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EDITED BY
Peter Bradl,
University of Applied Sciences
Würzburg-Schweinfurt, Germany

REVIEWED BY
Dimiter Velev,
University of National and World Economy,
Bulgaria
Jason Rivera,
John Jay College of Criminal Justice,
United States

*CORRESPONDENCE
Mustafa Oz
✉ moz@utk.edu

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The effect of education types on knowledge level in natural disaster information transfer

Mikail Batu[1], Mustafa Oz[2]*, İlknur Aydoğdu Karaaslan[3], Akan Yanık[4], Şehriban Kayacan[5] and Ebru Dıvrak[6]

[1]Department of Public Relations and Advertising, Necmettin Erbakan University, Konya, Türkiye, [2]School of Journalism and Media, The University of Tennessee, Knoxville, TN, United States, [3]Department Of Journalism, Ege University, İzmir, Türkiye, [4]Department of Marketing and Advertising, Aydın Adnan Menderes University, Aydın, Türkiye, [5]Independent Researcher, İzmir, Türkiye, [6]Department of Marketing and Advertising, Vocational School, Tarsus University, Mersin, Türkiye

This study explores the most effective educational methods for conveying information about natural disasters in large institutions like universities. Focusing on a sample of 405 students from Ege University (Turkey), it examines whether knowledge levels about natural disasters vary based on demographic factors such as gender, faculty, and class year. The findings reveal significant differences in knowledge based on these demographics. The study also shows that disaster education enhances overall knowledge and reduces these demographic disparities. Additionally, it compares the effectiveness of different communication tools—face-to-face, brochures, and videos—demonstrating that face-to-face and video-based methods are more effective than brochures in delivering disaster-related information.

KEYWORDS

natural disaster, disaster education, face-to-face education, video-based education, written education, disaster communication

1 Introduction

Turkey frequently experiences natural disasters due to its geographical location, meteorological, topographical features and geological structure. The two most common types of disasters in Turkey are flash floods and earthquakes. Being located within the Alpine-Himalayan belt, earthquakes in Turkey tend to cause more fatalities compared to floods (Aksoy, 2013, p. 248). Despite the knowledge that Turkey has a young and active geological structure due to its location, the failure to adhere to legal regulations in urban planning (such as roads, housing, industrial facilities, etc.) leads to major disasters when natural events occur (Meydan, 2023, p. 103).

Education enables individuals to increase their knowledge and skills, enhance their self-confidence and awareness levels, strengthen their problem-solving and critical-thinking abilities (Asharose et al., 2015). The direct and indirect contributions of education can reduce an individual's risk and degree of vulnerability. Education aimed at natural disasters is a prime example of this characteristic of education. Knowing what to do before, during, and after a disaster helps individuals and their loved ones survive, contributes to optimizing the post-disaster rehabilitation process, and facilitates a quick return to pre-disaster life (Mızrak, 2018, p. 62). Emergency managers, scientists, and educators conduct various efforts to inform the public about protective measures against disasters (Taştan and Aydınoğlu, 2022, p. 282). Education holds a significant place among these measures. Individuals who receive education on natural disasters, feel better mentally and physically, exchange information, and ensure the spread of education (Cutler and Lleras-Muney, 2006).

It is known that using an empowering approach that encourages the community to be prepared for disasters and threats, instead of fear and threat-based messages, can be more effective in raising awareness about disaster preparedness training in society (Jones, 2013). In addition to frequently preferred brochures and picture series, various tools such as posters, booklets, television, radio, internet and social media, workshops, symposiums, and panels are used (Rohrmann, 1999, p. 251). For instance, videos prepared for various age groups with the aim of informing the public and raising disaster awareness can be broadcasted on national TV channels (Varol, 2019, p. 196; Kara and Altunbay, 2020, p. 159). In Turkey, AFAD (2022a, 2022b) (Disaster and Emergency Management Presidency) and other institutions distribute brochures, posters, and booklets to the public to raise awareness about disasters. Nevertheless, it is observed that the topic is briefly addressed on television and radio programs only on memorial days related to disasters or shortly after devastating events (Özdemir and Şahinöz, 2022, p. 79).

Education and information are among the most crucial elements that enable societies to understand the risks of disasters and enhance their coping skills. Therefore, it is recommended that disaster planning and training activities should be conducted together. Training aims to raise awareness among individuals about potential hazards and risks they may encounter and provide them with information on how to take preventive measures (Gerdan, 2019, p. 104). Education on disasters should be prepared with an interdisciplinary approach, considering different age groups and educational levels, also it should be integrated into the education system with concrete learning tools and group activities, supported by experts (Gerdan, 2019, p. 104; Yasuda et al., 2018, p. 24).

The awareness of disasters contributes greatly to being prepared, behaving correctly before, after and during natural disasters and reducing the loss of life and property. Like in any institution, this situation is also crucial in universities. Institutions with large numbers of members, such as universities, need to transfer their corporate disaster preparations to the individuals who are members by using the right channels and the appropriate type of communication. In this context, when transfer of information is provided by using different types of education about natural disasters, determining which type of education is effective constitutes the purpose of the study.

The study investigates how different educational materials presented to students—such as videos, face-to-face sessions, and brochures—affect their acquisition of knowledge about natural disasters. The research aims to analyze the differences in students' knowledge acquisition before and after training, based on the type of training they received, as well as gender, department, and class variables. In this context, the study evaluates students' preparedness for disasters and emergencies when different educational materials are used according to their gender, faculty, and class level.

2 The hypotheses of the research

The impact of disasters varies according to demographic factors (Walker and Burningham, 2011, p. 217) and it is widely accepted that disasters disproportionately affect different groups (Hao et al., 2022). It is included in the current literature that research on disaster impact focuses on women (Rahman et al., 2023; Makwana, 2019; Bradshaw and Fordham, 2015) and that women show more sensitive behavior to natural disasters (Elçi, 2022, p. 61; Besnili Memiş, 2019; Aydın and Gülerarslan Özdengül, 2024). Determining who is most affected by disasters and under what conditions, and distinguishing why some people are more resilient than others, is important for determining potential policies for future disasters (Deryugina et al., 2018). In a study by Güldü (2023) involving 418 people on disaster awareness perception and coping styles with stress, gender, age, and education level were considered as demographic variables, and significant differences were found. The study, which examines individuals' beliefs in disaster preparedness in the context of demographic data, hopelessness, and fatalism tendencies, found that the level of belief in disaster preparedness was influenced by individuals' family structure. Socio-demographic characteristics (gender, education, income, marital status, etc.) were taken into account. It was determined that the tendency toward fatalism was affected by gender, education level, marital status, and whether individuals received education on disasters and their management (Gökçay and Çevirme, 2023). In a study conducted by Yıldırım (2024) on special education students, disaster literacy was evaluated based on both gender and grade level. The research results indicated a significant difference based on gender among students in the special education department. Additionally, when evaluated by grade level, a significant difference was found between 2nd and 3rd grade students. The level of disaster knowledge may vary depending on the department a person studies in. In their research, Sözcü and Aydınözü (2019) found a significant difference between the faculty they study in and the disaster knowledge level of students. Another study reveals that the level of knowledge gained from education is directly proportional to disaster literacy (Genc et al., 2022). In addition to this, the beneficial effects of disaster-specific education are clearly evident in research findings (Nouichi et al., 2015). In the study conducted by Özyer (2021), since Covid-19 was considered a natural disaster, it was observed that students' scores on the general health and coping strategies scale were not affected by their age, gender, or department. In Atalay (2024) study, conducted to evaluate participants' knowledge levels about earthquakes, significant differences were found in the analysis results based on variables such as gender, experiencing a disaster, and receiving disaster education, while no significance was found for variables like the program of study, grade level, and desire to receive disaster education. In this study, due to the lack of differences such as race and ethnicity among students, only demographic characteristics like gender, faculty, and grade level were evaluated. Therefore, the first hypothesis of the study is as follows:

> *H1*: Participant's natural disaster knowledge levels vary according to their demographic characteristics of them (gender, faculty, class).

The type of educational materials plays an important role in knowledge acquisition. Nagata et al. (2022) found that providing students with video-supported disaster education positively impacted their knowledge acquisition. Likewise, Gampell et al. (2020) also suggest that education delivered through video can be effective for students. In the study by Samarakkody et al. (2023, p. 3), it is mentioned that educators prefer face-to-face education, but they also support the use of digital or video-based education when face-to-face education is not possible. Nonetheless, they said that they could prefer other learning styles if the materials and content were prepared appropriately.

In a study conducted by Akçil et al. (2016), the Boğaziçi University Kandilli Observatory and Earthquake Research Institute sought to

update the Basic Disaster Awareness Education Program. The study involved 70 eighth-grade students and compared the original and updated versions of the program. Results indicated no statistically significant difference between the students participating in the original and updated versions of the program. However, a statistically significant improvement was observed in the conceptual understanding levels of students in the experimental group, who were initially at a disadvantage compared to the control group. This suggests that the educational materials provided to the students were effective in enhancing their understanding. Conducting a training face-to-face can result in higher efficiency as it minimizes barriers to communication flow. However, in situations where face-to-face education is not possible, there is a need for printed informative materials to support learning (Karakuş, 2024, p. 14). Brochures, which are one of the informative materials, have been used for education for a long time and are preferred because of the fact that they are economical and also, they facilitate reaching large audiences (Calhoun et al., 1984, p. 453). However, their cost-effectiveness and ease of distribution can also lead to trust issues (Ali and Salam-Salmaoui, 2024). Despite all of this, in cases where information needs to be distributed on a large scale, the use of brochures is preferred (Gültekin and Cinel, 2024, p. 75; Bakraktar, 2024, p. 57). Educators support the use of instructional materials as they increase efficiency in the learning process (Karakuş, 2024). In a study conducted with students from the Geography Department, the pre-test and post-test method was used to investigate the impact of using video-based materials on knowledge acquisition. The study found that the topic of minimizing damage that can occur after volcanic eruptions became more comprehensible. Additionally, it was noted that not only videos, but also other visual materials can enhance learning and memorization (Nasution et al., 2023). Accordingly, the use of a video, an audiovisual learning tool, together with a printed and visual learning tool such as a brochure can be effective in knowledge acquisition. Sürme and Akman (2021) also view the permanence of brochures as an advantage, as they provide an opportunity to access information again. In the light of this information, the second hypothesis of the study is as follows:

> *H2*: The information provided to participants through different educational materials influences their knowledge acquisition about natural disasters.

3 Methods

3.1 Population- sample

The population of the study consists of 32,639 students enrolled in Ege University (İzmir, Türkiye) during the Spring semester of the 2022–2023 academic year. Based on the sample table referenced by Yazıcı and Eroğlu (2014), the minimum required sample size at a 0.05 significance level is 385 when the population size is 10,000. The number of students participating in the study is 405. Stratified sampling was used due to the differences in characteristics (such as gender, age, knowledge level, etc.) of the population units related to the research topic and the potential variation of these characteristics across different educational departments. In the stratified sampling method, the population containing different characteristics is divided into homogeneous strata. The proportions of each stratum within the population are then determined (Ural and Kılıç, 2011, p. 40). This study cannot be generalized to Izmir or Turkey as it is a descriptive study focused on Ege University.

3.2 The general plan of the research

The study consists of two phases. The first phase is a cross-sectional study measuring students' knowledge levels regarding disasters. The second phase is a case–control study evaluating the effectiveness of the education. At the beginning of the study, brochures, educational texts, and videos were prepared based on AFAD's educational materials. Initially, the "Preparedness for Disasters and Emergencies Survey" was administered to the students. After the first administration of the survey, students received informative instruction through written communication material (brochure), face-to-face education, and videos. Considering the knowledge they acquired, the same students were re-administered the "Preparedness for Disasters and Emergencies Survey" to measure their knowledge levels post-instruction. Changes in knowledge levels before and after the instruction were determined. All the collection of the research data and educational interventions in the study were conducted face-to-face by trained researchers.

3.3 Data collection and analysis

The data in the study was obtained through a survey technique. The survey administered to the students consists of two sections. The first section includes a questionnaire form containing socio-demographic information of the participants, while the second section uses a 25-item questionnaire form developed by Dinçer and Kumru (2021) in their study "Preparedness of Healthcare Personnel for Disasters and Emergencies," which was used with permission.

The scale developed by Dinçer and Kumru (2021) has been used in various studies. For example, it was utilized as a scale in the studies "Measuring the Knowledge and Awareness Levels of Nurses Working in a University Hospital on Disasters" by Avcı et al. (2022), "Evaluating the CBRN Awareness of the Disaster Team in a Fully Equipped Hospital" by Kaynak and Kutlu (2023), "A Research on Vocational School Students within the Framework of Disaster Awareness and Disaster Preparedness Levels" by Çelik (2023), and "Perception of Disaster Preparedness Among 112 Emergency Health Services Workers" by Okan et al. (2023), among others.

The survey used is coded as follows: No: 1, Partially: 2, Yes: 3. A minimum score of 25 and a maximum score of 75 can be obtained from the survey. While the entire survey, along with demographic information, was administered before the training, only the second section of the survey was applied after the training. The survey includes questions regarding the preparedness of institution members for disasters and emergencies, which were analyzed in detail in the study findings. Some of these questions include: "Do you know the scope of incident levels (level 1, level 2, and level 3) in case of a disaster or emergency?," "Do you know how to report an incident in a disaster or emergency?," "Do you know who to contact within the institution in the event of a disaster?," and "Are you informed on how to notify your institution in the event of a disaster if necessary?"

Alongside descriptive statistics, in the evaluation of the data, the frequency distribution[1], the Chi-square analysis,[2] Kruskal-Wallis[3] which is a non-parametric test for comparing the averages between education types, and Wilcoxon signed-rank test used in dependent samples to evaluate the pre-training and post-training status of students' preparedness in disaster and emergency processes has been implemented. The data were analyzed and interpreted at a significance level of 0.05.

3.4 Ethical approval

The Ethical compatibility of the study has been approved by the Research and Publication Ethics Committee for Social and Human Sciences of Ege University, with decision number 06.03.2023-E.1162960. Informed voluntary consent forms have been obtained from all participants.

4 Findings of the study

In the study, students' knowledge of natural disasters was assessed based on gender, faculty, and class variables, and evaluations were conducted before and after training in line with the provided educational materials. This section first presents the descriptive analysis values related to the demographic characteristics and disaster knowledge levels of the students participating in the study. Additionally, students' knowledge levels before and after training were compared based on their demographic characteristics. According to the findings, the student participants consist of 57.8% females and 42% males.

Among the participants, 18.8% are from the Faculty of Literature, 11.6% from Health Sciences, 8.6% from Engineering, 8.1% from Dentistry, 7.4% from the Faculty of Economics and Administrative Sciences, 5.9% from the Faculty of Science, 4.7% from Faculty of Agriculture, 4.2% from Faculty of Medicine, 3.7% from Sports Sciences, and 3.0% from Faculty of Pharmacy. In addition to these faculties, the participation rates of students from Birgivi Islamic Sciences, Nursing, Aquaculture, Fine Arts and Design, and Architecture faculties are, respectively, 2.2, 2.0, 1.2, and 1.2%. Among the students participating in the research, 28.1% are in their 3rd year, 26.2% in their 1st year, 23.2% in their 2nd year, 16.8% in their 4th year, 3.5% in their 5th year, and 2.2% are in their 6th year. 4.2% of participants have previously served during any disaster, 5.9% have participated in disaster and emergency plan preparation and updating efforts, 9.1% have read the current disaster and emergency plan, 9.4% have attended disaster and emergency preparedness training, and 34.8% have participated in disaster and emergency drills.

4.1 Assessment of preparedness for disasters and emergencies based on pre- and post-training knowledge differences

When assessing students' preparedness for disasters and emergencies based on the training provided, it was observed that there were differences in certain areas. Significant differences were found in students' knowledge of the procedures to be applied to individuals with infectious diseases ($p = 0.025$), their awareness of whether their institutions have first aid supplies to assist during a disaster ($p = 0.005$), their knowledge of the procedures to be applied in environmental risks arising from the facility ($p = 0.025$), their experience in serving at any institution during a disaster ($p = 0.014$), their reading of the current disaster and emergency plan ($p = 0.0$), their participation in disaster and emergency preparedness training ($p = 0.002$), and their participation in disaster and emergency drills ($p = 0.005$). It was determined that there were differences in these areas following the students' education through video, face-to-face training, and brochures. According to the assessment, the type of education positively affects students' preparedness for disasters and emergencies. In other words, there is a significant difference between the students' knowledge levels and the training/education provided (see Table 1).

4.2 Evaluation of students' preparedness for disasters and emergencies before education (pre-E.) and after education (post-E.), by gender

Students' preparedness for disasters and emergencies before and after education, based on their gender, was assessed. When evaluating how they would report incidents during disasters and emergencies (B.E. $p = 0.006$ and A.E. $p = 0.354$), whom they would contact within the institution during disasters (B.E. $p = 0.004$ and A.E. $p = 0.610$), how they would report to the institution when necessary during disasters (B.E. $p = 0.025$ and A.E. $p = 0.796$), their responsibilities and duties during disasters and emergencies (B.E. $p = 0.032$ and A.E. $p = 0.003$), gas leakage procedures in their institutions (B.E. $p = 0.016$ and A.E. $p = 0.750$), and procedures to be followed during earthquakes (B.E. $p = 0.017$ and A.E. $p = 0.846$), there was a significant difference observed in knowing the phone numbers to call during disasters and emergencies (B.E. $p = 0.007$ and A.E. $p = 0.893$). However, after the training sessions, it was found that this significance had disappeared. Before the training, women were found to be more knowledgeable about disasters than men and more competent in making decisions on how to act in certain disasters and emergencies. However, after the training sessions, it was observed that this difference disappeared. This is because it was determined that men also acquired knowledge about disaster and emergency preparedness. While there was no significant difference in students' assigned roles in disasters and emergencies (B.C. $p = 0.782$ and A.C. $p = 0.001$), their previous involvement in any institution during a disaster (B.C. $p = 0.352$ and A.C. $p = 0.015$), and

1 Frequency analysis is a statistical technique that shows the observation frequency and percentage distribution of data. Demographic factors, survey items, and categorical or integer research questions are evaluated using frequency analysis (https://www.istmer.com/frekans-analizi-spss-ile-nasil-uygulanir/).

2 It is applied in cross-tabulations (row × column) to assess whether the categories of X and Y variables are independent or dependent on each other (Vehid and Eral, 2015).

3 The Kruskal-Wallis test is a nonparametric, robust test that serves as an excellent alternative to one-way analysis of variance. It is commonly used to test the null hypothesis that "more than two independent samples have been drawn from the same population" (Karagöz, 2010).

TABLE 1 Students' preparedness for disasters and emergencies before and after education.

	Before education			After education		
	Yes (%)	Partially (%)	No (%)	Yes (%)	Partially (%)	No (%)
Do you have any knowledge about the Emergency Color Code System?	25.7	50.3	24	90.9	2.5	6.7
Are you aware of the scope of incident level (Level 1, Level 2, and Level 3) in disasters and emergencies?	11.1	60.7	28.1	88.9	3.5	7.7
Do you know how to report an incident during a disaster or an emergency?	19.5	60.7	19.8	76.3	3.2	20.5
Do you know whom to contact within your organization in case of a disaster?	28.4	53.3	18.3	69.4	9.6	21.0
Do you know how to inform your organization in case of a disaster when necessary?	12.3	65.9	21.7	65.9	5.7	28.4
Do you consider yourself knowledgeable enough about disaster preparedness and disaster management?	9.1	59.3	31.6	48.4	5.4	46.2
Do you know your responsibilities and duties in a disaster or an emergency?	20.2	47.2	32.6	60.7	5.4	33.8
Do you know the limits of your knowledge, skills, and competency in disasters, and when you might exceed them?	11.1	63.0	25.9	51.9	13.6	34.6
Do you know the priorities of medical intervention that should be applied during disasters?	15.1	57.3	27.7	73.3	5.7	21.0
Do you know what individuals affected by a disaster should initially do in their institution?	11.1	64.2	24.7	62.2	10.6	27.2
Do you know the procedure that should be applied to individuals with infectious diseases?	14.3	54.3	31.4	75.3	7.9	16.8
Do you have first aid supplies available in your institution to assist you in case of a disaster?	21.0	53.8	25.2	58.3	24.4	17.3
Do you know if there are experts available in your institution in case of a disaster?	15.6	69.6	14.8	56.5	20.0	23.5
Are you aware of the procedures implemented in your institution in case of a disaster?	11.6	71.1	17.3	59.0	15.3	25.7

(Continued)

TABLE 1 (Continued)

	Before education			After education		
	Yes (%)	Partially (%)	No (%)	Yes (%)	Partially (%)	No (%)
Do you know what your institution should do in case of a disaster?	14.1	65.4	20.5	70.4	6.9	22.7
Are you knowledgeable about implementing emergency response plans, evacuation procedures, and similar functions in your institution during a disaster?	10.1	66.9	23.0	58.3	10.6	31.1
Do you have knowledge about the procedures that should be implemented in your institution in case of fire and explosions?	11.1	65.2	23.7	73.3	7.2	19.5
Do you know the procedures to be followed in your institution in case of a gas leak?	10.9	63.0	26.2	78.8	6.7	14.6
Do you know the rules to be implemented in the institution during a disaster?	14.1	54.1	31.9	68.4	4.7	26.9
Do you know the procedures to be followed in your institution during an earthquake?	18.3	45.7	36.0	76.5	4.4	19.0
Do you know the procedures to be followed in your institution during acts of terrorism and sabotage (bomb threat, suspicious package, attack)?	8.6	73.1	18.3	57.8	9.6	32.6
Do you know the procedures to be followed in your institution in case of a chemical incident?	8.9	73.1	18.0	67.2	8.6	24.2
Do you know the procedures to be followed in case of a potential evacuation in your institution?	11.4	64.7	24.0	62.2	7.4	30.4
Do you know the procedures to be followed for environmental risks originating from the facilities in your institution?	8.9	72.6	18.5	53.3	22.2	24.4
Do you know the phone numbers you should call in case of disasters and emergencies (fire department, police, etc.)?	57.8	28.6	13.6	93.3	1.2	5.4
Do you have an assigned role in case of disasters and emergencies?	3.7	92.1	4.2	12.3	82.0	5.7

participation in disaster and emergency plan preparation and updating activities (B.C. $p = 0.404$ and A.C. $p = 0.015$) before different types of training, significant differences were observed after the training. Before the training, no differences were observed based on gender in the specified situations. However, with the given training, differences emerged between men and women in areas such as taking roles,

preparing, and updating plans for disasters and emergencies. Especially, it was observed that women showed sensitivity to the topic after the training, leading to the observed differences (see Table 2).

4.3 Evaluation of students' preparedness for disasters and emergencies before and after education based on faculty

Before education, significant differences were observed among students based on their faculties regarding their knowledge of the "Emergency Color Code System" (B.C. $p = 0.01$ and A.C. $p = 0.109$), their awareness of incident levels (Level 1, Level 2, and Level 3) during disasters and emergencies (B.C. $p = 0.034$ and A.C. $p = 0.103$), their perception of themselves as sufficiently knowledgeable about disaster preparedness and management (B.C. $p = 0.009$ and A.C. $p = 0.504$), their understanding of the limits of their disaster-related knowledge, skills, and authority, and when they would exceed them (B.C. $p = 0.0$ and A.C. $p = 0.230$), their knowledge of medical intervention priorities during disasters (B.C. $p = 0.0$ and A.C. $p = 0.246$), whether they knew what actions individuals affected by disasters should take immediately within the institution (B.C. $p = 0.009$ and A.C. $p = 0.141$), their knowledge of the procedures to be followed for individuals with infectious diseases (B.C. $p = 0.0$ and A.C. $p = 0.122$), and whether there were experts available in their institution during disasters. Before education, significant differences were observed between students regarding their knowledge of what to do in their institution during disasters (B.C. $p = 0.0$ and A.C. $p = 0.190$), knowing what actions to take in their institution during disasters (B.C. $p = 0.002$ and A.C. $p = 0.217$), whether they had knowledge about the procedures to be followed in case of fires and explosions in their institution (B.C. $p = 0.047$ and A.C. $p = 0.289$), knowing the rules to be followed in their institution during disasters (B.C. $p = 0.035$ and A.C. $p = 0.074$), knowing the procedures to be followed during earthquakes in their institution (B.C. $p = 0.0$ and A.C. $p = 0.141$), knowing the procedures to be followed in case of evacuation in their institution (B.C. $p = 0.0$ and A.C. $p = 0.293$), and knowing the phone numbers to call during disasters and emergencies (fire department, police, etc.) (B.C. $p = 0.0$ and A.C. $p = 0.920$). However, after education, these differences disappeared (see Table 2). The observed differences before education among students based on their faculties are attributed to the faculties in the health field, such as medicine, dentistry, and health sciences, as it can be assumed that, due to their professions, they are knowledgeable about these issues and know what to do in such situations. After education, students from other faculties also became knowledgeable about disasters and emergencies, leading to the elimination of differences based on faculties. Students' understanding of necessary procedures, phone numbers, and rules during disasters and emergencies after education demonstrates the effectiveness of the training provided. However, there was no significance in terms of reading the current disaster and emergency plan (B.C. $p = 0.403$ and A.C. $p = 0.042$) and participating in disaster and emergency plan preparation and updating activities (B.C. $p = 0.451$ and A.C. $p = 0.013$) based on faculties before education, while significant differences were observed after education (see Table 2). Before education, students did not read the necessary documents or participate in activities related to disasters and emergencies; however, after education, they showed more sensitivity and actively participated.

4.4 Assessment of students' preparedness for disasters and emergencies before and after education based on classroom

Before and after disaster and emergency preparedness training, students were evaluated based on their knowledge of their classrooms and the "Emergency Color Code System" (B.C. $p = 0.0$ and A.C. $p = 0.570$), their awareness of incident levels (Level 1, Level 2, and Level 3) during disasters and emergencies (B.C. $p = 0.035$ and A.C. $p = 0.301$), and their understanding of reporting incidents to their institutions when necessary. Before (B.C. $p = 0.011$ and A.C. $p = 0.192$), students were evaluated on their understanding of the limits of their disaster-related knowledge, skills, and authority, and when they would exceed them (B.C. $p = 0.035$ and A.C. $p = 0.407$), their knowledge of medical intervention priorities during disasters (B.C. $p = 0.0$ and A.C. $p = 0.406$), whether they knew what actions individuals affected by disasters should take immediately within the institution (B.C. $p = 0.003$ and A.C. $p = 0.203$), whether they knew if there were experts available in their institution during disasters (B.C. $p = 0.020$ and A.C. $p = 0.623$), whether they were aware of the procedures implemented in their institution during disasters (B.C. $p = 0.012$ and A.C. $p = 0.419$), and what they should do in their institution during disasters. Before (B.C. $p = 0.007$ and A.C. $p = 0.203$), students were evaluated on their knowledge of implementing emergency intervention plans, evacuation procedures, and similar functions within the institution during disasters (B.C. $p = 0.002$ and A.C. $p = 0.243$), their awareness of the rules to be followed in the institution during disasters (B.C. $p = 0.034$ and A.C. $p = 0.068$), and their participation in disaster and emergency plan preparation and updating activities (B.C. $p = 0.013$ and A.C. $p = 0.065$). Significant differences were found based on their classrooms. However, after receiving education, these differences were no longer observed (see Table 2). When differences based on classrooms were evaluated before education, it was determined that students in the 3rd and 4th grades were more aware of being prepared for disasters and emergencies. It could be considered that students in the 1st and 2nd grades are in the adaptation process, and therefore, they may not have awareness of some topics yet. However, the awareness developed in 3rd and 4th-grade students might be attributed to their participation in community service activities or social responsibility projects they have been involved in during the first 2 years. Therefore, informing students about the procedures to be followed during disasters and emergencies starting from the early grades will enhance their preparedness in this regard. After receiving education, differences in preparedness for disasters and emergencies based on students' classrooms had disappeared. However, before education, students had been assigned roles during disasters and emergencies based on their classrooms. While no significant relationship was observed between having previously served in any institution during a disaster (B.C. $p = 0.103$ and A.C. $p = 0.0$), and reading the current disaster and emergency plan (B.C. $p = 0.201$ and A.C. $p = 0.001$) before education, a difference emerged after education (see Table 2). Before the education, there were no differences in students' preparedness for disasters and emergencies, their involvement in roles, etc., based on their classrooms. However, after the education, it was found that students had knowledge, took roles, and performed certain procedures based on their classrooms. Especially, it is observed that 1st and 2nd grade students, who were

TABLE 2 Evaluation of students' preparedness for disasters and emergencies based on gender, faculty, and classrooms.

	Before education			After education		
	Gender	Faculty	Class	Gerund	Faculty	Class
	P	*P*	*P*	*P*	*P*	*P*
Do you have knowledge about the Emergency Color Code System?	0.714	**0.01**	**<0.001**	0.943	0.109	0.570
Do you know the scope of event levels (level 1, level 2, and level 3) in a disaster and emergency situation?	0.451	**0.034**	**0.035**	0.991	0.103	0.301
Do you know how to report an event in a disaster or emergency situation?	**0.006**	**0.001**	**0.002**	0.354	0.254	**0.049**
Do you know who to contact in your institution during a disaster?	**0.004**	**<0.001**	0.758	0.610	**<0.001**	0.072
Are you informed on how to notify your institution when necessary in a disaster situation?	**0.025**	**0.001**	**0.011**	0.796	**0.032**	0.192
Do you consider yourself sufficiently knowledgeable about disaster preparedness and management?	0.638	**0.009**	0.093	0.305	0.504	0.955
Do you know your responsibilities and duties in a disaster and emergency situation?	**0.032**	**0.01**	0.094	0.925	**0.003**	0.481
Do you know the limits of your knowledge, skills, and competencies in disasters and when you might exceed them?	0.442	**<0.001**	**0.035**	0.802	0.230	0.407
Do you know the medical intervention priorities that need to be applied in disasters?	0.120	**<0.001**	**<0.001**	0.573	0.246	0.406
Do you know what should be done by the individuals affected in the institution immediately after a disaster?	0.081	**0.009**	**0.003**	0.515	0.141	0.203
Do you know the procedure that should be applied to individuals with contagious diseases?	0.062	**<0.001**	0.455	0.527	0.122	0.625
Are there first aid supplies in your institution to help you in a disaster situation?	0.059	**<0.001**	0.067	0.071	**0.001**	0.248
Do you know if there are any experts on the subject in your institution during a disaster?	0.256	**<0.001**	**0.020**	0.909	0.190	0.623
Are you aware of the procedures implemented in your institution during a disaster?	0.777	**0.001**	**0.012**	0.844	**0.007**	0.419
Do you know what your institution should do in a disaster situation?	0.325	**0.002**	**0.007**	0.424	0.217	0.203
Do you have knowledge of applying emergency response plans, evacuation procedures, and similar functions in your institution during a disaster?	0.336	**0.006**	**0.002**	0.753	**0.003**	0.243
Do you know the procedure to be followed in case of fires and explosions in your institution?	0.523	**0.047**	0.157	0.633	0.289	0.443
Do you know the procedures to follow in case of a gas leak in your institution?	**0.016**	**0.024**	0.355	0.750	**0.027**	0.259
Do you know the rules to follow during a disaster in your institution?	0.222	**0.035**	**0.034**	0.644	0.074	0.068
Do you know the procedures to follow during an earthquake in your institution?	**0.017**	**<0.001**	0.087	0.846	0.141	0.546
Do you know the procedures to follow in case of terrorism or sabotage (bomb threat, suspicious package, attack) in your institution?	0.938	**0.03**	0.203	0.784	**0.014**	0.279
Do you know the procedure to follow in case of a chemical incident in your institution?	0.146	**0.001**	0.743	0.543	**0.016**	0.064
Do you know the procedure to follow in case of a possible evacuation in your institution?	0.442	**<0.001**	0.231	0.794	0.293	0.245
Do you know the procedures to follow for environmental risks caused by your facility?	0.213	**<0.001**	0.985	0.216	**0.002**	0.595
Do you know the phone numbers to call in case of disaster and emergency situations (fire, police, etc.)?	**0.007**	**<0.001**	0.324	0.893	0.920	0.874
Do you have a defined role in disaster and emergency situations?	0.782	0.386	0.219	**0.001**	0.209	**0.035**

Bold values indicate significant results.

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not sufficiently knowledgeable and did not take roles before the education, were more active in these areas.

4.5 Assessment of students' preparedness for disasters and emergencies based on the type of education

According to the Kruskal-Wallis test statistic, students' preparedness for disasters and emergencies varies depending on the type of education they receive ($p = 0.016 < p = 0.05$). In other words, the type of education they receive affects students' preparedness. In this case, the Mann–Whitney Test was used to determine which type of education is responsible for the difference. When education types were compared pairwise, such as video and face-to-face education, no significant difference was found at the 0.05 significance level ($p = 0.662 > p = 0.05$). Therefore, whether students receive video or face-to-face education does not affect their preparedness for disasters and emergencies (see Table 3).

When comparing video and brochure education types, a significant difference was observed between the two at the 0.05 significance level ($p = 0.008 < p = 0.05$). It was found that the video education type is more effective than brochure in terms of preparedness. Therefore, video education type significantly influences students' preparedness for disasters and emergencies. When comparing brochure and face-to-face education types, a significant difference was observed between the two at the 0.05 significance level ($p = 0.024 < p = 0.05$) (see Table 3). Face-to-face education type is found to be more effective than brochures. Face-to-face education type significantly affects students' preparedness for disasters and emergencies. When the survey was conducted, the most frequent observation value regarding natural disaster levels was "no." However, after providing education through video, face-to-face, and brochure methods, when the survey was conducted again, the most frequent response given by students was "yes." This indicates that knowledge levels increased with the education provided before the research started.

5 Discussion and conclusion

Efforts to increase disaster awareness include the use of written communication methods such as brochures, posters, and booklets, as well as verbal communication methods like seminars, face-to-face training, and videos. In the study conducted by Ataman Bor (2023), students were given education related to disasters. Before the training began, the researcher provided preliminary information about the AFAD training video to the students. Then, the first 35 min of the Disaster Awareness training video, prepared by AFAD in 2021, were shown to them using a projector. After the training, it was determined that the Disaster Awareness Scale (DAS) scores given to the students showed a normal distribution compared to before the training. The ANOVA test conducted on repeated measurements revealed that the total DAS scores before and after the training significantly differed (Ataman Bor, 2023). The findings obtained from this study are also consistent with the literature. Learning through videos is an effective communication tool for increasing students' knowledge levels about disasters.

In their study, Nouchi et al. (2015) provided disaster prevention training to students. It was found that the group using their own pocketbook, which clearly illustrated situations and behaviors during a disaster with pictures, had greater awareness in coping with disasters compared to the group that learned through videos. Similarly, a study conducted by Nouchi and Sugiura (2014) demonstrated that students who used a disaster simulation game book in disaster prevention lessons had higher confidence in coping with natural disasters and adopting necessary safety behaviors compared to the group that learned through videos. Vandiver and Walsh, 2010 also proved that the effect of active learning is directly proportional to the active participation of students. In this study, as techniques such as simulations were not used, it was observed that learning through videos created a significant difference in the level of knowledge.

Yasuda et al. (2018) aimed to determine the impact of disaster education in schools on raising awareness. Game-like activities conducted through group events aimed to increase disaster prevention awareness among school-aged children. Surveys were administered to the study group before the lesson, after the lesson, and 1 month later. The results showed that regional differences affected the level of awareness. In regions with disaster experience, the increase in awareness was found to be short-term; however, in regions at risk of future disasters, the effect was observed to be more long-lasting. This indicates that prior disaster experience affects the level of awareness. Clerveaux and Spence (2009) also developed games aimed at increasing children's disaster awareness. These studies show that ensuring participants feel the threat of disasters and combining tools that encourage their participation in disaster preparedness are important for the success of disaster prevention education.

In their study, Sürme and Akman (2021) preferred brochures to quickly and economically convey information to multiple teachers. The personalized information transmission provided by brochures and their ability to assist in recalling information when needed was considered advantageous. The statistically significant increase observed

TABLE 3 Analysis of students' preparedness for disasters and emergencies based on education types.

	Type of education	*N*	Mean rank	Type of education	Mean rank	Type of education	Mean rank	Type of education	Mean rank
The state of preparedness for disasters and emergencies	Video	125	218.27	125	136.20	125	145.08	–	–
	Face-to-Face	142	211.74	142	132,07	–	–	142	151.17
	Broschures	138	180.18	–	–	138	120,16	138	129.52
	Total	405		267		263		280	
	Kruskall-Wallis H = 8.267 $p = 0.016$			Mann–Whitney U = 8600.500 $p = 0.662$		Mann–Whitney U = 6990.500 $p = 0.008$		Mann–Whitney U = 8283.000 **p = 0.024**	

Bold values indicate significant results.

in the number of correct answers among teachers after distributing the brochures indicates that this method is an effective means of information transfer. It has been observed that informative brochures have the potential to increase teachers' knowledge levels. In this study, it was found that brochures contributed to a significant improvement in disaster preparedness among teachers. In a study conducted in Australia, it was examined whether the public found disaster information materials useful, and it was indicated that brochures and booklets were liked but not widely used (Rohrmann, 1999). In a study conducted by Özdemir and Şahinöz (2022) in Kocaeli, it was found that although the AFAD Provincial Directorate and the metropolitan municipality distributed numerous posters, brochures, and booklets to citizens regarding disaster preparedness and mitigation, the public did not show sufficient interest in these publications, and the expected effectiveness was not achieved. The study concluded that verbal communication channels may be more effective than written communication (Özdemir and Şahinöz, 2022, p. 91). Similarly, in this study, it was found that informing through brochures increased knowledge levels; however, verbal communication significantly increased knowledge levels compared to written communication.

In the study, it was observed that before the training, women were more knowledgeable about disasters and more competent in making decisions during disasters and emergencies compared to men. However, after the training sessions, this difference disappeared. Before the training, no difference was observed between genders regarding taking responsibility, preparing, and updating plans for disasters and emergencies. However, after the training sessions, differences emerged between men and women in terms of taking responsibility, planning, and updating plans for disasters and emergencies. Especially, it was observed that women showed sensitivity to the subject after the training, leading to this difference. The differences observed in students according to their faculties before the training may have originated from faculties in the health field such as medicine, dentistry, and health sciences. This is because it is expected that they have knowledge in these areas due to the nature of their professions, and they should know what to do in such situations. After the training, it was found that the differences in being prepared for disasters and emergencies among students from other faculties disappeared. The rate of students knowing the necessary procedures, phone numbers, and rules for disasters and emergencies increased with the training provided. Before the training, students were not reading the necessary documents to be informed about disasters and emergencies, but after the training, it is noteworthy that they showed more sensitivity and active participation. When differences among students were evaluated according to their classes before the training, it was observed that 3rd and 4th-year students were more competent in being prepared for disasters and emergencies. The lack of awareness among 1st and 2nd-year students could be attributed to their adaptation process to the school environment, where they may not have developed awareness of certain issues. However, the awareness among 3rd and 4th-year students may have developed due to their participation in community service activities or social responsibility projects during their first 2 years. Therefore, informing students about the procedures to be followed in disasters and emergencies from the early grades will enhance their preparedness in this regard. After the training, differences in preparedness for disasters and emergencies among students according to their classes disappeared.

The analyses conducted show a significant difference between students being informed about disasters and emergencies through the provided training. Students' preparedness for disasters and emergencies varies depending on the type of training they receive. In other words, the type of training they receive affects their readiness. When training types were compared within themselves as video and face-to-face training, no difference was found. Therefore, whether students receive video or face-to-face training does not change their preparedness for disasters and emergencies. When compared with brochure-based training, video training was found to be more effective. Similarly, face-to-face training was found to be more effective than brochure-based training. Thus, the type of training is crucial for transferring information for preparedness for natural disasters and emergencies. Brochure-based training lags behind both video and face-to-face training. In other words, while video and face-to-face training show differences compared to brochure-based training, there is no difference between video and face-to-face training types. In this context, video and face-to-face training can be preferred for informing individuals about preparedness for natural disasters and emergencies. Video training can be preferable due to its asynchronous nature (especially due to the possibility of time and location independence).

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving humans were approved by the Ege University Institutional Review Board. The studies were conducted in accordance with the local legislation and institutional requirements. Written informed consent for participation in this study was provided by the participants' legal guardians/next of kin.

Author contributions

MB: Writing – original draft, Formal analysis, Writing – review & editing. MO: Writing – review & editing, Conceptualization, Writing – original draft. IK: Conceptualization, Writing – original draft, Writing – review & editing. AY: Data curation, Writing – review & editing, Writing – original draft. SK: Methodology, Writing – review & editing, Writing – original draft. ED: Methodology, Writing – review & editing, Writing – original draft.

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Conflict of interest

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