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The Impact of Artificial Intelligence-Supported Disaster Education in Secondary School Social Studies Classes on Disaster Awareness*

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Abstract

The purpose of this study is to examine the effect of artificial intelligence-supported disaster education on the disaster awareness of secondary school students within the scope of the Social Studies course. The study was conducted in a state secondary school in Osmaniye province during the 2023–2024 academic year, using a pre-test-post-test control group quasi-experimental design. The sample of the study consisted of 60 students in the 7th grade (30 experimental, 30 control). The Middle School Students Disaster Awareness Scale developed by Yetişensoy (2022a) was used as the data collection tool. The experimental group received disaster education using the artificial intelligence tools ChatGPT, Google Gemini, Adobe Firefly, and DALL-E for four class hours; the control group received traditional teaching methods. Independent samples t-test and dependent samples t-test methods were used in the analysis of the data. The findings revealed that the mean pre-test and post-test scores increased significantly ($p<0.01$) in the experimental group. Furthermore, when the post-test scores of the experimental and control groups were compared, a statistically significant difference was found in favour of the experimental group. Although the post-test scores increased in the control group, this difference was not significant. The results obtained show that AI-supported disaster education is an effective method for developing disaster awareness among secondary school students. The findings of the study are consistent with similar studies in literature and provide important evidence regarding the use of technological methods in disaster education. In this context, the integration of AI into Social Studies lessons has the potential to enrich the process of raising disaster awareness.

Keywords: Semi-Experimental Study; Artificial Intelligence-Supported Education; Disaster Education; Disaster Awareness; Social Studies

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Disaster Education and Social Resilience

Disasters are extreme natural events caused by nature or human activities that result in loss of property and life in society. Disasters have the potential to disrupt life and human activities, and their consequences can be devastating (Adanalı et al., 2022; Fuhrmann et al., 2008; Mızrak, 2018). Events occurring in nature (earthquakes, floods, etc.) are not classified as disasters as long as they do not harm people and human capital (Biricik, 2001). Disasters are the consequences of events rather than the events themselves (Disaster and Emergency Management Authority [AFAD], 2014; Şahan & Dinç, 2021). Earthquakes, floods, and tsunamis are examples of natural disasters, while wars, terrorism, and nuclear accidents are man-made disasters (Yetişensoy, 2022a). In our country, due to "geological, geographical, meteorological conditions and strategic location," major disasters are frequently encountered (AFAD, 2018a; Buluş-Kırıkkaya et al., 2011). This situation causes a high rate of property and loss of life, while also disrupting order. In addition to disaster risks, there is debate about whether the built environment in our country is resilient to disasters (Tırış & Erkuş, 2024).

A nation facing a major disaster may lose its human and economic capital significantly in a single blow. The most important measure to be taken against such a major risk is to build a disaster-resilient society. Resilience to disasters relies on action and organisation before the crisis even arises (Thornley et al., 2015). Although disasters are predictable in light of current technologies, it is impossible to know exactly when they will occur (Bartın-Savran & Çetin, 2024). For this reason, disaster response, post-disaster recovery and disaster prevention efforts are crucial and will minimise potential damage. The most important aspect of consolidated disaster management worldwide is preventive measures, and the most effective preventive method is disaster preparedness and education (Baldwin, 1994). It is known that the harmful effects of a disaster can be reduced by taking the necessary measures (Buluş-Kırıkkaya et al., 2011), and the most effective measure is raising disaster awareness among individuals, i.e., disaster education (Gerdan, 2019; Gül & Artvinli, 2023; Değirmenci et al., 2019; Avcı, 2023). Disaster education is of vital importance compared to any other type of education. An individual with high disaster awareness knows what to do before, during and after a disaster and takes precautions for themselves and their surroundings. It is known that disaster education increases disaster awareness in individuals (Clerveaux, 2010; Mızrak, 2018). Another point is the positive effects of disaster education on individuals when provided at an early age. Children, who are weaker than adults in coping with disasters, need to be educated about disasters at an early age to become disaster aware. This education is important because it enables them to spread this awareness not only to themselves but also to other segments of society, especially their parents. (Davis et al., 2003; Peek, 2008; Yetişensoy, 2022a). Schools are the central location for disaster education for children.

The Role of Disaster Education in Middle School Social Studies Lessons

“The Social Studies course is an effective "citizenship education programme" that imparts knowledge, skills, and values related to life and living to middle school students” (Şulek & Aktın, 2023, p. 69). Disasters are among the topics most directly related to human life. Social Studies frequently emphasises concepts related to disasters (Değirmenci et al., 2019). The Social Studies course is particularly important in our country, where disasters occur frequently, so that individuals can acquire knowledge, awareness and the ability to act in response to disasters at an early age.

When examining the Social Studies Curriculum (MoNE, 2023), various learning outcomes related to disasters emerge (SB.4.3.6.; SB.5.3.4.; SB.5.3.5.; SB.7.7.4.). For example, the learning outcome "SB.4.3.6. Makes the necessary preparations before, during, and after a disaster " included in the programme is aimed at raising students' awareness of disasters (Ministry of National Education [MoNE], 2023). Updated with the Türkiye Century Education Model and used in grades 4 and 5, the SSC gives more weight to the concept of disasters in terms of both quality and quantity compared to the previous programme (MoNE, 2023) (MoNE, 2024). This situation can be interpreted as the importance of disaster education and the idea of a disaster-resilient society. It can be said that the learning outcomes related to disaster education at the secondary school level are concentrated in the SSC (Durmuş et al., 2024). Social Studies is important in raising disaster awareness, and various methods can be used to increase retention when teaching this subject (Artvinli & Dönmez, 2023). One such method is AI-supported education, which has become widespread in recent years (Artvinli & Kaya, 2024).

Studies on secondary school students' disaster awareness and perception levels provide analyses of the current situation (Adanalı et al., 2022; Durmuş et al., 2024; Taşkın, 2020), while studies on disaster education contribute to the literature in terms of methods and techniques that can be used in this field. When examining studies conducted on disaster education at the secondary school level, Karataş (2011) examined the effect of using the creative drama method in natural disaster education on the academic achievement of secondary school students; Çakır and Kılcan (2022) examined the effect of scenario-based education on the disaster knowledge and attitude levels of secondary school students; Doğan and Koç (2017) examined the effect of digital games prepared on the topic of earthquakes on academic achievement; Piyadeoğlu-Kaya (2019) examined the effect of disaster awareness education for secondary school students on students' knowledge levels about disasters; and Doğan and Koç (2017) examined the effect of disaster awareness education for secondary school students on students' knowledge levels about disasters. the effect of digitally developed games on academic achievement in relation to earthquakes; Piyadeoğlu-Kaya (2019) investigated the effect of disaster awareness education for secondary school students on their level of knowledge about disasters; Şahan and Dinç (2021) investigated the effect of disaster education provided to secondary school students using the simulation teaching method on their level of knowledge and achievement.

The Use of Artificial Intelligence in Disaster Management

“Artificial Intelligence (AI) is a technology programmed to think and act like a human. Artificial intelligence engines are designed to learn, reason, and solve problems in a manner similar to human cognition” (O'Connor & ChatGPT, 2023, p. 4). This technology simulates human knowledge and thought processes (Huang et al., 2019). Computer programmes and algorithms are used to achieve a human-like intelligence structure. Artificial intelligence encompasses concepts such as deep learning and machine learning (Aubrey, 2016). Today, its use is widespread in sectors such as healthcare, education, transportation, and entertainment. One such area is disaster management. Artificial intelligence has the potential to minimise the possible effects of disasters by analysing meteorological and geological data during pre-disaster, during-disaster, and post-disaster processes (Demirel & Arıkan, 2023). "Pre-disaster

(preparation, damage reduction, and prevention), during-disaster (response), and post-disaster (recovery, reconstruction, and development)" (Angın, 2024, p. 623) processes, it is an important tool for improving the quality of life of people living in disaster-prone areas (Karaca, 2023). Artificial intelligence can make important and valid predictions about disasters such as earthquakes, typhoons and floods by processing clusters of meteorological, seismic and geographically sourced data (Baltazar et al., 2024). For example, artificial intelligence can warn of flood risks by analysing rainfall amounts, determine the direction of spread of forest fires, provide warnings before earthquakes, conduct damage assessment analyses in disaster areas, and guide search and rescue activities through its modelling (Demirel & Arıkan, 2023). On the other hand, data-driven technologies carry the risk of leading to flawed modelling and unreliable predictions due to technical limitations such as data reliability, biases, transparency, and privacy (Chun et al., 2025). From this perspective, the use of artificial intelligence in disaster management presents itself as an area open to debate and development.

Artificial Intelligence-Supported Educational Approaches

With the advancement of science and technology today, significant developments have also been achieved in the field of artificial intelligence. This technology is evolving and becoming increasingly widespread (Huang et al., 2021). With Industry 4.0, a new era in technology has begun, and the use of these technological opportunities in education has come to the fore. Thus, the use of technologies such as artificial intelligence in education has added a new dimension to the role of teachers in education (Eren, 2021). Artificial intelligence has begun to be used today as a new paradigm to traditional educational methods. This period has brought with it new opportunities, potential, and difficulties (Ouyang & Jiao, 2021). If artificial intelligence is not used ethically in the academic field, it can lead to situations such as plagiarism, cheating, and copying, which in turn bring discussions about laziness and academic integrity (O'Connor & ChatGPT, 2023). On the other hand, artificial intelligence in education offers the opportunity to maximise the learning experience independently of time and place with features such as "adaptive learning, personalisation of learning, learning styles, and intelligent teaching systems" (Eren, 2021, p. 199). In line with these opportunities, the use of artificial intelligence technology in education and teaching environments has become increasingly prominent. In fact, many countries have begun to include the use of this technology in education among their national goals (Huang et al., 2021). The use of technology in education provides certain advantages to students and teachers. It can be particularly beneficial in teaching abstract subjects. Technological methods such as simulation, digital games and virtual reality are used in disaster education (Ooi et al., 2019; Solarino et al., 2024; Sujarwo et al., 2018). The use of artificial intelligence technology, like other technological methods, is expected to play an important role in disaster education by simulating abstract parts that students cannot perceive in their minds. Furthermore, AI-based teaching offers considerable advantages over other technological methods in terms of time and cost. While AI applications are improving in performance day by day, their costs are decreasing (Arslan, 2020). This situation indicates that AI-supported disaster education will gain importance in the future.

The use of artificial intelligence technology in education has increased in recent times. This situation provides us with a resource for observing and analysing the positive and negative aspects of artificial intelligence technology. Although the use of technology in disaster education appears in the literature, studies on artificial intelligence-supported disaster

education are quite limited (Artvinli & Kaya, 2024). Similarly, studies related to artificial intelligence in the field of Social Studies Education are quite limited (Seyhan, 2024; Yalçın, 2023; Yetişensoy, 2022b). It is necessary to take advantage of artificial intelligence opportunities to develop Social Studies Education and ensure technological integration (Yetişensoy, 2022b). Therefore, this experimental study is important in terms of its place in literature and its pioneering role for future studies. This study aims to investigate the effect of artificial intelligence-supported disaster education on disaster awareness. In this regard, answers to the following questions were sought:

- Is there a statistically significant difference between the pre-test scores of the experimental group and the control group in which AI-supported disaster education was implemented?
- Is there a statistically significant difference between the post-test scores of the experimental group and the control group that received AI-supported disaster education?
- Is there a statistically significant difference between the pre-test and post-test total scores of the experimental group that received AI-supported disaster education?
- Is there a statistically significant difference between the pre-test and post-test total scores of the control group in which AI-supported disaster education was implemented?

Method

Research Design

This study was conducted using a pre-test post-test experimental design with control groups, one of the quantitative research methods. The quasi-experimental model is a design that attempts to statistically reveal the effect of the independent variable on the dependent variables and allows the findings to be interpreted within a cause-and-effect relationship (Büyüköztürk et al., 2020; Taşkın & Durmuşoğlu, 2024). The experimental and control groups were formed through random assignment. Pre- and post-measurements were conducted for both groups. During the research process, lessons in the experimental group were conducted using AI-supported education, while lessons in the control group were conducted using traditional methods.

Working Group

The study group consisted of 60 pupils (30 experimental / 30 control) attending the 7th grade of a state secondary school in Osmaniye province during the 2023-2024 academic year. The gender distribution of participants is equal in both groups (15 girls/15 boys). The experimental and control groups were randomly assigned from two classes with similar overall weighted grade point averages.

Semi-Experimental Procedure Process

The experimental process encompasses the AI-supported disaster education process. Based on discussions with subject matter experts (a computer engineer and a social studies teacher who has taken an AI seminar), ChatGPT and Google Gemini AI bots were used in the information gathering process, while Adobe Firefly and DALL-E AI bots were used in visual

creation. For example, the command "Give examples of disasters likely to occur around Osmaniye province" was entered into the ChatGPT artificial intelligence robot, and the information provided by the artificial intelligence robot was conveyed to the students. Similarly, when the command "Draw pictures of items that should be in an earthquake kit" was entered into the Adobe Firefly artificial intelligence robot, it presented sample images, and these images were conveyed to the students. Furthermore, the ChatGPT and Google Gemini AI bots provided information such as earthquake assembly areas in Osmaniye, a link to the AFAD website, and an example of a family emergency plan. Although the AI bots provided sufficient resources in terms of "information," they were observed to be inadequate in terms of providing "visuals."

Data Collection Tools

In the study, the Middle School Students Disaster Awareness Scale (MSSDAS) developed by Yetişensoy (2022a) was used as a measurement tool. This measurement tool was the most suitable measurement tool in literature for measuring disaster awareness at the middle school level. The scale consists of a single factor with an eigenvalue of 9.771 and 18 items. Responses were prepared as a five-point Likert scale. The Cronbach's Alpha (α) coefficient reflecting the internal consistency of the test was found to be .949. The data collection tool consists of a single factor. Furthermore, there are no reverse-scored items.

Data Collection and Analysis

The data were collected as follows: Pre-tests were administered simultaneously to the experimental and control groups prior to the experimental procedure. Subsequently, post-tests were administered to the experimental group after the semi-experimental procedure and to the control group after lessons were conducted according to the curriculum. In the analysis of the data obtained within the scope of the study, the Kolmogorov-Smirnov test was first performed to determine whether the data showed a normal distribution (n=30). According to the test results, the skewness and kurtosis values were found to be within the range of +1.5 and -1.5. Based on this, tests for normality (parametric) were applied (Tabachnick & Fidell, 2013). An independent groups t-test was applied to make intra-group comparisons between the pre-test and post-test total scores of the experimental and control groups. For repeated measures, a dependent groups t-test was applied to determine whether there was a difference between the two measurements.

Findings

This section contains analyses of the data collected during the research and the findings obtained.

Statistical Findings Regarding Pre-Test Scores of the Experimental and Control Groups

Table 1

Results of the Independent Samples t-Test for the Pre-Test Scores of the Experimental and Control Groups

Group	N	x̄	S	*t*	*sd*	*p*
Control	30	66.66	3.62	-992	58	,325
Experiment	30	68.03	6.62			

An independent samples t-test was applied to measure the pre-test scores of the students in the experimental and control groups on the Middle School Students Disaster Awareness Scale (MSSDAS) (Table 1). According to the test results, the mean pre-test scores for the control and experimental groups were found to be $\bar{x}$= 66.66 and $\bar{x}$= 68.03, respectively. It can be seen that the mean scores of the experimental and control groups were close to each other before the experimental procedure. Finally, the results of the independent samples t-test were examined (t = -992; p > .05), and no statistically significant difference was found between the mean scores of the groups.

Statistical Findings Regarding the Final Test Scores of the Experimental and Control Groups

Table 2

Independent Samples t-Test Results for the Final Test Scores of the Experimental and Control Groups

Group	N	$\bar{x}$	S	*t*	*sd*	*p*
Control	30	67.53	4.22	-5.563	58	,000
Experiment	30	75.20	6.25			

An independent samples t-test was applied to measure the final test scores of the students in the experimental and control groups (Table 2). According to the test results, the mean final test scores for the control and experimental groups were found to be $\bar{x}$= 67.53 and $\bar{x}$= 75.20, respectively. The means of both groups differed significantly from each other, and a statistically significant difference was found (t = -5.563; p < .05).

Findings Regarding the Comparison of Pre-test and Post-test Scores for the Experimental Group

Table 3

Results of the Related Sample t-Test for the Pre-test and Post-test Scores of the Experimental Group

Test	N	$\bar{x}$	S	*t*	*sd*	*p*
Preliminary test	30	68.03	6.62	-5.136	29	.000
Final Test	30	75.20	6.25			

The results of the dependent groups t-test for the pre-test and post-test scores of the experimental group students are presented in Table 3. According to the test results, the mean pre-test and post-test scores of the students in the experimental group were found to be $\bar{x}$=68.03 and $\bar{x}$=75.20, respectively. The mean scores increased in the group where the experimental procedures were applied, and a significant difference was found in favour of the final tests (t = -5.136; p < .05).

Findings Regarding the Comparison of Pre-test and Post-test Scores in the Control Group

Table 4

Results of the Related Sample t-Test for Pre-test and Post-test Scores in the Control Group

Group	N	x̄	S	*t*	*sd*	*p*
Pre-test	30	66.66	3.62	-1.718	29	,097
Final Test	30	67.53	4.22			

The results of the dependent groups t-test for the pre-test and post-test scores of the control group students are presented in Table 4. According to the test results, the mean pre-test and post-test scores of the students in the control group were found to be $\bar{x}$=66.66 and $\bar{x}$=67.53, respectively. Accordingly, although the mean scores of the control group students showed a slight increase in the final tests, there was no statistically significant difference (t = -1.718; p > .05).

Results and Discussion

This study investigated the impact of artificial intelligence-supported disaster education on students' disaster awareness. The experimental group received four hours of artificial intelligence-supported education within the Social Studies course, and the effects were examined. During this process, questions about disaster topics covered in the Social Studies Curriculum (7th grade) were posed to artificial intelligence engines, the answers were conveyed to the students, and images related to the topics were designed by artificial intelligence and conveyed to the students. The pre-test score averages applied before the experimental procedure were quite close to each other, and no statistically significant difference was found between them (experimental group x: 68.03; control group x: 66.66). However, a significant difference in favour of the post-tests was observed in the group that underwent the experimental procedure (pre-test x: 68.03; post-test x: 75.20; p<0.01). On the other hand, the final tests of the experimental and control groups were examined, and a statistically significant difference in favour of the experimental group was found (control group x: 67.53; experimental group x: 75.20; p<0.01). Finally, the mean pre-test and post-test scores of the control group were examined, and no significant difference was found (pre-test x: 66.66; post-test x: 67.53; p>0.05). In this case, it can be said that the AI-supported disaster education applied to the experimental group had a positive effect on the disaster awareness of secondary school students (p < 0.01). While the scale scores of the control group, which was taught using traditional methods, showed a small increase, the scale scores of the experimental group students showed a greater increase compared to the control group in the AI-supported lesson. This research concludes that AI-supported disaster education is a successful method for increasing disaster awareness among secondary school students. The data obtained from this research is consistent with literature. This is demonstrated in the discussion section below.

The findings of this research reveal that artificial intelligence-supported teaching approaches have significant potential in raising disaster awareness. However, the effectiveness of disaster education depends not only on classroom applications but also on the continuity of national disaster management policies and social resilience programmes. Indeed, the Disaster Management report published by the Disaster and Emergency Management Authority (AFAD) defines disaster education as a fundamental preventive strategy that should be designed for all segments of society (AFAD, 2018a). The study Examples of Disaster Resilient Society

Practices details successful disaster awareness projects implemented through the collaboration of local governments, civil society organisations, and educational institutions (AFAD, 2018b). In particular, the applications carried out between 2012 and 2018 under the National Earthquake Research Programme (NERP) emphasise the need for disaster education to be planned at the national level due to Türkiye's location in the earthquake belt (AFAD, 2018b). Similarly, game-based disaster education applications developed in Nepal by Marahatta et al. (2024) have also demonstrated that innovative methods can yield effective results in countries with different risk profiles. Furthermore, Shoji et al. (2020) reported that dance-based disaster education programmes in Japan significantly increased behavioural awareness. Reports prepared in Türkiye as part of post-disaster recovery efforts reveal that starting disaster education at an early age strengthens not only individual knowledge levels but also social solidarity and resilience capacity (AFAD, 2018b). In this context, AI-supported disaster education applications should be expanded in line with national policy documents and disseminated by preparing guidance documents for teachers and school administrators. Thus, disaster education will be positioned as part of national risk reduction strategies and supported by innovative methods recommended in international literature.

Disaster education varies significantly depending on countries' geographical locations, risk profiles, and cultural contexts. Countries located in earthquake zones focus their education programmes more on earthquake disasters, while coastal countries prioritise topics such as floods, cyclones, and tsunamis. For example, in countries such as Indonesia, which frequently experience tsunami disasters, disaster education places particular emphasis on flooding and tsunami issues (Mustadi & Atmojo, 2020; Atmojo et al., 2023). In contrast, disaster education programmes focusing on earthquake risk are widely implemented in Türkiye and Japan due to the intensity of tectonic activity (Hada et al., 2015; Doğan & Koç, 2017).

There are numerous studies in the literature where disaster education is implemented using both traditional and digital methods (Akçil et al., 2014; Marahatta et al., 2024; Mendonça et al., 2019; Ooi et al., 2019; Shoji et al., 2020; Shyr et al., 2021; Şahan & Dinç, 2021; Yeon et al., 2020). Traditional methods generally encompass drama, storytelling, and scenario-based teaching techniques. For example, the Basic Disaster Awareness Education Programme developed by Boğaziçi University Kandilli Observatory, when applied to secondary school students, has provided a significant increase in the level of conceptual understanding (Akçil et al., 2014). Yeon and colleagues (2020) found in their study with students who had experienced earthquakes in South Korea that disaster education increased learning motivation through positive emotional responses. Similarly, Mangione et al. (2013) story-based disaster education study resulted in a statistically significant increase in students' attention and motivation. Research conducted by Çakır and Kılcan (2022) determined that scenario-based education improves knowledge levels and attitudes towards disasters. Shoji et al. (2020) dance-based disaster education programme strengthened primary school students' ability to develop appropriate behaviours during disasters.

Disaster education programmes conducted using digital technologies also occupy a significant place in literature. Şahan and Dinç (2021) demonstrated that simulation-based teaching significantly increased students' earthquake knowledge. Sujarwo et al. (2018)

achieved meaningful results in reducing disaster risk by using simulations as part of school-based disaster education. In virtual reality-based applications, Ooi and colleagues (2019) reported high levels of attention and user satisfaction in a fire disaster education programme. Rajabi et al. (2022) used virtual reality technology in earthquake emergency training in Iran and found that it yielded higher performance compared to traditional methods.

Digital game-based disaster education applications also make significant contributions. Doğan and Koç (2017) examined the effect of teaching earthquake-related topics through digital games on academic achievement and reported a significant increase in final test scores in the experimental group. Similarly, Solarino and colleagues (2024) emphasised the awareness-raising potential of a game called "Inundation" regarding sea level rise risks. Shyr and colleagues (2021) examined the effects of interactive teaching experiences and digital puzzles on earthquake knowledge in Taiwan, determining that the application increased learning success. The game-based disaster education model developed by Marahatta et al. (2024) in Nepal has led to positive developments in the knowledge and preparedness skills of students, particularly those living in rural areas.

Non-digital methods have also been found to make significant contributions to disaster education. Hada and colleagues (2015) found that an educational programme based on Japan's earthquake early warning system strengthened students' self-help and mutual aid skills during disasters. Research conducted in Brazil by Mendonça et al. (2019) found that risk reduction education on geohydrogeological disasters significantly increased students' awareness levels.

These findings highlight the importance of enriching disaster education with different methods and materials. The common point of the studies is that both traditional and digital approaches have positive effects in terms of disaster awareness, knowledge level and attitude development. However, it is seen that researchers have not reached a definitive consensus on which method is more effective, and different models are preferred in different contexts. This situation reinforces the need to test innovative approaches in the field of disaster education.

The AI-supported teaching approach used in this study offers an original contribution in that it is a method that has been examined in a limited number of studies in literature in the context of disaster education. The flexibility of AI engines in presenting information and their capacity to provide visual support hold significant potential in the process of raising disaster awareness. Integrated into the Social Studies course, this approach has increased students' interest in the subject and provided an interactive environment that supports learning. In this respect, the study highlights the need for more empirical research on AI-based disaster education applications and serves as a guiding example for future work.

Recommendations

According to the results of this study, AI-supported disaster education significantly increases middle school students' level of disaster awareness. Based on these findings, the following recommendations have been developed:

Recommendations for Teachers

- Social Studies teachers should regularly utilise artificial intelligence tools such as ChatGPT and Google Gemini to obtain information on disaster education topics and prepare classroom presentations.

- It is recommended that visual materials related to disasters be created using tools such as DALL-E and Adobe Firefly in the educational process.
- Group work and interactive presentations should be conducted to enhance students' awareness of disaster preparedness.
- Periodic evaluation surveys should be prepared to measure the impact of artificial intelligence-based activities on student achievement.

Recommendations for School Administrators

- The necessary hardware support should be provided for the use of smart boards, internet connections, and licensed artificial intelligence tools in school classrooms.
- Seminars on "Artificial Intelligence-Based Disaster Education" should be organised for teachers.
- Inter-schoolworking groups should be established to share successful application examples.
- Artificial intelligence-supported sample scenarios and a digital content bank should be created in schools.

Recommendations for the Ministry of National Education and Policy Makers

- The Social Studies Curriculum should include explanatory guides supporting the use of artificial intelligence in disaster education learning outcomes.
- An "Artificial Intelligence-Supported Disaster Education Implementation Guide" should be prepared for teachers and school administrators.
- Project calls supported by TÜBİTAK or MEB should be launched to promote disaster awareness, and best practices should be rewarded.

Recommendations for Parents

- Information meetings should be organised for parents to reinforce disaster awareness within the family environment.
- Students should be encouraged to share AI-based materials with their families.

Recommendations for Researchers

- This research should evaluate the retention of AI-supported disaster education through follow-up tests conducted at intervals of 3–6 months.
- Similar studies should be conducted at secondary school and primary school levels to examine differences between age groups.
- Focus group discussions should be conducted to gain a deeper understanding of students' perceptions.

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