Architecture (10.7%) is lower compared to other fields. This distribution shows that the sample is more focused on technology and IT fields. This suggests that the findings of the study may be more generalizable, especially in these fields. At the same time, since there were enough representatives from other fields, it can be said that information can also be obtained about the general trends of various levels of education. This diversity allows the results of the study to be compared across different levels and fields of study.

Table 4

Distribution of Participants according to Class Level

Education Levels	***f***	**%**
Class 1	71	23,8
Class 2	68	22,8
Class 3	84	28,1
Class 4	75	25,1
Total	298	100

According to Table 4, the group with the highest proportion among the participants is 3rd grade students (28.1%). This is followed by 4th grade students (25.1%), 1st grade students

(23.8%) and 2nd grade students (22.8%). This distribution indicates a balanced representation of each grade level in the sample. The slightly higher representation of 3rd grade students may indicate that students at this grade level are more likely to participate in the research. This diversity allows the findings of the study to be compared across students at different grade levels and increases the generalizability of the results. Moreover, the presence of a sufficient number of participants from each grade level allows the study to assess the situations and experiences of students at different stages of the learning process.

Data Collection Tool

The "Computational Thinking" scale developed by Üzümcü (2023) was used as a data collection tool in the study. The construct validity of the Computational Thinking scale was first evaluated by two different field experts. Then, exploratory factor analysis was performed for statistical validity. The scale consists of 28 items. It has a 5-point Likert type and 6-factor structure. Computational Thinking Scale options were: (1) Strongly Disagree, (2) Disagree, (3) Undecided, (4) Agree, and (5) Strongly Agree. The Cronbach's Alpha internal consistency coefficient of the scale was 0.96. As part of the reliability assessment process, item-total correlation coefficients were calculated using item analysis methods. Item-total correlation coefficients. 30 is expected to be higher than 30. In addition, a lower-upper group item analysis was also conducted as part of the reliability study. In this analysis, the comparison of the differences between the item mean scores of the lower 27% and upper 27% groups with the total scores of the test using an unrelated t-test is accepted as an indicator of the internal consistency of the scale. Üzümcü (2023) also calculated the Cronbach Alpha coefficient, which is the consistency coefficient of the scale.

Participants were informed about the purpose of the study before filling out the scale. The scale was delivered to the participants via an online form. The participants were informed by the researcher that their sincere responses to the items in the scale would contribute to the research scientifically. It took an average of 10 minutes to fill out the scale. All participants voluntarily participated in the study.

Collection of Data and Analysis

Analyses were conducted to determine whether the data met the normality assumption. For the normal distribution test, kurtosis and skewness coefficients were taken into consideration. As a result of the normality test, since the kurtosis and skewness values were within the range of ±1.0, it was determined that the distribution did not show an abnormal

deviation from normal (Kline, 2015). In the analysis of the data, independent t-test and ANOVA analyses were applied to determine the score differences between the groups.

Ethical Committee Approval

In this study, all the rules specified in the "Directive on Scientific Research and Publication Ethics of Higher Education Institutions" were followed. None of the actions specified under the second section of the Directive, "Actions Contrary to Scientific Research and Publication Ethics", have been carried out.

Within the scope of our study, 'Informed Consent Form' was signed by the participants. Scales, questionnaires and photographs belonging to others were used, and the necessary permissions were obtained from their owners and these permissions were stated in the study.

Findings

In this study, it was aimed to examine the level of computational thinking skills of higher education students. The data obtained were tabulated and presented in line with the sub-problems.

Findings Related to the First Sub-Research Question

Descriptive statistics related to the first sub-problem of the study, which is higher education students' computational thinking skill levels, are shown. The findings obtained as a result of the analysis are given in Table 5.

Table 5

Descriptive Statistics on Higher Education Students' Computational Thinking Skill Levels

Dimension Related to the Scale	N	X̄	Ss	Min	Max	Skewness	Kurtosis
Computational Thinking Scale	298	4,03	,14	3,54	4,25	,122	-,362

Since the mean score of the participants on the scale is 4.03 and the standard deviation is 0.14, the participants' computational thinking skill levels are generally high and close to each

other. It is seen that the scores are close to the average. The minimum score is 3.54 and the maximum score is 4.25. This indicates that the participants are generally at a similar level in their computational thinking skills and that there are few outliers. Most of the scores are concentrated around the mean and there are no large deviations in the distribution. In this case, higher education students were found to have high levels of computational thinking skills.

Findings Related to the Second Sub-Research Question

The averages of higher education students' computational thinking skill levels exhibit a normal distribution. Based on this, it was analyzed with independent sample t-test to reveal whether there is a significant difference in higher education students' computational thinking skill levels according to gender. The results obtained are given in Table 6.

Table 6

Independent Sample T-Test Analysis Results Regarding Higher Education Students' Computational Thinking Skill Levels by Gender

Gender	N	X̄	Ss	t	sd	p	f
Woman	142	3,87	,13				
Male	156	4,19	,19	-16,3	296	<,001	13,2

The average score of female participants is 3.87, while the average score of male participants is 4.19. The average score of men is higher than that of women. The standard deviation of women is 0.13 and the standard deviation of men is 0.19. This indicates that men's scores show a slightly wider distribution than women's scores. There is a statistically significant difference between male and female participants in terms of their scores on the computational thinking scale. Men scored higher than women in computational thinking skills. As a result, it is possible to say that gender is effective on computational thinking skills.

Findings Related to the Third Sub-Research Question

The averages of higher education students' computational thinking skill levels exhibit a normal distribution. Based on this, it was analyzed with independent sample t-test to reveal whether there is a significant difference in higher education students' computational thinking skill levels according to the level of education. The results obtained are shown in Table 7.

Table 7

Independent Sample T-Test Analysis Results Regarding Higher Education Students' Computational Thinking Skill Levels According to Level of Education

Education Level	N	X̄	Ss	t	sd	p	f
Associate degree	162	3,87	,13				
License	136	4,23	,14	-22,1	296	,218	1,52

While the average score of associate degree students is 3.87, the average score of undergraduate students is 4.23. The average score of undergraduate students is higher than the average score of associate degree students. The standard deviations are 0.13 for associate degree students and 0.14 for undergraduate students. These values show that the score distributions of both groups are quite similar. There is no statistically significant difference between the scores of the computational thinking scale between associate and undergraduate students ($p<.05$). As a result, it is seen that there is no significant difference between students' computational thinking skill levels according to their level of education.

Findings Related to the Fourth Sub-Research Question

One-way analysis of variance (ANOVA) was analyzed to reveal whether there is a significant difference between higher education students' computational thinking skill levels according to the department they study. The results of the descriptive analysis are given in Table 8 and the results of ANOVA are given in Table 9.

Table 8

Descriptive Analysis of Higher Education Students' Computational Thinking Skill Levels According to the Department of Study

Scale	Department of Education	N	X̄	ss	Min	Max
Computational Thinking Skill Scale	Business	34	3,82	,11	3,54	4,04
	Logistics Management	32	3,89	,16	3,54	4,11
	Computer Programming	58	3,88	,13	3,57	4,14
	Information Security Technology	61	4,02	,22	3,68	4,54
	Digital Game Design	43	4,18	,16	3,89	4,54
	Public Relations and Advertising	38	4,25	,11	4,04	4,46

Interior Architecture	32	4,28	,12	4,04	4,57

The average score of business administration students is 3.82. This average has the lowest score among these departments. This result shows that students in this department have relatively lower computational thinking skills than other departments. Interior architecture and public relations and advertising departments have the highest average scores. This indicates that students in these departments have high computational thinking skills. In addition, departments such as information security technology, digital game design and computer programming also have high averages. It shows that students studying in these fields have strong computational thinking skills. Scheffe test was conducted in order to reveal where the significant difference between the levels of computational thinking skills of higher education students according to the department they were studying. The results obtained are given in Table 9.

Table 9

One-Way Analysis of Variance (ANOVA) Results Regarding Higher Education Students' Computational Thinking Skill Levels According to the Department of Study

Scale		**Sum of Squares**	**Mean Squares**	**F**	**P**	**Difference**	**Impact Value**
Computational Thinking Skill Scale	Between Groups	8,30	1,38	53,86	<,001	Difference there is	6
	Within Groups	7,47	,026				291

As seen in Table 9, the fact that the p value is less than .001 indicates that there are significant differences between the groups in their computational thinking skill levels. This shows that the average computational thinking scores between different departments are statistically different from each other. In other words, according to the ANOVA results, there are significant differences between higher education students' computational thinking skill scale scores. Because statistically significant differences were found in the levels of computational thinking skills between different departments. This difference is strongly supported by the value of $p<0.001$. This finding indicates that computational thinking skills may vary depending on the department in which the student is studying. When Table 8 and Table 9 are considered together, it can be expected that computational thinking skills are higher in technical and creative majors (Digital Game Design, Computer Programming, Information Security

Technology, Interior Architecture). Such majors tend to provide students with more practical and technical skills. This may explain the high level of computational thinking skills.

Findings Related to the Fifth Sub-Research Question

One-way analysis of variance (ANOVA) was analyzed to reveal whether there is a significant difference between higher education students' computational thinking skill levels according to their grade levels. The results of the descriptive analysis are given in Table 10 and the results of ANOVA are given in Table 11.

Table 10

Descriptive Analysis of Higher Education Students' Scores on Computational Thinking Skill Levels According to Class Level

Scale	Class Level	N	X̄	ss	Min	Max
Computational Thinking Skill Scale	Class 1	71	3,86	,14	3,54	4,14
	Class 2	68	3,87	,12	6,57	4,14
	Class 3	84	4,12	,21	3,68	4,54
	Class 4	75	4,26	,12	4,04	4,57

Standard deviations are generally low, indicating that students' scores are close to each other within the class. In 3rd grade, the standard deviation (0.21) was slightly higher than the other grades. When the average scores at the class level are analyzed, it is seen that the students' computational thinking skill levels increase as their class levels increase. In other words, it is seen that the average scores increase as we move from the 4th grade to the 4th grade. This shows that students' computational thinking skills improve during the education process and that they have higher skills in higher grades.

Scheffe test was conducted in order to reveal where the significant difference between the computational thinking skill levels of higher education students according to their grade levels originated from. The results obtained are given in Table 11.

Table 11

One-Way Analysis of Variance (ANOVA) Results Regarding Higher Education Students' Computational Thinking Skill Levels by Grade Level

Scale		Sum of Squares	Mean Squares	F	P	Difference	Effect Size
Computational Thinking Skill Scale	Between Groups	8,11	2,70	103,7	<,001	Difference there is	3
	Within Groups	7,66	,026				294

The fact that the p value in Table 11 is very low (<0.001) indicates that there are significant differences between the levels of computational thinking skills according to grade levels. According to the results of the analysis, a significant difference was found between 2nd and 3rd grade ($p<0.05$). This finding indicates that 3rd grade students exhibit an average of 0.24 points lower computational thinking skills compared to 2nd grade students. Similarly, a significant difference was found between 2nd and 4th grade students ($p<0.05$). According to this finding, 4th grade students have an average of 0.38 points lower computational thinking skills than 2nd grade students. In addition, a significant difference was also observed between 3rd and 4th grade ($p<0.05$). In this case, it was determined that 4th grade students showed an average of 0.13 points lower computational thinking skills compared to 3rd grade students. As a result, shows that there are significant changes in students' computational thinking skill levels as their grade levels increase.

Discussion and Results

In the information age, the rapid development of technology and the impact of digital transformation processes in all areas of our lives have made computational skills important. In this context, computational thinking skills refer to a set of competencies that encompass the ability to understand, analyze and solve complex problems, which are particularly important in STEM (Science, Technology, Engineering and Mathematics) fields. The possession of these skills by higher education students plays a critical role in both their academic success and career planning. In addition, higher education students' computational thinking skill levels are extremely important as they face rapid changes and innovations today and these skills need to be developed (Bakırtaş & Lamba, 2020). In this study, it was aimed to examine higher education students' computational thinking skill levels.

In the first sub-research question of this study, the levels of higher education students' computational thinking skills were examined. According to the results of the study, higher education students were found to have high levels of computational thinking skills. Majeed et al., (2022) also obtained similar results. It was determined that 100 3rd year computer science students had high computational thinking skills. In the study of Korkmaz et al., (2015), it was determined that half of the perceptions of individuals towards their computational thinking skill levels were high. Pérez-Suasnavas et al., (2023) found the opposite result in their study. It was found that university students had difficulty in computational thinking skills. It is suggested that this is due to the personal characteristics of the students.

When the levels of computational thinking skills were analyzed according to gender, it was found that the computational thinking skills of males were higher than those of females. This result can be attributed to various factors such as gender roles, inequalities in educational opportunities and cultural norms. For example, it is thought that when males are directed or encouraged more towards technology and STEM (Science, Technology, Engineering, Mathematics) fields, their skill levels in these fields may be higher. In addition, social expectations and role models may also support men to gain more experience in these fields. Esteve-Mon et al., (2020) also found that female students had lower levels of computational thinking skills than male students. The reason for this is explained by the fact that their digital competence skills are more limited. In the study conducted by Oluk and Çakır (2017), computer thinking skill levels of university students were examined. According to the findings of the study, when the computer thinking skill levels of the students were evaluated in terms of gender, it was seen that there was a difference in favor of male students. However, Sarıtepeci (2017), Oluk (2017), Akgün (2020) and Aksit (2018) have studies showing that women have higher computational thinking skill levels than men. The reason for this is shown as the reason that girls spend more time to develop these skill levels.

According to the level of education, it was concluded that there was no statistically significant difference between the scores of the computational thinking scale between associate and undergraduate students. The studies in the literature do not fully parallel with this finding. Sert-Orhan (2023) found that 4th grade students had higher information processing thinking skills compared to 1st grade students. In his study, Paf (2019) emphasized that as a result of examining the results obtained in the context of the class variable, students' information processing thinking skill levels increased as their grade levels increased. Subaşı (2022), on the other hand, based on the findings obtained regarding the grade level, found that the computational thinking skills of 4th grade students were higher than those of 1st and 2nd grade

students. In the study conducted by Kuleli (2018), it was determined that the levels of computational thinking skills of pre-service teachers differed in favor of upper grades. This difference between the findings of the study and the literature can be attributed to several reasons. It can be said that the demographic characteristics of student groups, learning environments and the content of educational programs also affect the results. In addition, while some educational institutions may have a special curriculum or additional support programs for computational thinking skills, the lack of such support in some institutions may negatively affect students' skill levels. In addition, students' personal motivation, interests and study habits also play an important role in the development of these skills.

When the computational thinking skill levels of the students according to the department of study are analyzed, it is seen that the computational thinking skills of the students in the business administration department are relatively lower compared to the other departments. Interior architecture and public relations and advertising departments have the highest average scores, indicating that these students have high computational thinking skills. In addition, departments such as information security technology, digital game design and computer programming also show high averages. These results suggest that students studying in these fields have strong computational thinking skills. The results reflect the impact of education in different departments on computational thinking skills. Bilbao, Bravo, Garcia, Rebollar, and Varela (2022) also found that engineering students have higher computational thinking skills.

In conclusion, this study revealed important findings by evaluating the participants' computational thinking skills. In general, the participants' computational thinking skill levels were found to be high and close to each other. Factors such as gender and level of education were found to be effective on these skills. It was concluded that male participants had higher scores than female participants, while there was no difference between undergraduate students and associate degree students. In addition, education in different departments was found to have a significant impact on these skills. Students studying in technical and creative departments were found to have stronger computational thinking skills.

Recommendations

The results show that educational programs and students' developmental processes affect their computational thinking skills. In this direction, the following suggestions are made for future studies:

1. In this study, the effects of demographic variables such as gender and educational level on computational thinking skills were examined. In future studies, the effect of different demographic factors such as age, occupational choice, cultural background on these skills can be investigated.

2. The effectiveness of different educational methods used to develop computational thinking skills can be investigated.

3. Interdisciplinary projects and studies should be encouraged through collaboration between different departments. This can help students develop different perspectives and apply their computational thinking skills in different fields.

4. Computational thinking skills should be supported by using digital tools and online platforms in education.

5. In the study, it was found that students studying in technical and creative departments have stronger computational thinking skills. Therefore, programs and course contents specific to these departments should be developed and these skills of students should be further strengthened.

Ethical Committee Approval

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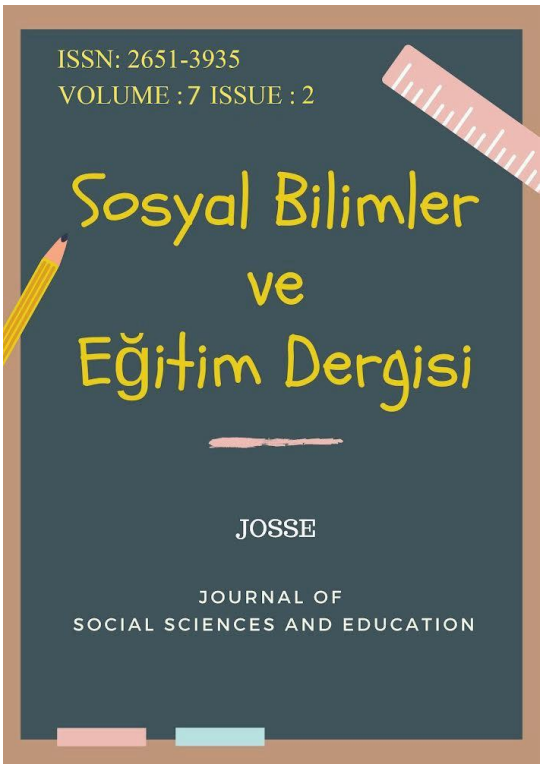

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Future of Earthquake-Based Disaster Logistics and Futuristic Approaches

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Future of Earthquake-Based Disaster Logistics and Futuristic Approaches

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Abstract

Disasters that occur in the world can be caused by natural as well as human-induced factors. These disasters cause damage to cities, villages, and inhabited areas, and also result in loss of life and property. Accurately and effectively planned disaster logistics management activities are crucial during these moments when life comes to a halt. Today, it is evident that cities suffer damage or even face extinction due to deficiencies in planning, coordination, and opportunities within these practices. To mitigate the consequences of disasters and minimize damage, it is essential to always be prepared for such events and manage them well before, during, and after they occur. Disaster logistics practices should be dynamic and tailored to the specific event, suitable for addressing the situation at hand. Each disaster requires a unique set of solutions that depend on the area and geography affected. Therefore, disaster logistics must adopt and develop new approaches with a sustainable perspective. Given that earthquakes are among the disasters that occur frequently in our country, there is a critical need to create earthquake-based disaster management and action plans. Looking at disaster logistics from a futuristic perspective, it is clear that digital transformation technologies can have a significant and beneficial impact, making disaster logistics services more efficient, innovative, and solution oriented. The study conducted a literature review within the framework of qualitative research methodology, providing a detailed analysis of the role of digital transformation technologies in earthquake logistics processes. The literature review was conducted by reviewing relevant academic articles, reports, books, and scientific research. Special emphasis was placed on studies published in the last 10 years, focusing on the intersection of disaster logistics and digital transformation technologies.

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Introduction

Considering the effects of disasters on human life, as well as on all living things and many areas of society, it is seen that disasters are considered as extraordinary events. Disasters do not occur in a single way and are expressed in different classes. These; Flood, earthquake, tsunami, landslide takes place in many different ways. Among the aforementioned disasters, earthquakes, which endanger the lives of living things and affect human life, are among the areas that need to be examined. Earthquake; While it causes deaths and injuries, it also causes economic losses and disrupts social life. In revealing the disaster risks, the necessary preparations before, during and after the earthquake are realized with planning and coordination. In this direction, correct disaster logistics practices are needed in order to manage the process correctly.

Considering the fact that Turkey is located in an earthquake zone and has experienced severe earthquakes, the concept of disaster logistics is an important issue that should be emphasized. It is a fact that there are certain structural and administrative problems in the fight against disasters. Developing a disaster management approach to solve these problems is supported and expected. With a sustainable understanding, large-scale policies should be integrated into the system in a long-term way and disaster logistics practices should be carried out in a planned manner.

In the study, it is aimed to address the problems encountered in earthquake-based disaster logistics while determining disaster policies and to develop solutions for these problems. Among the expected developments in disaster logistics, sustainability, planning and coordination of the optimum storage areas for the disaster area, accurate estimation of alternative routes together with transportation and transportation infrastructure, determining the issue on the basis of technology, from which warehouse, in which order and by which transportation vehicle the product will be brought in the supply of demand-oriented products, Many topics can be counted, such as accessing warehouse and truck information on the system and monitoring the active process, having well-trained and ideal warehouse personnel who set speed as a criterion in warehouses.

Method

Type of Research: The research has a qualitative feature. In the light of the information given in the first chapters and the document review, a qualitative study was carried out in the last chapter.

Research Method: The study, reviews were presented using the document review method. Literature, reports and archives were searched about the future of disaster logistics and futuristic approaches. During the literature review phase, academic sources published at both national and international levels on disaster management and logistics were examined, with a particular focus on the effects of earthquakes and the logistics processes specific to this type of disaster. Based on the data obtained from these sources, potential areas for the application of digital transformation technologies in disaster logistics were identified and explored in depth.

Subject of the Study: It includes the determination of the role of possible technologies to be used in disaster logistics and the benefits that are thought to be presented to human life.

Purpose of the study: It is the examination of futuristic approaches that can be used within the scope of disaster logistics as a result of natural disasters and the development of awareness in this direction.

Importance of the Study: It is thought that it will contribute to the literature in terms of determining the factors affecting futuristic approaches in disaster logistics and disaster logistics, which have been emphasized in recent years.

1. Disaster Logistics

Disaster logistics is expressed as the use of logistics methods such as planning, coordination and resource management to deal with extraordinary situations such as natural disasters, disasters or emergencies (Barbarosoğlu et al., 2002, p. 118). Such events can occur for various reasons such as earthquakes, floods, fires, tsunamis, hurricanes, volcanic eruptions, epidemics. As Erturgut and Yılmaz (2020) stated, disaster logistics is a critical process that requires effective organization, cooperation and resource management. In this way, it is possible to reduce the damage caused by disasters and enable societies to return to normal life more quickly (Erturgut, Yılmaz, 2020, p. 106).

Disaster logistics aims to efficiently distribute resources to save lives, assist the injured and meet basic needs, by enabling emergency and rescue teams to reach affected areas quickly and effectively. During such events, the emergency needs of disaster victims such as medical care, shelter, water, food and cleaning must be met (Ersoy and Börühan 2013).

Disaster logistics requires effective cooperation and coordination between government agencies, non-governmental organizations, humanitarian organizations and other stakeholders. Disaster logistics is a complex and critical process that includes issues such as rapid response, flexibility, effective use of logistics networks and the importance of information sharing. For this reason, it is important that it is carried out by teams and experts specialized in disaster management and disaster logistics (Thompson, 2015, p. 168).

2. Problems Encountered in Disaster Logistics and Solution Suggestions

Disaster logistics includes all of the logistics activities that ensure the effective management of aid and resources during natural disasters or emergencies. During and after a disaster, many important difficulties and problems may arise. In this case, logistics is considered one of the most important areas among the activities to be done during and after the disaster, and the cost item is seen as the highest applications.

In disaster logistics, a fast, effective, effective and efficient process management is required, and it is expected that the activities to be done will be responded quickly in a way that will bring operational success towards the demands. Although it is a difficult task to ensure operational efficiency, it is essential and alternative solutions are needed for the problems encountered. It is very important to examine the problems that occur after the disaster and to understand the solutions to these problems, to minimize the wounds of the disaster and to be prepared for possible disasters. In this context, the problems encountered in disaster logistics and suggestions for solving these problems are explained in detail below.

2.1.Problems Encountered in Disaster Logistics

Disaster logistics operations require a lot of planning, coordination and coordination. Every unplanned action drags the already complex and intricate process into bigger problems and exposes it to bigger problems. From the moment of disasters, it should be acted with the awareness that everything that needs to be done is done in a race against time, and considering possible scenarios, false, incomplete and exaggerated data should be eliminated, demand forecasts should be made with data from the right sources, and search and rescue efforts should be started by distributing resources according to the size of the opportunities. It should be known that every decision made while managing the aforementioned process affects the next decision and lays the groundwork for possible problems. Logistics activities that need to be carried out after disasters occur should also be carried out in the light of this information, and logistics operation practices should be carried out by taking into account every variable in the

field. In disaster logistics, there may be unforeseen demand variations, possible damage to transportation routes, and unexpected situations depending on their location, shape and size. Along with these problems, the fact that many aid organizations act unaware of each other is among the problems faced. What needs to be done here is to act in cooperation with many different public and/or private institutions and organizations, government bodies and military units. Since disaster logistics operations are complex and chaotic structures, coordination is seen as an important building block at every step (Çınar and Mutlu, 2020, p. 54).

It is not possible to provide any predictions about where, when or how severe an earthquake-related disaster will occur. After the earthquake occurs, especially in the first stage, the extent of the damage, the accurate determination of the needs of the victims and the supply of resources are difficult. Disasters involving such an unknown cause many unknowns even after they occur, which is among the reasons that prevent the applicability of the disaster logistics process in terms of planning, effectiveness and efficiency (Sheu, 2007, p. 687).

While managing the operation in disaster logistics, issues such as demand uncertainties, resource allocation, uncertainties in the status of transportation routes, and the management of the transportation process carry uncertainties, and from this point of view, uncertainties should be taken into account during disaster preparation and planning (Galindo and Batta, 2013, p. 202).

As the first step after the disaster, damage assessment is carried out and humanitarian aid logistics activities are activated. As soon as a disaster occurs, the supply chain process is initiated and urgent needs are provided and delivered to the region. Depending on the condition of the transportation routes, the most accurate mode of transportation is selected and the needs must be dispatched to the region as quickly as possible. However, since the urgent needs are wanted to be sent to the disaster area as quickly as possible, the damage and needs analysis cannot be done very accurately in the first place (John & Ramesh, 2016, p. 63). Demands that are not predicted correctly cause disruption of aid activities in the post-disaster period and bring many problems with them. The main factors in the emergence of these problems are the deterioration in the flow of information, the unknown number of the population in need of help and accessibility (Lodree and Taskin, 2009, p. 4).

It is not easy for everyone to agree on disaster logistics operations, to meet on a common ground and to base them on a mathematical infrastructure, to make completely rational decisions, to manage activities on a process basis (Beamon and Balcik, 2008, p. 7). In this context, it is difficult to calculate costs with numerical data, since the main aim is to ensure that the disaster victims receive humanitarian aid and to alleviate the suffering to some extent.

Depending on the extent of the destruction at the disaster site, delays occur in providing, delivering and distributing the requests of those in need. Every damage that occurs in communication, distribution, transportation and energy infrastructure disrupts disaster logistics operations (Chakravarty, 2011, p. 5). Rapid delivery of aid to the region is a top priority for disaster survivors who need urgent help. All optimum planning made in ordinary logistics processes is out of order in disaster logistics, and the correct cost mentioned in the seven lines of logistics loses its validity in disaster logistics. Since time is racing, pragmatic solutions can be preferred on the basis of urgent assistance, regardless of cost. The delays increase as the road works for the extent of the destruction after the disaster take longer, which delays the delivery of aid and causes less aid to be sent during the delivery of aids (Chakravarty, 2011, p. 7).

The problems encountered in earthquake-based disaster logistics are mentioned, but when these problems are examined from a wider perspective, it is known that there are many other problems. Other problems encountered in disaster logistics are as follows (Çınar and Mutlu, 2020, p. 54., John and Ramesh, 2016, p. 63., Watson et al., 2007, p. 1., Day et al., 2012, p. 25, Balcik and Beamon, 2008, p. 102);

• Disasters cause adverse effects on logistics and organizational skills in the affected country.

• During natural disasters, power lines, communication infrastructure and communication systems may be damaged or interrupted. This makes it difficult to coordinate emergency teams and direct requests for assistance.

• Sending non-essential products causes loss of time during transportation and storage, but also causes wasted space.

• The fact that the demand for needs cannot be known with precise data causes difficulties in performance management in disaster logistics activities.

• It is difficult to maintain sufficient stocks before a disaster because it is uncertain which type of disaster will occur and when. For this reason, the problem of not having enough materials and resources to meet the urgent needs is frequently encountered in the event of a disaster.

• Congestion or closure of transportation routes after the disaster, transportation problems caused by the resulting debris cause disruptions in disaster logistics services.

• In the disaster preparedness process, there are deficiencies in the expectation of the emergency, and it causes serious problems in reaching the wrongly located emergency resources.

• Disaster victims and people who want to send aid to the city, medical support teams, firefighters and NGOs want to go to the disaster area at the same time, affecting the transportation and communication channels negatively. Disasters require complex coordination between different institutions, non-governmental organisations, governments and international aid organisations. The fact that many organizations and people want to provide assistance can create difficulties in coordination and make effective use of resources difficult.

• Disaster areas often carry security risks after the event. The destruction, disorder and confusion in the environment can threaten the safety of aid teams and add risks to logistics operations.

• Another problem encountered in disaster areas is caused by weather conditions. Severe weather conditions are often observed in disaster areas. In particular, situations such as storms, floods or tornadoes can seriously affect aid and logistics operations and put safety at risk. Similarly, conditions such as intense winter conditions, extremely hot weather, fog and rain in earthquake areas can disrupt the logistics process.

• After disasters, logistics operations are very important not only in the emergency aid phase, but also in the post-disaster reconstruction process. Repair and reconstruction efforts of the destroyed infrastructure require logistical attention and coordination.

• The emergence of epidemics in the disaster area is one of the problems that arise in the execution of the logistics operation. Problems in entry and exit to the region, difficulty in meeting individual needs are among the most important problems.

2.2.Solution Suggestions for Problems Encountered in Disaster Logistics

It is known that the response process for the size and actual location of the disaster requires different improvement and management stages at different time intervals. Logistics activities should be carried out in a planned manner in order to meet the food, shelter, medical supplies needs of the disaster victims, to evacuate the disaster victims and to do all these as soon as possible.

In addition to housing and health services after a disaster, it is of vital importance that many issues such as providing logistical support, making arrangements for transportation, taking security measures, and taking precautions against epidemic diseases are of vital importance in terms of quicker recovery of disaster survivors (Şipal, 2023, p. 821). In this respect, many problems are encountered in disaster logistics activities that will be provided for the benefit of the society after the disaster occurs and there are delays in the realization of the aforementioned services. Understanding the problems that occur in earthquake-based disaster

logistics correctly and developing solutions for them and implementing them are guiding in terms of reducing the damage that may occur in possible disasters. The need for expert disaster logistics personnel in the transportation, storage and distribution stages in the disaster area is not adequately met. Experienced ideal supply chain specialists and logisticians are faster and more effective in finding appropriate solutions to problems, based on their experience and using the knowledge gained from their past experience. For this reason, it is a fact that experienced logistics workers make more accurate decisions to solve critical situations and their numbers should be increased (Pettit and Beresford, 2009, p. 460).

Solution suggestions for the problems encountered in earthquake-based disaster logistics are listed as follows; (Kaya, 2023; Coşandal and Partigöç, 2022, p. 153; Foreword and Atalay, 2015, p. 3; TRT Haber, 2023; Özdemir, 2021, p. 42).

• Planning is the most important element for solving problems in disaster logistics. It is very important to plan ahead and be prepared for disaster situations. It is necessary to create strategic plans against possible scenarios by making disaster risk analyzes and scenario studies, and to be prepared with minimum predictable practices.

• In order to minimize the damage to the environment caused by the debris after the disaster, it is necessary to determine different routes and change the route in order to carry out the debris removal works in a fast and controlled manner and to realize alternative transportation. In order to be able to serve after the disaster, the vehicle delivery companies in the region should be determined in accordance with the risk management planning before the disaster and the determined companies should be sent to the region when the disaster occurs.

• Determining the suppliers in the region for the disaster area in national and international dimensions according to the nature of the disaster and shortening the waiting times in the disaster logistics processes are among the solutions.

• Studies are needed to strengthen coordination and communication. In terms of communication, more radio orbits should be established at points where satellite, GPS broadcasts, field radios and NGO radios are insufficient. There is a need for structuring in matters such as tower-base stations independent of buildings, strengthening the fiber infrastructure, shortening the procurement process of the wireless network. The number of mobile base stations should be increased. There is a need for alternative communication facilities such as shared use between operators. Radiolink, drone, 4G etc. communication alternatives should be developed.

• Logistic support selected from expert personnel in the disaster area is needed. The planned support for logistics and logistics personnel should be determined in advance. In

disaster situations, more than one institution and organization should intervene. Therefore, it is vital to ensure effective communication and cooperation among all stakeholders. Organizing joint trainings and doing exercises based on disaster scenarios are important in strengthening this coordination and solving problems.

• In order to facilitate transportation for international aid calls, customs, transportation and transportation problems should be prevented and coordination should be ensured.

• Since speed is one of the most important determinants in disaster logistics processes, cash aids are important in this regard. Rapid cash aid to the region is much more beneficial than the emotional and irregular aid that delays the process. This situation should be prevented as the lack of coordination created by people who want to go to the aid area irregularly causes delays.

• Awareness and preparation on a business basis is an important step in solving problems.

• Businesses and sectors in different fields should cooperate and sustainability should be the basis while doing this.

• It is very important to have regional warehouses at certain points. In this context, perishable food products should be stored in cold storage. It is important to make the chain store warehouses ready for disasters and to ensure their safety. Before a disaster, storage and stockpiling of critical materials is also important. Among these materials, emergency equipment such as food, water, medicine, blankets to meet basic needs should be kept.

• Bicycles, motor couriers and survivors can be micro-distributed in the disaster area in line with their needs. It is also important to provide loading and unloading equipment for microdistribution.

• Waste management etc. It is a necessity to get support from the logistics sector in these matters.

• Regular trainings should be given to human resources within the scope of search and rescue, burial, debris removal and emergency aid activities.

• There is a need for restructuring of AFAD and a supportive department that includes competent people in the field of logistics.

• Reporting the suggestions by academicians who are experts in their fields and sending these outputs to both Afad and NGOs is an important step in terms of cooperation.

• The fact that the Turkey disaster plan is being built together with the logistics master plan in order to make it more functional, it is predicted that acting together will positively affect the results.

3. Expected Developments in Disaster Logistics

Expected developments and preparations in terms of disaster logistics should be seen as the most important issue in cases where the existence of living things is in danger and should be carried out quickly. Considering the developments that need to be made;

- Advanced technology and automation applications,
- Data analytics and artificial intelligence applications,
- Sustainability and environmental awareness activities,
- Investments in fast communication and communication systems,
- Improved logistics and warehousing activities,
- Trained ideal warehouse personnel development,
- Ensuring the preliminary provision of ideal warehouse areas,
- Increasing human resources studies and training,
- Topics such as strengthening international cooperation and coordination can be listed (Ersoy and Börühan, 2013, p. 80; DeJohn 2005, p. 8; Aydın, 2020).

The most important development in disaster logistics is the use of applications based on advanced technology and automation. In the future, it is expected that more robotic technology and automation will be used in disaster relief and response processes. Autonomous drones and unmanned aerial vehicles can reach disaster areas quickly and perform tasks such as damage detection and aid distribution, and benefit from their use in disaster management processes both in our country and all over the world. In this direction, it is the first area that is expected to develop rapidly and effectively in disaster logistics (Adıgüzel, 2022, pp. 55-56). Data analytics and artificial intelligence applications used together with these technologies are also one of the most important areas that need to be improved in disaster logistics. Big data analysis and artificial intelligence can provide a better understanding of disaster predictions and their effects, and help to make better decisions before and after disasters, allowing resources to be distributed more effectively (Adıgüzel, 2022, p. 50).

Another area that is expected to develop in disaster logistics is sustainability and environmental awareness activities. In the future, the environmental impact of disaster logistics solutions can be taken into greater consideration. Environmental issues such as sustainable material use, energy efficiency and carbon footprint reduction may become more important in disaster response processes. It is important to prepare the society effectively and to participate in the response processes in disasters. In the future, a cultural change is expected in which society's sensitivity to disasters increases and skills to cope with disasters become widespread (Abbasi, Nilsson, 2016, p. 276, Kovács & Spens, 2007, p. 101-102).

Another area that needs to be developed and focused on is investments in fast communication and communication systems. Communication is critical in an emergency. It is expected that stronger communication infrastructures and emergency communication systems will be developed in the future in order to get the fastest solutions in disaster situations. In this way, it is possible to strengthen the communication between the disaster areas and the center and to ensure coordination quickly (Çınar and Mutlu, 2020, p. 53).

Improved logistics and storage activities are also one of the areas that need to be developed in disaster logistics. It is envisaged to develop more effective storage and distribution systems for disaster logistics. In order to react quickly to disasters, it is of great importance to store important materials and make them easily accessible when needed. After disasters occur, materials and goods that need to be delivered to those in need quickly and in a planned way are possible with the right storage activities. In this direction, it is important to make plans in the pre-disaster process and to develop studies on this subject, without waiting for the times when disasters occur (Önsüz & Atalay, 2015, p. 3).

Trained ideal warehouse personnel development is important for disaster logistics. Although the warehouse planning mentioned above is important, it is equally important that the personnel working in the planned warehouses are trained. In the process of competing with time, inexperienced and uninformed personnel can disrupt business processes. Therefore, before disasters occur, studies in this area should be accelerated and personnel should be trained (Bostan and Yüce, 2021, p. 522).

Another area that needs to be developed in disaster logistics activity processes is the provision of ideal warehouse areas. After disasters occur, it takes time to search the warehouses and to activate the found warehouses quickly. That's why up-front provisioning is of critical importance.

Increasing human resources studies and training them is another important issue in disaster logistics. In the future, the importance of trained personnel with disaster coping skills will increase even more. The training and preparation of disaster logistics teams helps the response processes to be carried out in a more effective and coordinated manner and plays a key role in saving life (Tanyaş et al., 2013, p. 2).

Strengthening international cooperation and coordination is also one of the steps expected to develop in the future. Disasters often have a cross-border impact. A stronger global disaster response system is expected in the future, with increased cooperation and coordination between countries. This helps deliver faster and more effective aid to disaster areas.

4. Futuristic Approaches in Disaster Logistics

Today, it is expected that disaster management systems will be examined and implemented in a technology-oriented manner in order to meet the sustainable welfare level. Technological developments that spread to many areas of life day by day have become a necessity in terms of disaster logistics. It is possible to provide many benefits before and after disasters with the use of internet of things, big data, autonomous vehicles, autonomous robots, RFID and barcode systems, and drone technologies.

Although these technologies, which are expressed as smart systems, have been mentioned a lot lately, it is statistically seen that they have not found the desired level of use at present. First of all, since disaster management brings the management of a chaotic process, there is a great need for the aforementioned technologies in order to process all kinds of data correctly and turn it into output. Awareness should be created that it is an area that needs to be invested rather than awareness in order to find use only in the face of disasters and that it should be applied within this scope.

In order to talk about futuristic approaches, first of all, the data we have must be analyzed and processed correctly, and when the output is obtained, correct inferences should be made regarding the dangers from these outputs. In this context, it is important to take precautions and to integrate traditional geology with digital transformation technologies and to present it in a coordinated manner within the framework of futuristic approaches. Thus, taking the necessary steps to reduce the damage caused by earthquake-based disasters, being prepared in ways that can provide foresight, and carrying out studies within this scope make it possible to provide the necessary conditions.

It is a social duty and priority to protect the society against earthquake-based natural disasters and to minimize the risk. In this context, the use of big data among futuristic approaches to earthquake points to an important area. The use of data obtained by machine learning is a benefit that serves society. In this context, further research shows that a promising way has been built for technology-based disaster management, whose awareness is raised and whose use is expected to increase (Corbi et al., 2019, p. 1304).

By making use of all the data obtained, there are advantages of using technology, in other words futuristic approaches, in developing disaster management strategies, providing risk prediction, performing analyses, fully fulfilling the plans in the order of preparation, response and improvement, and putting all these into action. Technology-based applications have started to be preferred frequently in order to minimize the risks that may arise in solving urban logistics

problems and in the effective realization of disaster logistics (Çağlayan, et al., 2018; Yiğitcanlar, et al., 2020).

With the use of artificial intelligence, it is possible to make earthquake predictions through machine learning, to estimate building damage by using geographic information systems, and to provide predictions based on earthquake data. Thus, efficiency and accuracy increase with machine learning while predicting earthquakes (Cyprus, 2022, p. 365).

Modeling is used to classify, classify, map, evaluate and predict the future of data obtained from all earthquakes that occur with machine learning. Machine learning, which finds use in this way, is among the most used methods in the field of artificial intelligence (Ayaydın & Akçayol, 2022, p. 4).

At the same time, studies are continuing to develop robots for use in disasters, but it is not enough to develop robots alone, and all institutions and organizations are expected to work in cooperation with the government (Hoşgörmez, 2020).

Since earthquakes can damage many living things and structures at the same time, different disaster management processes are required for the size of the earthquake, the condition of the damage, the durability of the buildings, seismic factors, and geological conditions. After the disaster management strategy is determined, a more active and efficient disaster logistics and process efficiency can be achieved. However, advancing technology-oriented with a futuristic perspective saves time and brings optimization.

When we look at earthquake-based disaster logistics from a futuristic point of view, when we consider the technologies that need to be integrated to ensure success in disaster logistics and gradually find use; Transportation of aids with smart traffic management, more active and energy-efficient progress with the use of autonomous trucks, machines that interact via the internet of things will provide benefits in many areas from warehouse automation to inventory processes, cost-effective, time-saving, efficient and effective distribution with coordinated disaster logistics activities providing cost advantage in automated warehouses, obtaining disease history data for disaster victims' personal information and preventing unnecessary and incorrect treatment, logistics support to progress together with artificial intelligence, and thus the opportunity to recover more economically. At the same time, creating an emergency management unit so that more than one department can work in cooperation by activating smart logistics and smart supply chain management in order to adapt to emergencies at all times provides an effective and efficient management (Adıgüzel, 2022, p. 47).

It is known that in order to provide the right logistics service in earthquake-based disaster logistics, all kinds of information about earthquakes bring many different variables in

the management of the situation. In such a case, information such as which transport mode to use, which route to go, population information, past disease data of the disaster victims are handled and optimization is provided by artificial intelligence according to the outputs of the algorithm. Artificial intelligence has a very significant role in disaster logistics in accessing information such as choosing a hospital, which way to reach emergency patients, and the traffic situation by using smart transportation channels (Adıgüzel, 2022, p. 50).

In order to manage earthquake-based natural disasters in a planned and correct way within the scope of disaster logistics, applications that can be made to reduce losses are detailed in futuristic approaches in disaster logistics on a technology basis. It has been tried to give examples of futuristic approaches on the axis of digital transformation technologies.

Table 1

Futuristic Approaches and Usage Areas

Futuristic Approaches	Usage Areas
Autonomous Vehicles	Transporting materials to the wreck site
	Debris removal with autonomous forklifts and robot arms
	Fast supply of needs through autonomously moving cargo ships
	Supply of needs with autonomous aircraft
Drone	Delivery of emergency aid to the region
	Identification of damaged buildings
	Scanning the area and intervention in flood and landslide-like situations
	Detection eye in cases where the roads are closed
	Scanning with heat cameras in needy areas (pet-wild animal detection)
Internet of Things	Determination of disaster scenarios within the scope of settlements,
	Performing micro-zoning operations for the hazard level and risk status of the determined maps,
	Determining the risk situation structurally,
	The planned use of equipment and devices in disaster relief, to prevent loss of life and property in dangerous areas,
	Instant traffic information, route optimization and planning, determination of the appropriate route for the product group to be transported and selection of the transport mode according to these criteria,
	Real-time correction of travel plans,
	Identification and management of warehouses, rapid tracking of which materials and drugs are in which warehouse in case of disaster, notification of deficiencies to the center, follow-up of orders,
	Reducing the need for manpower in transporting disaster survivors to health institutions through the communication and communication of vehicles with each other and reaching people who are waiting to be rescued from the disaster and who are waiting to be rescued.
	Making cost estimates for possible disaster situations
Big Data	Earthquake detection and prediction based on data
	Monitoring material inventory
	Route optimization

	In the disaster management model, which is preventive and risk-reducing, data can be used for preparedness against a disaster and risk-damage reduction methods.
	To store the information about the chronic diseases of the people injured in the disaster, to store the information on whether the injured person has diabetes, heart disease, whether he has an allergy to antibiotics or drugs, and to transmit this information to the health personnel who intervened in the disaster, and in the emergency response of the injured,
	It can be used to gather information and allocate medical resources by creating medical and rescue system and population-based rescue plans.
Autonomous Robots	In determining the damage to the buildings and the damage to the infrastructure,
	In the separation of aids, property identification, analysis, counting, selection processes
Virtual Reality **Augmented Reality**	Using simulation studies in the management of future disasters
	Creating scenarios and experiencing the moment of the event and determining the forms of intervention
RFID and Barcode Technologies	Determining the treatment methods applied to the disaster victims and seeing the aided materials
	Avoiding duplicating material and preventing abuse
	Information and communication technology, especially space-assisted technology, is at the stage of warning and response in case of disaster.
	Creation of emergency plans
	Identification of temporary shelters
	RFID, tag readers provide efficient storage and retrieval of products and efficient operation of the warehouse,
	Solving transportation – health – accommodation – technical equipment problems
Geographic Information Systems	Damage assessment studies,
	Determination of evacuation corridors
	Directing the emergency response teams correctly in the field,
	Preventing traffic jams by closing the road to traffic in natural disasters,
	Reaching shelters, emergency facilities or supply facilities,
	Creation of decision support systems.

Source: (Adıgüzel, 2022, p. 52; Hoşgörmez, 2020; Şen and Esmer, 2017, p. 235; Aydın, 2020)

Discussion and Results

As the world becomes more interconnected and at the same time facing the challenges of changing climate, population growth and urbanization, the need for innovative and forward-looking approaches to disaster logistics is more important than ever. This situation of need necessitates the adoption of futuristic approaches, especially in disasters, and the support of societies in disaster situations. The relationship between the future of disaster logistics and futuristic approaches is highly emphasized as it directly affects the society's ability to effectively respond to and manage disasters, emergencies and humanitarian crises.

In this study, the concept of disaster and the phenomenon of earthquakes, which always cause great destruction, were investigated. In the continuation of the study, the probable

futuristic approaches to be used are explained by detailing the problems encountered in disaster logistics and their solution suggestions. Finally, possible developments for disaster logistics have been evaluated and the usage areas of futuristic approaches both today and in the future are detailed.

Disasters, whether natural or man-made, occur more frequently and more intensely. Climate change is contributing to more frequent and extreme weather events such as hurricanes, wildfires, floods and droughts. Futuristic approaches to disaster logistics can help prepare and respond to these events more efficiently and effectively. At the same time, the world is witnessing rapid advances in technologies such as artificial intelligence, robotics, drones, blockchain, and the Internet of Things (IoT), and integrating these technologies into disaster logistics improves real-time data collection, communication, resource allocation and coordination, making it faster and faster. enable targeted interventions.

Futuristic approaches to disaster logistics emphasize data analytics and predictive modelling. By utilizing big data and artificial intelligence, emergency response teams can make more informed decisions and allocate resources based on real-time information. Thus, disaster response is more optimized and its impact on affected communities is minimized. Future-oriented disaster logistics are designed with flexibility and adaptability in mind. As disasters become more complex and unpredictable, it is critical to have logistics systems that can adapt to changing conditions and recover quickly from disruptions.

Disasters often disrupt supply chains, leading to shortages of critical resources such as food, water, medical supplies and shelter. A futuristic approach to disaster logistics should include robust supply chain management systems that can rapidly reroute essential materials and deliver them to affected areas.

Using innovative methods such as futuristic approaches, drone delivery and blockchain-based transparent delivery systems can revolutionize humanitarian aid delivery. This can increase the efficiency and accountability of aid distribution and ensure that aid reaches those who need it most, and its use in all disaster areas in the future is heavily acted upon.

Although the current approaches in disaster logistics are largely based on traditional methods, rapidly changing global conditions, climate crisis, increasing population density, and urbanization are driving the need for more innovative and advanced technological solutions. In this context, the integration of digital transformation technologies into disaster logistics facilitates the establishment of effective and rapid intervention processes.

Another notable point in the discussion is the critical role that technology plays not only during disasters but also in the preparation before and the recovery processes after them. The

study emphasizes that the use of big data, artificial intelligence, the Internet of Things, and drone technology in disaster logistics enhances the speed of logistics processes, cost-effectiveness, and the development of decision-making mechanisms. In particular, big data and artificial intelligence hold significant importance in identifying the needs of the affected area and determining intervention priorities. This enables accurate and rapid decision-making in disaster management, potentially minimizing the negative impacts on human life.

Several challenges and limitations must also be considered to fully utilize the mentioned technologies. The first of these challenges is that sufficient levels of infrastructure, training, and financial resources are necessary for the effective use of technology. Many countries, particularly developing ones, do not have complete access to these advanced technologies. This indicates that increased international cooperation and funding are needed to make technology more effective in disaster logistics.

Secondly, the adoption of futuristic approaches in disaster logistics requires not only technological integration but also societal awareness and government policies to support these approaches. To accelerate post-disaster intervention processes and enhance community resilience, collaboration among governments, non-governmental organizations, and the private sector is essential. In this process, the lack of coordination and insufficient resources can adversely affect post-disaster intervention efforts.

Finally, futuristic approaches to disaster logistics must be sustainable. No matter how advanced technology is, the human factor and awareness-raising efforts regarding disaster situations remain crucial. Therefore, not only technological solutions but also the training and capacity building of humanitarian aid teams should be considered as critical components.

When considered within the context of the discussion, the future of disaster logistics should be strengthened through innovative technology-based approaches. However, in this process, merely advancing technology will not be sufficient; societies, governments, and international organizations must also develop policies to enhance access to and utilization of these technologies. In this context, the study indicates that digital transformation technologies will play a critical role in the future of disaster logistics and emphasizes the need for increased global cooperation to integrate these technologies more effectively.

As a result, the relationship between the future of disaster logistics and futuristic approaches is vital for building a more resilient and cohesive society. By adopting innovation, technology and data-driven decision-making processes, we can better respond to emergencies, minimize the impact of disasters, and ultimately save lives and resources. To meet the challenges posed by an uncertain and rapidly changing world, governments, organizations and

individuals need to adopt forward-thinking strategies and work together. While technological innovations for the future of disaster logistics offer significant opportunities, strong steps must be taken at both the infrastructural and institutional levels to effectively utilize these opportunities.

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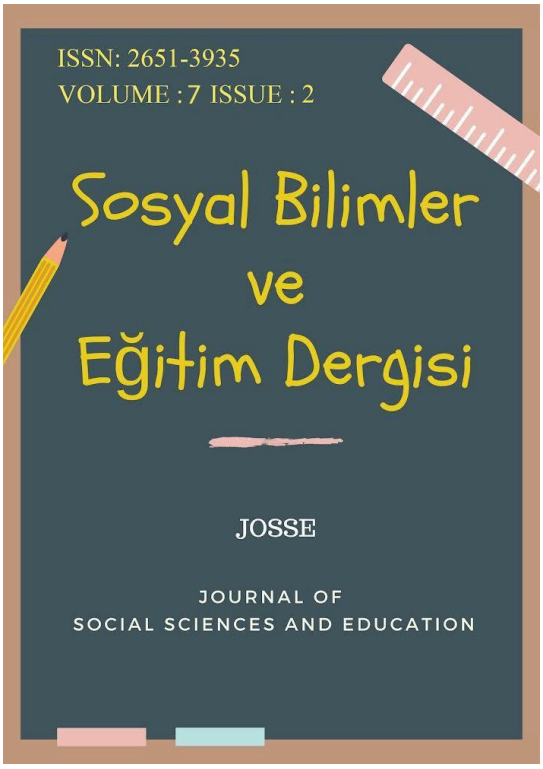

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Psychometric Properties of Turkish Versions of the Non-Attachment Scale Short Form

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Abstract

This study aimed to examine the psychometric properties of the Non-Attachment Scale Short Form in a Turkish sample. With the participation of 244 adults over 18 years of age, the Short Form of the Nonattachment Scale, the Resilience Scale and the Ontological Addiction Scale were used as data collection tools. Cronbach's alpha and McDonald's omega coefficient were used for the reliability of the Non-Attachment Scale Short Form. According to the results of the analyses, the internal consistency coefficient and McDonald's value were found to be .77 and .78, respectively. Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA) were used to test the construct validity of the scale. The results of the analyses showed that the model fit and Kaiser-Meyer-Olkin (KMO) values were at an acceptable level. Item factor loadings ranged between .40 and .67 and the scale was found to have a single factor structure. The statistically significant difference between the 27% lower and upper groups among the participants showed that the item discrimination index of the scale was at a good level. According to the correlation findings conducted to test the criterion validity of the scale, non-attachment was found to have positive significant relationships with resilience (r = .60) and negative significant relationships with ontological dependence (r = -.39). As a result, adaptation of the Short Form of the Non-Attachment Scale can be said to be a valid and reliable measurement tool.

Keywords: Attachment, non-attachment, validity, reliability

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Introduction

Attachment concept has been recognised as one of the main topics of psychology for many years. Especially in Western psychology, attachment encompasses the relationship established with important people, primarily caregivers, from childhood onwards (Bowlby, 1979). Attachment styles are generally considered in three different categories as secure, avoidant and anxious. Secure attachment meets the basic biological and psychological needs of the child. With avoidant attachment style, caregivers are uncaring and hostile towards the child. Whereas in anxious attachment style, parents behave inconsistently in meeting the needs of their children (Özbay, & Çelik, 2024). Studies on attachment styles have shown that anxious and avoidant attachment have positive relationships with various psychological problems (Gökdağ, 2021; Messina et al., 2023). On the other hand, secure attachment has been found to increase individuals' life satisfaction and well-being (Sagone et al., 2023). This situation is interpreted as the attachment figures make the individual feel safe and make it easier to manage stress and regulate emotions (Cassidy, & Shaver, 2018). Besides, another explanation may be that individuals who are in secure relationships feel supported and loved, which positively affects their psychological health (Sahdra et al., 2010).

As mentioned above, attachment is defined as a positive concept representing trust in relationships in Western psychology. However, in ancient Buddhist texts, human suffering is stated to be related to attachment (Wallace, 2008). Attachment is seen as a mental disorder that defines individuals' attachment to their self-image, other people, objects and the physical World (Ho et al., 2022). In other words, since everything in life is temporary and variable, this attachment can lead to disappointment. Individuals need to be able to recognise the illusion of permanence in order to get rid of suffering (Sahdra et al., 2010). For this reason, attachment is seen as being stuck or developing a kind of addiction (Sys et al., 2024). According to another definition, attachment is interpreted as the assignment of unrealistic characteristics by excessively directing emotional and cognitive resources to an idea or object (Shonin et al., 2014).

Attachment definitions of the Buddhist tradition are more similar to the anxious attachment-oriented approaches in Western psychology. This perspective, conceptualised as anxious clinging, has caused ambiguities in the Western and Buddhist psychology literatüre (Sahdra et al., 2010). There are also points of overlap between secure attachment in Western psychology and non-attachment in Buddhist tradition. High levels of both secure attachment and non-attachment are reported to be autonomous and self-confident (Sahdra et al., 2010).

However, in the discussions on the definitions of non-attachment (Sys et al., 2024), the negative conceptualisation of non-attachment as the opposite of attachment is rejected. Non-attachment is emphasised to be a structure independent of attachment and can be contextualised positively. This contextualisation includes acceptance, letting go, practicing deep presence, adopting a universally interconnected self-schema and developing perceptual distance in terms of experiences and reactions to them, which are inspired by Acceptance and Commitment Therapy, Dialectical Behavioural Therapy, Compassion Focused Therapy and Mindfulness Based Interventions (Tremblay et al., 2024).

Non-attachment is to establish a balanced relationship with negative experiences without suppressing them and clinging to positive experiences (Sahdra et al., 2010). This flexible way of establishing a relationship is emphasised to be important in preventing the individual from having rigid cognitions about himself/herself and his/her goals (Whitehead et al., 2018). This view leads individuals with high level of non-attachment to show higher levels of kindness and compassion to themselves and others (Roca et al., 2020; Yang et al., 2020). Studies on non-attachment have shown that non-attachment is associated with low levels of psychological distress and high levels of well-being. For example, non-attachment was found to have negative relationships with suicidal ideation, somatic symptoms, anxiety and depression (Weiss et al., 2014). Besides, in the meta-analysis study conducted on non-attachment, it was found that non-attachment had significant positive relationships with well-being and mindfulness (Ho et al., 2022). Especially in difficult crisis periods such as Covid-19, nonattachment is known to increase strong positive beliefs in humanity and life (Mak et al., 2023). One study conducted on a young population showed that non-attachment positively affected resilience (Goswami et al., 2024). Moreover, non-attachment positively predicts happiness through the sense of coherence (Siah, 2024).

Consequently, non-attachment has significant and important relationships with many psychological factors. Therefore, there is a need to better understand the effects of non-attachment in different cultures and societies. However, to the knowledge of the authors, there is not yet any study on non-attachment behaviour in Turkey. One of the reasons for this situation can be said to be the lack of a measurement tool that can measure non-attachment behaviour. In order to measure non-attachment behaviour, Sahdra et al. (2010) first developed the 30-item Non-Attachment Scale. This scale, which has a single-factor structure, has been validated on different cultures. Validity and reliability were found to be at the desired level in Chinese and Spanish samples (Feliu-Soler et al., 2016; Zhao et al., 2013). However, to overcome the time limitation in the application of the scale and to make it more useful, Chio

et al. (2018) developed the 8-item Nonattachment Scale Short Form. Although this scale, which was developed on the Chinese sample, is used in studies on non-attachment, no adaptation has been made in a different culture yet. For this reason, this study aims to adapt the scale to Turkish culture and make the concept of non-attachment studyable in Turkey.

Method

This study deals with the adaptation of the Non-Attachment Scale-Short Form (NAS-SF) developed by Chio et al. (2018) into Turkish. In this study, relational research design, one of the general survey models, was used. This section provides information about the adaptation process of NAS-SF into Turkish. The structure of the study group, the measurement tools used, and the adaptation process of the scale are explained in detail.

Participants

This study's participants consisted of 244 individuals over the age of 18. The mean age of the participants was 26.72 years (SD=8.39). Of the participants, 81 were male (33.2%) and 163 were female (66.8%). In addition, 26 (10.7%) of the participants were high school graduates, 195 were undergraduate students (79.9%), and 23 (9.4%) were graduate students. When the socioeconomic status was analyzed, 38 (15.6%) of the participants stated low, 195 (79.9%) stated medium and 11 (4.5%) stated high. Ethical approval was obtained from the Siirt University Ethics Committee with the decision dated 10.11.2023 and numbered 5839.

Measures

Non-Attachment Scale-Short Form (NAS-SF)

The Non-Attachment Scale (NAS) was developed to measure the level of attachment to thoughts, feelings, desires, and experiences of individuals (Chio et al., 2018). Based on the long form NAS (Sahdra et al., 2010), the 8 items selected for the Non-Attachment Scale - Short form (NAS-SF) in this study were used (e.g., I can accept the flow of events in my life without getting stuck or pushed by them. I see that I can be calm and/or happy even when things are not going my way). Participants answer a 6-point Likert scale ranging from ‘strongly disagree’ to ‘strongly agree’. Higher scores on the scale indicate higher levels of non-attachment. One item of the scale was removed because its factor loading was below .25.

The scale showed satisfactory reliability (Cronbach's alpha = .93) in its original 8-item form (Chio et al., 2018). In the present study, the reliability value of the scale was found to be .77.

Brief Resilience Scale (BRS)

The BRS was developed to measure a person's ability to "bounce back" from stressful situations (Smith et al., 2008). The scale contains 6 items (e.g., It does not take me long to recover from stressful situations), and each item is rated on a 5-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). The reliability value of the adapted scale was .83 and as a result of CFA, goodness of fit indices were found as x2/sd (12.86/7) = 1.83, NFI = 0.99, NNFI = 0.99, CFI = 0.99, IFI = 0.99, RFI = 0.97, GFI = 0.99, AGFI = 0.96, RMSEA = 0.05, SRMR = 0.03. A higher score on the scale indicates a higher level of resilience. BRS was translated into Turkish by Doğan (2015). In the present study, the Cronbach α value of the scale was calculated as .82.

Ontological Addiction Scale

The scale was developed by Barrows et al. (2022) to understand the level of self-dependency of individuals based on the ontological addiction theory. The long form of the ontological addiction scale, which has a single-factor structure, consists of 31 items and is in a 5-point Likert format. (e.g., How did you think you could avoid experiencing discomfort, did you find it difficult to cope with rejection?). The reliability value of the adapted scale was .87 and as a result of CFA, goodness of fit indices were found as CMIN/df=2.427; RMSEA=0.075; RMR=0.054; GFI=0.922; CFI=0.921; IFI=0.922. It is scored between never=0 and almost always=4. In addition, validity and reliability studies have also been conducted on the 24-item and 12-item short forms, and in this study, the 12-item short form was adapted, and the reliability value was found to be .84 (Ekşi & Şekerci, 2023). In the present study, the reliability value was found to be .75.

Procedure

This scale was adapted by the International Test Commission Test Adaptation Guide: A Criteria Checklist was taken into consideration (Hernández et al., 2020). Within this context, firstly, permission for adaptation was obtained from the developers of the original scale. Four researchers translated the instructions and items of the NAS-SF scale into Turkish. To determine the equivalence of the items in the original form and the translated form, an expert evaluation form was prepared. Eight experts from the fields of psychology and

linguistics evaluated the original and translated versions of the scale in the form. The final version of the Turkish form of the scale was created within the framework of the feedback received from these experts.

Statistical Analysis

The validity and reliability analyses of the data obtained within the scope of the study were analyzed with SPSS 26 and AMOS 24 programs. Construct validity, criterion validity, and content validity techniques were used to determine the scale's validity. Expert opinion was sought for the scale's content validity, and Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA) were used for construct validity. To determine the reliability of the scale, Cronbach's Alpha reliability coefficient and Mc. Donald ω Value is used. For item analysis, the unrelated t-test was used to test the differences between the corrected item-total correlation and the item average scores of the lower 27% and upper 27% groups, which were formed according to the total scores of the test (Büyüköztürk, 2010).

Ethical Committee Approval

Ethical approval was obtained from the Siirt University Ethics Committee with the decision dated 10.11.2023 and numbered 5839.

Findings

Exploratory Factor Analysis (EFA)

Exploratory factor analysis was used to determine the construct validity of the adapted scale. When Table 1 is examined as a result of the EFA, it is seen that the NAS-SF explains % 34.05 of the variance as a single dimension.

Table 1

KMO ve Bartlett's Tests

Kaiser-Meyer-Olkin		.817
Bartlett's Test of Sphericity	Ki-kare Value	372.93
	Serbestlik Derecesi	21
	p	.001
Total explained variance	%	34.05

When Table 1 is examined, the KMO sample fit coefficient was found to be .817 ($p<0.001$). It is stated that the KMO should be higher than .60, and the Barlett test should be significant to determine whether the data are appropriate (Büyüköztürk, 2010).

Table 2

Factor Loads of the NAS-SF

Items	Factor Loads
	Turkish Form
1	,604
2	,656
3	,678
4	,555
5	,652
6	,407
7	,480

Table 2 shows that the scale has a single-factor structure, and the items on the scale range from 0.407 to 0.678 and have high load values. Büyüköztürk (2018) stated that factor loading values should be 0.45 and above, but the limit value can be reduced to 0.30 for scales with few items. The total score obtained from the scale gives the NAS-SF score.

Confirmatory Factor Analysis (CFA)

CFA was used to measure the construct validity of the scale. Findings related to CFA are presented in Figure 1.

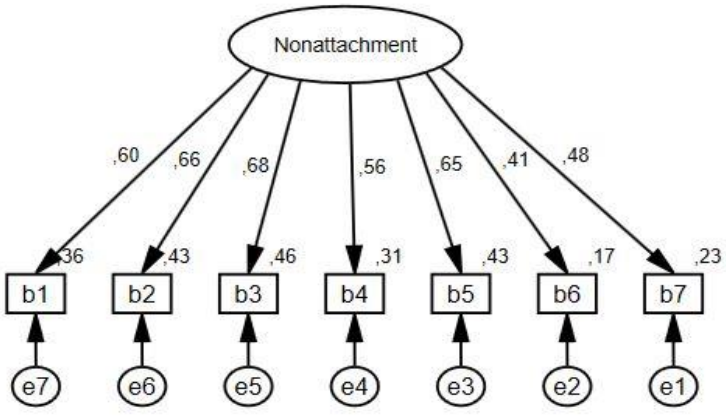

Figure 1. *Confirmatory factor analysis*

The acceptable fit indices of the model resulting from Schermelleh-Engel, Moosbrugger, and Müller's (2003) CFA were between 2≤ χ2/sd≤3 / χ2/sd for RMSEA, between 0.05≤ RMSEA≤0.08, and 0.85 for AGFI. That is, between ≤AGFI≤0.90, GFI 90≤GFI≤0.95 is sufficient. The one-dimensional and 7-item structure of the NAS-SF was analyzed by CFA and found to have appropriate fit values (CMIN/df= 2.424; RMSEA=0.077; CFI=0.944; TLI=0.916; IFI=0.945; RFI= 0.865). In this context, it is seen that the fit indexes of the model obtained for the NAS-SF as a result of CFA are at a suitable level.

Criterion Validity of the Scale

The correlation analysis performed to determine the criterion validity determined that the NAS-SF had a correlation value between .60 with resilience and -.39 with ontological addiction. The results regarding the criterion validity are shown in Table 3.

Table 3

Relationships between NAS-SF, resilience, and Ontological Addiction

Variables	M	SD	1	2	3
1. NAS-SF	26.06	6.55	-	.60*	-.39*
2. Resilience	18.01	4.42		-	-.42*
3. The ontological addiction	24.91	6.66			-

*p<0.001, N=244.

Reliability

To measure reliability, Cronbach Alpha (α) and Mc. Donald ω value in Table 4; The difference between 27% lower and upper scores is given in Table 5. Findings related to these are presented under this title.

Table 4

NAS-SF Internal Consistency Coefficient

Scale	**Mc. Donald ω**	**Cronbach's Alpha**
NAS-SF	.78	.77

When Table 4 is examined, Cronbach's Alpha value for NAS-SF is calculated as α=.77 and Mc Donald Omega value as ω=. 78.. The generally accepted alpha value in Social Sciences is 0.70 and above (Büyüköztürk, 2010). This shows that the scale has a good value in terms of reliability.

Table 5

T-Test Results of 27% Lower and Upper Groups of NAS-SF score

	Items	Corrected item-Total Correlation	t-test
1.	Yaşadığım olayları, onlara takılmadan veya onları bir kenara itmeden kabul edebilirim.	.52	13.53
2.	Geçmişte yaşadığım pişmanlıklarımı ve can sıkıcı duygularımı geride bırakabilirim.	.55	14.37
3.	Olaylar istediğim gibi gitmese bile sakin ve/veya mutlu olabileceğimi düşünüyorum.	.58	13.06
4.	Hayatımın herhangi bir anında, istenen ya da istenmeyen bir şey olduğuna bakmaksızın hayatın bana sunduklarına kapım açıktır.	.48	9.87
5.	Hayatımda neler olup bittiğine aldırış etmeden/takılmadan mutlu olabildiğimi düşünüyorum	.55	13.71
6.	Kusursuz olmayan, sıradan bir insan olmaktan memnunum.	.37	7.90
7.	Olumsuz veya acı verici de olsa aklıma gelen düşünce ve duygularla yüzleşebilirim.	.44	9.44

$^{**}p<0.001$

The adjusted item-total correlation analysis in Table 5 and independent samples t-test were used to test the differences between the item mean scores of the lower 27% and upper 27% groups formed according to the total test scores. Büyüköztürk (2018) stated that an item-total correlation of 0.30 and above is sufficient. The adjusted item-total correlations ranged between .37 and .58, and the t (df=130) values for the differences in the item scores of the lower and upper 27% groups determined according to the total scores ranged between 7.90 ($p<0.001$) and 14.37 ($p<0.001$). Therefore, this result shows that the scale is successful in discriminating individuals.

Discussion and Results

The present study adapted the Non-Attachment Scale-Short Form (NAS-SF) developed by Chio et al (2018) to Turkish culture. The findings obtained in the study show that the single-factor structure of the NAS-SF was confirmed. Firstly, Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA) were conducted to test the construct

validity of the scale. As a result of EFA, the KMO (Kaiser-Meyer-Olkin) value was found to be .817. The fact that this value is above .80 means that it is at an excellent level and the sample is sufficient (Marofi et al., 2020; Tabachnick, & Fidell, 2018). This study found that the total variance explained in the one-factor structure was 34.05%. Since the variance explained in single-factor structures should be at least 30%, the scale provides this sufficiency (Büyüköztürk, 2018). Moreover, as a result of the CFA, it was determined that the model fit values of the NAS-SF scale showed a good level of fit.

Factor loadings of the items of the NAS-SF scale were found to range between .40 and .67. Since item factor loadings should be at least .30 (DeVellis, 2017), the obtained values can be said to be acceptable. However, since one item in this study had a factor loading below .30, the 8-item structure of the scale was reduced to 7 items. Therefore, although the study was conducted by the theoretical substructure of non-attachment, adaptation studies can be affected by cultural differences. Furthermore, the 7-item structure of the NAS-SF scale is similar to the number of items in the short form developed by Sahdra et al. (2015). However, different studies in which this scale (Sahdra et al., 2015) was used showed that the model fit indices were not sufficient. Therefore, a new short-form was developed by Chio et al. (2018). This study tested its validity and reliability in the Turkish sample.

Analyses conducted to test the reliability of the scale showed Cronbach Alpha .77 and McDonald's .78. This result shows that the internal consistency coefficient is at an acceptable level as in the original scale (α=.93). According to the results of the item-total correlation analysis of NAS-SF, the difference between the lower and upper group of 27% was found to be significant. According to this result, the NAS-SF scale's item discrimination level can be said to be good. In order to test the criterion validity of the NAS-SF scale, Resilience and Ontological Addiction scales were used. Significant positive relationships were found between non-attachment and resilience (r = .60) and significant negative relationships with ontological addiction (r = -.39). Similarly, the limited number of findings in the literature show that non-attachment has a positive relationship with resilience (Goswami et al., 2024). Besides, ontological addiction and non-attachment are known to have negative relationships bilinmektedir (Barrows et al., 2022). These results suggest that increasing the level of non-attachment may play a critical role in strengthening resilience and preventing ontological addiction.

Finally, all analyses conducted in this study show that the Turkish form of the NAS-SF scale is a valid and reliable measurement tool. However, this study has some limitations. The first limitation is that the sample of the study consists only of adults over the age of 18.

Including different age groups in future studies in which this scale will be used may contribute to the generalisability of the non-attachment findings. Besides the validity and reliability analyses in this study, different approaches such as measurement invariance can be used. Another limitation of this study is that the data were obtained through self-report. To prevent the established method bias that may be caused by this situation, techniques such as interviews and observations can be used in future research. Despite these limitations, the presence of a tool that can measure the level of non-attachment of individuals in Turkey is thought to contribute to the understanding of the causes and consequences of non-attachment. Thus, especially academicians and mental health professionals may have the opportunity to examine the structure of non-attachment and develop various intervention programs to strengthen non-attachment.

Ethical Committee Approval

Ethical approval was obtained from the Siirt University Ethics Committee with the decision dated 10.11.2023 and numbered 5839.

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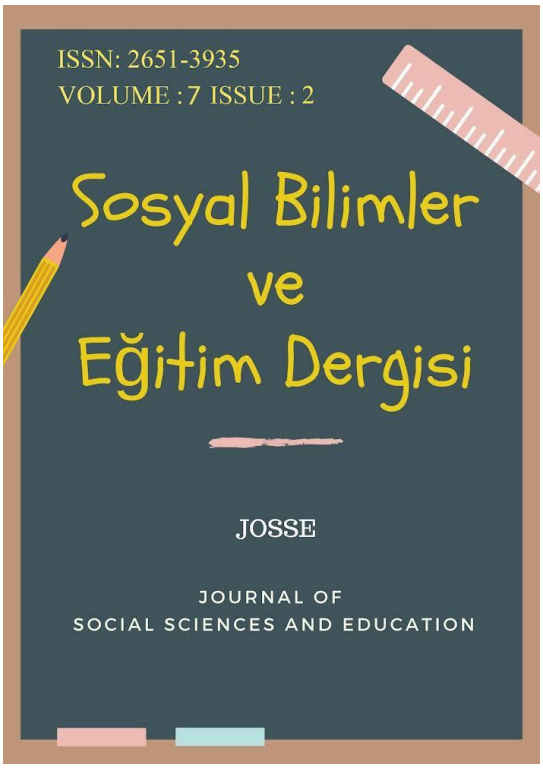

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The Effect of Historical Places Through Virtual Museums on Students' Academic Achievement and Attitudes Towards The Course in Social Sciences Course Concept Teaching

**This Study "The Effect of Historical Places Through Virtual Museums on Students' Academic Achievement and Attitudes Towards The Course in Social Sciences Course Concept Teaching" derived from the thesis titled.*

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The Effect of Historical Places Through Virtual Museums on Students' Academic Achievement and Attitudes Towards The Course in Social Sciences Course Concept Teaching

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Abstract

This research, 7. the classroom social studies course was conducted in order to determine the effect of historical sites on students' academic achievements and attitudes towards the course through virtual museums in concept teaching. In line with the aim, 20 concepts included in the social studies curriculum were selected. A 20-question academic achievement test was prepared and applied to be applied to students in relation to these concepts. In addition, a 35-item attitude scale was applied to determine the students' attitudes towards the Social studies course. The study group of the research consists of 40 7th grade students (20 experimental, 20 control). The study was carried out over a total period of 3 weeks. The experimental group was taught concepts through virtual museums in historical places, and the control group was taught according to the Social Studies curriculum. SPSS, which is a statistical analysis program, was used for the analysis of quantitative data. In the measurements related to the research, dependent and independent variable t test, mean, standard deviation values were calculated. According to the results of the analysis, it has been determined that the use of virtual museums with historical sites in social studies course concept teaching enables more effective learning compared to traditional methods and creates significant differences in students' attitudes towards social studies course.

Keywords: Social studies, historical place, virtual museum, concept

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Introduction

Social studies has been defined as" a course that integrates basic cultural elements from the findings obtained from studies in many fields into information selected and kneaded with an interdisciplinary approach; adapted to the primary school level and the child's global perception" (Sözer, 1998, p. 4). It is a course that takes the subject of social studies from social sciences and combines it within its own structure. The Social studies course, which contains information related to many fields such as history, geography, archaeology, anthropology, politics, philosophy, sociology, economics (MEB [Ministry of Education], 2005, p. 51), has a very rich structure in terms of content. Since the fact that the social studies course dominates such a wide area requires teaching concepts related to this field, concept teaching is becoming an important topic in the social studies course.

One of the most important goals in teaching concepts that are abstract conceptions of an object or thought in the human mind (TDK [Turkish Language Association], 2023) is to embody abstract concepts and to gain the ability to use them in daily life (Çaycı, Demir, Başaran and Demir, 2007, p. 625). In the social studies course, it is of great importance for students to understand the subjects, to provide correct learning and to know the concepts in order to solve the problems they face in daily life (Soylu, 2019, p. 35). Many methods and techniques are used in the teaching of the concepts included in the social studies course. In addition, concepts are embodied with different studies and applications and it is made easy for students to learn concepts (Öz, 2019, p. 11).

One of the applications that can be used to make concepts concrete and provide meaningful learning to students and facilitate the concept teaching process is the teaching of concepts through historical sites (Üztemur, Dinç and Acun, 2018, p. 295). According to the statement made by Ata (2002, p. 58) historical places consist of historical buildings left by people living in past periods for the purpose of using or creating artifacts, and places where historical events occurred. In this context, the historical places are mosques, madrasas, inns, baths, caravanserais, complexes, etc. from the structures, it can be the place where an event or war took place, or a place where a well-known person lived, where he was born (Öner, 2015, p. 93).

The use of historical sites in education has started to become digitalized with scientific and technological developments. It can be difficult to go directly to historical sites for some reasons. Examples of this situation are vehicle obstacles in transportation, accident risk, material obstacles, problems that may occur in the space, problems that may occur in the control

of crowded groups, problems that may occur in obtaining permits (Kılıç, Turan, Yalı ve Bulut, 2023, p. 853). However, the process of digitalization in education with technological developments brings the visits to historical sites to a virtual dimension. Thus, the problems experienced during museum trips are minimized thanks to virtual museum trips.

Virtual museum trips are an important tool that provides the opportunity to visit historical sites and museums in our country or around the world with an internet connection (Çolak, 2006, p. 295). At the same time, it also contributes to the development of digital literacy skills that are required to be acquired in the Social studies course. In today's world, digital literacy is of great importance, especially at the point of adapting to the digitalization process and using it correctly. Due to the fact that it is both economical and easy to implement, virtual museums have recently become a preferred area.

The concepts included in the social studies course can be taught to students through trips to historical sites thanks to virtual museum technology. There are learning areas in the social studies course and concepts that students want to be taught in each learning area (Kılınç, Çoban, Akşit, 2015, p. 636). It is not possible for learning to be fully realized without these concepts being introduced to the student (Parker, 2001). Because individuals learn with concepts. Thanks to the concept teaching studies carried out on the students, concept deficiencies or misconceptions are eliminated and a solid foundation is prepared for subsequent learning. Because meaningful learning can be realized as concepts are embodied (Akhan and Kılıçoğlu, 2014, p. 25). In this context, concept teaching studies can be carried out in historical places with virtual museums in the process of providing concepts to students. This situation enriches the educational environment and provides orientation to modern methods instead of classical teaching methods.

The subject of our research was to determine the effect of the acquisition of concepts in the social studies curriculum in historical places through virtual museums on the academic achievement of students and their attitudes towards the social studies course. In order for the goals set in the Social Studies curriculum to be realized, the concepts contained in the program should be taught in such a way that they can create the same meaning in the minds of all students (Alkış, 2012, p. 75). For this reason, considering that students have different cognitive and affective characteristics, the realization of concept teaching in virtual museums and historical places will be able to address many areas by increasing the diversity in learning (Aktaş, Yılmaz and İbrahimoğlu, 2021, p. 1298). At the same time, since it will be an activity that attracts the attention of students, it ensures that permanent learning takes place (Kayabaşı, 2005, p. 157). The aim of the research is to determine the effect of historical places on students' academic

achievements and attitudes towards the course through virtual museums in social studies course concept teaching. 7 In this research. It is aimed to determine the effect of introducing the concepts included in the social studies program of the classroom students through virtual museum trips to historical sites on academic achievement and lesson attitudes.

When the literature review is carried out, it is seen that studies related to the teaching of concepts have been carried out. However, it has been seen that there is a gap in the literature regarding the teaching of concepts in historical places through virtual museums and no studies have been found on this subject. In this context, considering the importance of concept teaching in social studies course, realization of this by different methods will add richness to learning environments. The teaching of concepts by visiting historical places with virtual museum applications, reinforcement and elimination of misconceptions will enrich the teaching.

Gürbüztürk and others (2013) stated in his research that the application of traditional methods of learning methods to students limits knowledge and therefore modern methods should be used. In this context, interactive learning is one of the different methods. Duman (2013) emphasized the importance of using technological tools that appeal to many senses of students in education in their studies. In this context, virtual museums have important effects on the learning process. Concept teaching occupies an important place in social studies curricula (MEB, 2018). However, studies have shown that the concepts included in the program are not learned by the students at the desired level (Akgün, 2014; Avcı, 2015; Bitlisli, 2014; Boz and Çoban, 2019; Çakmak, 2006; Çelikkaya and Kürümluoğlu, 2019; Demirci, 2019; Fidan, 2009; Kayacan, 2010; Öktem, 2006; Özdoğan, 2019; Özkaya, 2019; Çakmak, 2019; Özkaya, 2010; Talay, 2011; Ünlü, 2011). It is seen that this situation is caused by the inability to embody concepts in the concept teaching process (Demirkaya and Karacan, 2016; Memişoğlu and Tarhan, 2016; Özdoğan, 2019; Özkaya, 2010; Soylu and Memişoğlu, 2020).

The contribution of virtual museum trips to historical sites to the embodiment of abstract concepts in the minds of students and concept teaching is an undeniable reality. In the studies conducted by Demirboğa (2010), it was found that virtual museum activities provide positive contributions to students' cognitive and affective sense. However, the research conducted on virtual museum trips (Ata, 2002; Erim, 2005; Utku, 2008; Akyüz, 2009; Tosun, 2009; Demirci, 2009; Filiz, 2010) When looking at the results, it was found that the teaching activities supported by virtual museum trips positively affected student attitudes towards the relevant course and subject.

The question of this research article is that “What is the impact of historical places through virtual museums on students' academic achievements and attitudes about the course in

social studies course concept teaching?" has been determined as. The subproblems of the specified problem sentence are:

1. What is the impact of historical places through virtual museums on the academic achievements of female students in the teaching of social studies course concepts?
2. What is the impact of historical places through virtual museums on the academic achievements of male students in the teaching of social studies course concepts?
3. What is the effect of historical places through virtual museums on the attitudes of female students about the lesson in social studies course concept teaching?
4. What is the effect of historical places through virtual museums on the attitudes of male students about the lesson in social studies course concept teaching?
5. Is there a significant difference between virtual museum trips to historical sites applied to the experimental group and the pre-test and post-test in the concept teaching application?
6. Is there a significant difference between the pre-test and post-test in the achievement test applied to the control group?

Method

Model

This research is an experimental model research that examines the effects of historical places on students' academic achievements and attitudes towards the course through virtual museums in teaching the concepts in the Social Studies program of 7th grade students. The experimental method is used to determine the cause-effect relationship of the results observed directly under the control of the researcher (Karasar, 2005, p. 87). Experimental methods make an important contribution to Deciphering and analyzing the causality between variables in studies conducted in the field of social sciences. In this context, research-oriented interpretations become easier (Gürbüz and Şahin, 2018, p. 376).

Sample

In the research conducted, Yavuz Selim Secondary School 7. two groups were formed from the class students. A total of 40 students were selected, including 20 students in each group. In this research, an experimental control group was formed in order to determine the effect of concept teaching in virtual museums and historical places. When deciding which of

the selected groups will be the experimental and which will be the control group, it was treated impartially. The pre-test and post-test academic achievement and attitude scales were prepared and applied to be applied to both groups. The classroom where concepts are processed in historical places with virtual museums constitutes the experimental group; the classroom where the course is processed according to the social studies curriculum constitutes the control group.

Data Collection Tool

In relation to the research, data were obtained by using two different measurement tools. The measurement tools used in the research are the social studies concept teaching achievement test and the Social studies course attitude scale. The necessary permissions have been obtained from the owner of the scale in order to use the social studies attitude scale. In order to measure the students' learning related to the subject, the academic achievement scale applied in the form of pre-test-post-test was used. It was aimed to measure 20 concepts determined by the academic achievement scale. The concepts to be measured by the academic achievement test are as follows:

* Settlement
* Foundation
* Invention
* Chronology
* Continental
* Gaza
* Migration
* Reform
* Monarchy
* Civilization
* Tolerance
* Geographical location
* Common heritage
* Solidarity
* Century
* Era
* Sovereignty
* Conquest
* Milestone
*Independence

In the concept teaching, the “Social Studies Course Attitude Scale” developed by Ilke Evin Gencel (2006) was used to reveal the effect of the use of virtual museums in historical places on students' attitudes towards the course. The attitude scale is in the five-point likert style. There are 35 items in the scale. The scale items were rated as “Not Suitable at All=1”, “Not Suitable=2”, “I am undecided=3”, “Suitable=4”, “Very Suitable=5". The negative items

of the scale were scored in the opposite direction. The maximum and minimum score range that can be obtained from the scale and the range determined for its interpretation are as follows;

Score	Comment
35-59	Very Negative
60-91	Negative
92-126	Moderate Positive
127-155	Positive
156-175	Very Positive

Collection of Data and Analysis

Two different measurement tools were applied in the research. These are determined as "Academic Achievement Scale" and "Social Studies Attitude Scale". The analyses were carried out by using SPSS 20.00 package program for the analysis of quantitative data obtained from the applied scales. The quantitative data obtained from the research were analyzed with the SPSS program using parametric (prametric) and non-parametric (nonprametric) tests. Parametric data are important in terms of giving the strongest results (dependent-independent t test, etc.).

The correct answers given by the students in the achievement test are coded as "1" and the incorrect answers are coded as "0". Since the Likert scale was used in the attitude scale, the answers were graded between 1-5, the total score was calculated and classification was made according to the total scores.

In the comparison of the pre-test and post-test data obtained from the experimental and control groups of the academic achievement scale, the dependent sample t test and independent sample t test were applied to analyze whether there is significance according to various variables. The results obtained as a result of the analysis are tabulated and explained. Arithmetic mean was calculated when determining the average of the scores obtained. In addition, standard stubs were calculated to determine the distance of the results in the distribution to the arithmetic mean. In order to measure the reliability of the applied scales, the Cronbach Alpha coefficient was calculated and indicated. The obtained data were tabulated and the findings were interpreted. The results of the analysis were considered statistically significant with a 95% confidence level and $p<0.05$ values.

Ethical Committee Approval

Yıldız Technical University, Social and humanities ethics committee, 30.09.2024 meeting date, 2024. With the decision of Meeting No. 09, there were no findings contrary to ethics in the study titled “The Effect Of Hıstorıcal Places Through Vırtual Museums On Students' Academıc Achıevement And Attıtudes Towards The Course In Socıal Scıences Course Concept Teachıng" and the information about the data collection tools and methods to be used in this study.

Findings

In this part of the study, the findings and comments obtained from the analysis of the data collected from the experimental and control groups related to the subproblems of the research are included.

1. Findings on the Effect of Historical Places on Academic Achievement of Female Students in Social Studies Course Concept Teaching Through Virtual Museums

The first subproblem of the research is "What is the effect of historical places on the academic success of female students in teaching concepts in social studies course through virtual museums?" It is expressed as. Findings and comments regarding the sub-problem are included in the table.

Table 1

The Findings Obtained by Dependent Sample T-Test Regarding The Effect of Historical Places on Academic Achievements of Female Students İn Social Studies Course Concept Teaching Through Virtual Museums (Control Group)

Control Group		f	$\overline{X}$	ss	t	p
FEMALE	Post-test	8	7,38	1,188	1,000	,351
	Pre-test	8	7,25	1,282		

In Table 1, the pre-test and post-test results of the control group female students were obtained by the dependent sample t test. When Table 1 was examined, the average pre-test score

($\overline{X}$) of female students in the control group, where the course was taught only by applying the Social Studies curriculum, was calculated as 7,25 and the average post test score ($\overline{X}$) was 7,38. The standard deviations of the preliminary test are 1,282 and the post test is 1,188. There is no significant difference between the pre-test and post test scores of the control group female students (t_7=1,000; p>0.05). As a result of the application, there was no significant change in the academic achievements of students who took courses using the traditional method.

Table 2

The Findings Obtained By Dependent Sample T-Test Regarding The Effect Of Historical Places On Academic Achievements Of Female Students İn Social Studies Course Concept Teaching Through Virtual Museums (Experimental Group)

Experimental Group		f	$\overline{X}$	ss	t	p
FEMALE	Post-test	8	19,13	,991	17,567	,001
	Pre-test	8	7,63	1,923		

In Table 2, the pre-test and post-test results of the female students of the experimental group were obtained by the dependent sample t test. Table 2 shows the findings related to the effect of historical places on the academic achievements of female students through virtual museums in the concept teaching of social studies course. In this context, the average pre-test score ($\overline{X}$) of the experimental group of female students was determined as 7,63 in the measurements made before the application. However, the average of the final test score ($\overline{X}$) of the course application made as a result of using historical sites through virtual museums in the concept teaching of the Social studies course has been determined as 19,13. There is a significant deciency between the pre-test and post-test score averages of the female students in the experimental group (t_7=17,567; p<0.05). As a result of the application, it is seen that the use of historical sites through virtual museums in the concept teaching of the social studies course has made a significant change in the academic achievements of female students.

2. Findings on the Effect of Historical Places on Academic Achievement of Male Students in Social Studies Course Concept Teaching Through Virtual Museums

The second subproblem of the research is "What is the effect of historical places on the academic achievement of male students in teaching concepts in social studies course through virtual museums?" It is expressed as. The findings and comments regarding the second sub-problem are as follows: stated in the table.

Table 3

Findings and Comments Obtained by Dependent Sample T-Test Regarding The Effect of Historical Places on Academic Achievements of Male Students in Social Studies Course Concept Teaching Through Virtual Museums (Control Group)

Control Group		f	$\overline{X}$	ss	t	p
MALE	Post-test	12	7,67	1,231	1,483	,166
	Pre-test	12	7,50	1,087		

In Table 3, the pre-test and post-test results of the male students of the control group were obtained by the dependent sample t test. When Table 3 was examined, the average pre-test score ($\overline{X}$) of male students in the control group, where the course was taught only by applying the Social Studies curriculum, was calculated as 7,50 and the average post test score ($\overline{X}$) was 7,67. The standard deviations of the preliminary test are 1,087 and the post test is 1,231. There is no significant difference between the pretest and post test scores of the male students of the control group (t_{11}=1,483; p>0.05). As a result of the application, there was no significant change in the academic achievements of students who took courses using the traditional method.

Table 4

Findings and Comments Obtained by Dependent Sample T-Test Regarding The Effect of Historical Places on Academic Achievements of Male Students İn Social Studies Course Concept Teaching Through Virtual Museums (Experimental Group)

Experimental Group		f	$\overline{X}$	ss	t	p
MALE	Post-test	12	19,42	,793	21,191	,001
	Pre-test	12	7,33	1,557		

In Table 4, the pre-test and post-test results of the male students of the experimental group were obtained by the dependent sample t test. Table 4 shows the findings related to the effect of historical places on the academic achievements of male students through virtual museums in the concept teaching of social studies course. In this context, the average pre-test score ($\overline{X}$) was determined as 7,33 in the pre-application measurements of the male students of the experimental group. However, the average of the post test score ($\overline{X}$) of the course application made as a result of using historical sites through virtual museums in the concept teaching of the Social Studies course was determined as 19,42. There is a significant difference between the pretest and post test score averages of the male students in the experimental group (t_{11}=21,191; $p<0.05$). As a result of the application, it is seen that the use of historical sites through virtual museums in the concept teaching of the social studies course has made a significant change in the academic achievements of male students.

3. Findings on the Effect of Historical Sites on Female Students' Attitudes Towards the Lesson Through Virtual Museums in Social Studies Course Concept Teaching

The third sub-problem of the research is "What is the effect of historical places via virtual museums on the attitudes of female students about the lesson in social studies course concept teaching?" is expressed in the form. The findings and comments related to the third sub-problem are indicated in the table.

Table 5

The Findings and Comments Obtained From The Dependent Sample T-Test on The Effect of Historical Sites on The Attitudes of Female Students About The Lesson Through Virtual Museums İn The Social Studies Concept Teaching Course (Control Group)

Control Group		f	$\overline{X}$	ss	t	p
FEMALE	Post-test	8	125,75	10,660	4,994	0,002
	Pre-test	8	105,75	19,039		

In Table 5, the pre-test and post-test results of the control group female students were obtained by the dependent sample t-test. The analysis was performed according to the mean and standard deviations in the table.When Table 5 is examined, the average pre-test score ($\overline{X}$) of the students enrolled in the course according to the social studies curriculum was calculated as 105,75 and the average post test score ($\overline{X}$) was calculated as 125,75. The standard deviations of the preliminary test are 19,039 and the post test is 10,660. As a result of the application, there is no significant difference in average ($\overline{X}$) between the pretest and post-test attitude scores of female students towards the Social Studies course. It is seen that the average difference in the attitude scale applied before and after the application is not at a high level.

Table 6

The Findings and Comments Obtained From The Dependent Sample T-Test on The Effect of Historical Sites on The Attitudes of Female Students About The Lesson Through Virtual Museums in The Social Studies Concept Teaching Course (Experimental Group)

Experimental Group		f	$\overline{X}$	ss	t	p
FEMALE	Post-test	8	149,63	10,183	10,707	0,001
	Pre-test	8	108,38	8,634		

In Table 6 the pre-test and post-test results of the female students of the experimental group were obtained by the dependent sample t-test. The analysis was performed according to the mean and standard deviations in the table. Table 6 shows the findings related to the effect of historical places on the attitudes of female students towards the lesson through virtual museums in social studies course concept teaching. In this context, the average score of the experimental group of female students ($\overline{X}$) was determined as 108,38 in the pre-test measurements made before the application. However, the average of the son test score ($\overline{X}$) on the attitude scale applied after the study conducted as a result of using historical sites through virtual museums in the concept teaching of the social studies course was determined as 149,63. There is a significant difference between the pre-test and post test score averages of the female students in the experimental group. As a result of the application, it is seen that the use of historical sites through virtual museums in the concept teaching of social studies course creates a significant difference in the effect of female students' attitudes towards the lesson.

The difference between the pre-test and post test averages of the female students in the control group was determined as 20 points. The difference between the pre-test and post-test averages of the female students in the experimental group was found to be 41,25 points. This situation reveals a significant difference in practice between the experimental girl and control girl groups.

4. Findings on the Effect of Historical Places on Male Students' Attitudes Towards the Lesson Through Virtual Museums in Social Studies Course Concept Teaching

The fourth sub-problem of the research is "What is the effect of historical places via virtual museums on male students' attitudes about the lesson in social studies course concept teaching?" is expressed in the form. The findings and comments related to the fourth sub-problem are indicated in the table.

Table 7

The Findings and Comments Obtained From The Dependent Sample T-Test Regarding The Effect of Historical Sites Via Virtual Museums on The Attitudes of Male Students in The Social Studies Concept Teaching Course (Control Group)

Control Group	f	$\overline{X}$	ss	t	p

MALE	Post-test	12	127,17	5,042	6, 964	0,001
	Pre-test	12	116,83	6,740		

In Table 7, the results of the control group of male students before and after the test were obtained by the dependent sample t-test. The analysis was performed according to the mean and standard deviations in the table. When Table 7 was examined, the average pre-test score ($\overline{X}$) of the men in the control group in which the social studies course curriculum was applied was calculated as 116,83 and the average post-test score ($\overline{X}$) was calculated as 127,17.The standard deviations of the preliminary test are 6,740 and the post test is 5,042. There is no significant difference between the pre-test and post-test averages of male students in the control group. As a result of the application, a serious difference could not be achieved in the attitudes of male students who were taught by traditional methods regarding the Social studies course.

Tablo 8

The Findings and Comments Obtained From The Dependent Sample T-Test Regarding The Effect of Historical Sites Via Virtual Museums on The Attitudes of Male Students in The Social Studies Concept Teaching Course (Experimental Group)

Experimental Group		f	$\overline{X}$	ss	t	p
MALE	Post-test	12	152,75	6,047	18, 185	0,001
	Pre-test	12	110,08	5,501		

In Table 8, the results of the experimental group of male students before and after the test were obtained by the dependent sample t-test. The analysis was performed according to the mean and standard deviations in the table. When Table 8 is examined, the findings related to the effect of historical places on the attitudes of male students towards Social studies course through virtual museums in social studies course concept teaching are included. In this context, the average pre-test score ($\overline{X}$) of the experimental group of male students was determined as 110,08. However, the average post test score of the course application conducted as a result of using historical sites through virtual museums in the concept teaching of the Social studies

course was determined as 152,75. There is a significant difference between the pre-test and post test score averages of the male students in the experimental group. As a result of the application, it is seen that the use of historical sites through virtual museums in the concept teaching of the social studies course has caused a significant change in the attitudes of male students towards the Social studies course.

The difference between the pre-test and post test score averages of male students in the control group is calculated as 10,34 points. The difference between the average scores of the pre-test and post test scores of the male students in the experimental group is calculated as 42,67. This situation reveals a significant difference in practice between the experimental male and control male groups.

5. Findings regarding the Significant Difference Between Virtual Museum Visits to Historical Sites Applied to the Experimental Group and the Pre-Test and Post Test in the Concept Teaching Study

The fifth sub-problem of the research is "Is there a significant difference between virtual museum visits to historical sites applied to the experimental group in the concept teaching practice and the pre-test and post-test?" is expressed in the form. The findings and comments related to the fifth sub-problem are indicated in the table.

Table 9

The Findings and Comments Obtained by The Independent Sample T-Test Regarding The Concept Teaching Practice With Virtual Museum Trips in Historical Places Applied to The Experimental Group

	Groups	N	$\overline{x}$	ss	sd	t	p
Experimental	Pre-test	*20*	7,40	1,635	19	28,172	,001
	Post-test		19,30	,865			

The mean ($\overline{X}$) was found to be 7,40 and the standard deviation was found to be 1,635 in the pre-test measurement performed before application to the experimental group. However, the average of the achievement test applied as a result of using historical places through virtual museums in the concept teaching of the Social studies course was found to be 19,30 and the

standard deviation was 0,865. There is a significant difference between the pre-test and post-test score averages of the experimental group (t_{19}=28.172; p<0.05). This situation shows that the use of historical sites through virtual museums in concept teaching in social studies course has a significant impact on the concept teaching process.

6. Findings regarding the Deciency of a Significant Difference Between Pre-Test and Post-Test in the Achievement Test Applied to the Control Group

The sixth sub-problem of the research is “Is there a significant difference between the pre-test and post-test scores in the achievement test applied to the control group?" has been expressed as. The findings and comments related to the sixth subproblem are indicated in the table.

Table 10

The Findings and Comments Obtained by The Independent Sample T-Test Regarding The Pre-Test and Post-Test Achievement Test Applied to The Control Group

	Groups	N	$\overline{x}$	ss	sd	t	p
Control	Pre-test	*20*	7,40	1,142	19	1,453	,081
	Post-test		7,50	1,235			

The average pre-test score applied to the control group before the study was determined as 7,40 and the standard deviation was 1,142. After that, the course was processed in accordance with the Social studies course curriculum and the achievement test was applied as the post test at the end of the process. As a result of the last test, the average score was found to be 7,50 and the standard deviation was found to be 1,235. There is no significant difference between the pre-test and post test scores of the control group (t_{19}= 1, 453; p>0, 05). This situation shows that lecture teaching with traditional methods in social studies course concept teaching does not have a meaningful impact on students' concept teaching process.

Discussion and Results

In the concept teaching of the social studies course, the academic achievement test prepared by the researcher and the attitude scale for the previously prepared Social studies

course were used as a measurement tool in order to determine the impact of historical sites on students' academic achievements and attitudes towards the course through virtual museums. The measurement data obtained in the research were analyzed by quantitative analysis methods and transmitted as is. In the study, 6 sub-problems were created while evaluating the attitudes of historical places towards students' academic achievements and courses through virtual museums during the concept teaching process. The data obtained from the achievement test and attitude scales applied in accordance with the sub-problems were analyzed. The data obtained from the achievement test and attitude scale were evaluated by an expert person and the researcher and the result was reached.

Scientific and technological developments in the world have also changed the traditional processes in education. For this reason, it is aimed to enrich the teaching process with different methods and techniques in teaching and to harmonize education with the developments experienced. Thus, it is possible to realize effective and permanent learning.

As a result of the research conducted, historical places through virtual museums have a positive impact on the academic achievements and attitudes of students towards the course in social studies course concept teaching.

A total of 40 students, including 8 girls and 12 boys from the experimental group and 8 girls and 12 boys from the control group, participated in the research. The results of the academic achievement test and attitude scales applied to the experimental and control group were evaluated according to the sub-problems and the results were reached.

The pre-test scores of the experimental and control groups were obtained according to the independent sample t test results and it was determined whether there was an academically significant difference between the groups at the Deci-sion. According to the results of the analysis, the average of the experimental group was measured as 7,45 and the average of the control group was 7,40. In the study, $p>0.05$ was calculated ($p=0.456$). This situation showed that there was no significant difference between the experimental and control group. In this context, the fact that the groups were in a similar situation to each other provided more precise information in the final test results related to the application.

In the first sub-problem of the research, “What is the impact of historical places through virtual museums on the academic achievements of female students in the teaching of social studies course concepts?" an analysis has been made regarding the answer to the question. According to the results obtained from the academic achievement scale, the effect of historical sites on the academic achievements of female students in the experimental and control group through virtual museums in the concept teaching of the social studies course resulted in favor

of female students in the experimental group. In this context, statistically, there is a significant difference between the experimental and control groups. This situation shows that historical places through virtual museums greatly increase the academic achievements of female students in the teaching of social studies course concepts.

In the second sub-problem of the research, "What is the impact of historical places through virtual museums on the academic achievements of male students in the teaching of social studies course concepts?" an analysis has been made regarding the answer to the question. According to the data obtained from the academic achievement scale, the effect of historical sites on the academic achievements of male students in the experimental and control group through virtual museums in the concept teaching of the social studies course resulted in favor of male students in the experimental group. As a result of statistical data, there are significant differences between male students in the experimental and control groups. This situation shows that historical places through virtual museums greatly increase the academic achievements of male students in the teaching of social studies course concepts.

In the first and second subproblems of the research, concept teaching was carried out to the control group using traditional methods, while the concept teaching process to the students in the experimental group was carried out in historical places through virtual museums. After the application made in the experimental group, it was found that their academic achievements showed a significant difference compared to the control group. In this context, the concept teaching process with virtual museums in historical places, realized with the integration of technology into education, offers an important impact in increasing the academic achievements of students.

When the relevant literature is examined, Avcı and Öner (2015) state that historical sites should be actively used in social studies education. In this context, the contribution of historical places to education is an undeniable fact. Similarly, Hunter and Shull (1992) state that historical sites are effective in linking education with subject areas. Öner (2015) stated that historical places are important in terms of providing differentiation in traditional education. Meydan and Akkuş (2016) state parallel views stating that the use of historical sites offers important benefits in the realization of effective learning. Çepni and Aydın (2015) state that the use of historical places is important in ensuring permanence in learning. Ata (2002) mentioned the situations where it is difficult to make direct trips to historical sites and stated that these situations are problems that restrict the student and the teacher. For this reason, the importance of using virtual museums in minimizing the problems experienced during historical site trips has also been stated in the field summer studies.

Gürbüztürk (2013) stated in his research that applying traditional methods of learning methods to students limits knowledge and therefore modern methods should be used. In this context, interactive learning is one of the different methods. Duman (2013) emphasized the importance of using technological tools that appeal to many senses of students in education in their studies. In this context, virtual museums have important effects on the learning process. Öner (2015) states that virtual museums have an important place in supporting the educational processes of students, especially those who are in the concrete period. Concept teaching occupies an important place in social studies curricula (MEB, 2018). However, studies have shown that the concepts included in the program are not learned by the students at the desired level (Akgun, 2014; Avcı, 2015; Bitlisli, 2014; Boz and Shepherd, 2019; Çakmak, 2006; Çelikkaya and Kürümlüoğlu, 2019; Demirci, 2019; Fidan, 2009; Kayacan, 2010; Öktem, 2006; Özdoğan, 2019; Özkaya, 2019; Çakmak, 2019; Özkaya, 2010; Talay, 2011; Ünlü, 2011). It is seen that this situation is caused by the inability to embody concepts in the concept teaching process (Demirkaya and Karacan, 2016; Memişoğlu and Tarhan, 2016; Özdoğan, 2019; Özkaya, 2010; Soylu and Memişoğlu, 2020). The contribution of virtual museum trips to historical sites to the embodiment of abstract concepts in the minds of students and concept teaching is an undeniable reality. The findings obtained as a result of the research prove this situation.

In the third sub-problem of the research, “What is the effect of historical places through virtual museums on the attitudes of female students about the lesson in social studies course concept teaching?" the answers to his question have been sought. According to the data obtained from the attitude scale of the social studies course, the effect of historical sites on the attitudes of female students in the experimental and control groups through virtual museums in the concept teaching of the social studies course resulted in favor of the female students in the experimental group. As a result of the statistical data, a significant difference was observed between the averages of the attitude scale total scores of the experimental and control groups. The difference between the pre-test and post-test averages of the female students in the control group was calculated as 20 points, and the dec dec difference between the pre-test and post-test averages of the female students in the experimental group was calculated as 41,25 points. This situation shows that historical places through virtual museums have a significant impact on the attitudes of female students about the lesson in social studies course concept teaching. In addition, in the score scale determined in the attitude scale, the pre-test results of the girls in the control group showed that they had a "moderately positive" attitude with an average score of 105,75, while the post-test results showed that they had a "moderately positive" attitude with

an average score of 125,75. The average pre-test score of the female students in the experimental group was calculated as 108.38 and the "medium-level positive" attitude and the average post-test score was determined as "positive level" attitude as 149,63. In the concept teaching studies applied to the experimental group, it has been observed that the use of historical places through virtual museums has an increasing effect on student motivation. This situation proves that concept teaching studies conducted by traditional methods have a weak effect on the attitudes of female students.

In the fourth sub-problem of the research, "What is the effect of historical places through virtual museums on the attitudes of male students about the lesson in social studies course concept teaching?" the answers to the question have been analyzed. There is a significant difference according to the attitude scale results of male students in the experimental and control groups. The difference between the average score of the pre-test and post-test attitude scale of male students in the control group was 10,34, while this difference was measured as 42,67 for male students in the experimental group. This situation shows that historical places have a significant impact on the attitudes of male students towards the lesson through virtual museums in social studies course concept teaching. In addition, in the score scale determined in the attitude scale, the pre-test results of the male students in the control group showed that they had a "moderately positive" attitude with an average score of 116,83, while the post-test results showed that they had the same "positive" attitude with an average score of 127,17. However, the fact that there is a very small difference here does not have a serious impact on the result. The pre-test score average of the male students in the experimental group was calculated as 110,08, indicating a "medium level positive" attitude, while the post-test score average was determined as 152,75, indicating a "positive level" attitude. In the concept teaching studies applied to the experimental group, it has been seen that the use of historical places through virtual museums is effective in increasing student motivation. This proves that the concept teaching studies carried out by traditional methods have a weak effect on the attitudes of male students. It has been determined that the findings obtained as a result of the research contain similar results as the studies of Yildirim and Tahiroğlu (2012). Yildirim and Tahiroğlu (2012) presented the results supporting the study by showing that teaching with virtual museums has a positive effect on students' attitudes.

In the studies conducted by Demirboğa (2010), it was found that virtual museum activities provide positive contributions to students' cognitive and affective sense. However, when the results of the research conducted on virtual museum trips (Ata, 2002; Erim, 2005; Utku, 2008; Akyuz, 2009; Tosun, 2009; Demirci, 2009; Filiz, 2010) are examined, it has been

found that the teaching activities supported by virtual museum trips positively affect student attitudes towards the relevant course and subject.

In the fifth sub-problem of the research, "Is there a significant difference between virtual museum trips to historical sites applied to the experimental group and the pre-test and post-test in the concept teaching application?" the answer to the question was analyzed and the result was reached. As a result of the obtained data, it has been determined that the application of concept teaching with virtual museum trips in historical places makes a significant difference. It has been found that virtual museums, in which technological applications are used in concept teaching applications, significantly contribute to students' academic achievement and attitudes about the course when realized through historical sites. In the sixth sub-problem, "Is there a significant difference between the pre-test and post-test in the achievement test applied to the control group?" the absence of a significant difference in the analyses related to the question shows that the effect of concept teaching activities with traditional methods on students' academic achievement and attitudes is weak.

Recommendations

The recommendations determined in accordance with the findings obtained as a result of the research are listed as follows.

- Historical places of interest and virtual museums can be used for social studies subjects.
- Historical places can be used to teach values and skills to students as well as concept teaching studies with virtual museum visits.
- In social studies courses, historical places can be used more for concept teaching studies with virtual museum trips.
- Virtual museum trips to historical sites can be used to teach concepts that will be acquired not only at the secondary school level, but also from elementary school.
- More activities can be included in the Social studies curriculum and textbooks for concept teaching studies with virtual museum trips in historical places of interest.
- Teacher training programs at the faculties of education can be given more space to studies related to the use of virtual museums.
- Virtual museum education can be further disseminated as an elective or compulsory course at universities for the effective use of concept teaching studies.

- It is recommended that the teacher of the course who will conduct the application plan the teaching process appropriate to the age and educational level of the students in concept teaching studies with virtual museum trips in historical places.
- In-service training can be given to teachers for the planning and implementation of virtual museum visits.
- Since the use of virtual museums is linked to technological infrastructure, infrastructure problems should be resolved by the Ministry of Education.
- Since research-related studies are almost non-existent in the literature, it is recommended that researchers close the current gap by conducting more academic studies in this field.

Ethical Committee Approval

Yıldız Technical University, Social and humanities ethics committee, 30.09.2024 meeting date, 2024. With the decision of Meeting No. 09, there were no findings contrary to ethics in the study titled “The Effect Of Hıstorıcal Places Through Vırtual Museums On Students' Academıc Achıevement And Attıtudes Towards The Course In Socıal Scıences Course Concept Teachıng" and the information about the data collection tools and methods to be used in this study.

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