Journal of Learning and Teaching in Digital Age, 2024, **9**(2), 129-144
https://dergipark.org.tr/en/pub/joltida
ISSN: 2458-8350 (online)

Review Paper

Design of Online Digital Disaster Training Program for Pre-Service Teachers[1,2]

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ARTICLE INFO

Received: 29 January 2024
Revised: 01 April 2024
Accepted: 15 April 2024

Keywords:
Online Disaster Education
Online Learning Environments
Pre-service Teachers
Taba Model

doi: 10.53850/joltida.1427559

ABSTRACT

At the basic education level, content related to disasters is included in the scope of courses such as Life Sciences, Science, and Social Studies. Studies reveal that teachers and pre-service teachers who conduct these courses are not equipped with the necessary technological and pedagogical skills. It is predicted that integrating disasters and disaster education, which have an interdisciplinary structure, with Web 2.0 technologies, one of today's digital learning tools, will make significant contributions to making disaster education effective. In this framework, the study aimed to design a "Digital Disaster Education Program" in an online learning environment for pre-service primary school, science and social sciences teachers. The study consists of three main parts: designing, implementing, and evaluating the Digital Disaster Education Program. Taba (Grassroots Rationale) model was used in the design of the program. The program, which had a five-day implementation period in the online environment, was repeated three times on different dates and with different participants within a year. In each implementation, 24 pre-service social studies, 24 pre-service science, and 24 pre-service primary school teachers (72 pre-service teachers in total) from across Turkey participated voluntarily. The digital disaster education materials developed by the participants during the program were evaluated with an analytical rubric. As a result, an example of Web 2.0 supported online disaster education programme based on Taba Model has emerged. After the evaluation process, some of the participant products were entitled to receive support by being projected toThe Scientific and Technological Research Council of Türkiye (TÜBİTAK), which is one of the reflections of the positive results of the process. At the end of the study, suggestions were presented for the acquisition of disaster education and digital teaching skills in the pre-service process.

INTRODUCTION

Digital literacy, one of the most important 21st-century skills, was first introduced by Gilster (1997) and used to describe the skills needed to access, manage, and organize digital information, participate in online networks, and evaluate digital resources and services. However, the emergence of concepts such as digital competence, which includes the use of digital technologies for broader purposes, has facilitated the integration of digital literacy into different fields (Ilomäki vd, 2023). These technologies offer students the opportunity to deliver interactive content, provide customized learning experiences, and help students progress at their own pace (Smith et al., 2019) while supporting independent learning by making it easier for students to access course materials online (Brown & Jones, 2020). In this way, students are more engaged in learning and teaching objectives are easier to achieve (García & Martínez, 2017). In addition, it has an increasing importance in terms of contributing to the spread of digital literacy (Anderson, 2016).

Web 2.0 tools are among the most widely used digital learning tools. Web 2.0 tools come to the forefront with their features such as appealing to multiple senses (Prensky, 2009), allowing the user to easily perform tasks specialized in different fields and in various fields, easy use, allowing collaboration and interaction to take place in a natural flow (Atıcı & Yıldırım, 2010), and ease of content creation and sharing (Minocha & Roberts, 2008). The structure of Web 2.0 tools that allow the user to work in flexible time, supporting the creativity of the user (Jarret, 2008), free access and fun content, and easy and effective inclusion in the course environment are among the other reasons for preference (Brown, 2012). There are many studies indicating that Web 2.0 tools are frequently used in digital learning activities (Bryant, 2006; Carrasco, 2006; 2008; Crook et al., 2008). Another important issue is that Web 2.0 tools provide outputs that support social constructivism theory (Lu, Lai, & Law, 2010). Web 2.0 tools, which allow students to be active participants during the lesson and contribute to the content created, also provide users with the opportunity to produce, edit, control, and socialize their content (Horzum, 2007). In this way, students are no longer individuals who take in and consume the information presented to them in the classroom and consume that information; they become an active community of

[1]This study was prepared with the data obtained within the scope of the 2237-A Scientific Educational Activities Support Program with codes 1129B372300156, 1129B372200950, 1129B372200324.
[2]This study is an improved version of the abstract presented in 15th Eurasian Conference on Language and Social Sciences, February 25 - 26, 2023 LITHUANIA

students who produce their own information, reorganize the information they produce, research, and question the source of information.

Disaster Education and the Importance of Using Digital Learning Tools in Disaster Education

The possibilities provided by Web 2.0 digital learning tools offer important opportunities for designing an engaging, hands-on, and activity-based disaster education that covers the skills required to build a disaster-resilient society. It is predicted that the development, management, and use of digital contentwill provide many advantages for students to build their knowledge through active experiences. Concretization of abstract concepts, simulation of activities that are difficult, costly, and dangerous in physical environments [Ministry of National Education (MEB), 2018], and introduction of applications that are not accessible are some of these advantages in terms of disaster education. In addition, risk maps can be created with Web 2.0 tools, and concept maps supported by visuals such as posters, infographics, e-books, and animations, pictures and videos can be created about what to do before, during, and after disasters. Many learning objects such as fishbones, digital stories, and bulletin boards where the causes and consequences of disasters are revealed can be prepared.

Especially those working at the basic education level have important duties in raising disaster awareness required for individuals to realize disasters (Değirmenci, 2019). However, teachers state that the lack of a qualified education experience in disaster education before service is one of the most important problems (Birinci Konur et al., 2023). Considering the diversity of disasters, the importance of disaster education, interdisciplinary cooperation within the scope of holistic disaster management, and the need to meet the achievements outlined in the curricula, it is important to train pre-service teachers who are equipped in every sense.
In teacher education programs, except for the Social Studies Teacher Education Program, it is noted that disaster education courses are offered as electives and students take these courses according to their preferences. In the content of these courses, basic disaster issues are addressed and the multidimensional and interdisciplinary structure of disasters is not mentioned [Council of Higher Education (YÖK), 2018]. In addition, there is no opportunity to practice integrating disaster education with digital learning tools such as Web 2.0 technologies. The fact that there are direct or indirect acquisitions related to natural disasters in many courses, especially life science, science, and social studies courses at the primary school level, makes it necessary for prospective teachers to have a technological pedagogical infrastructure to teach these contents. Thus, studies to overcome such deficiencies through practices outside formal education have gained importance in recent years, and public institutions and organizations have been seen to be in an effort to support them.

In addition, the theme of "Disaster Education" was among the priority issues under the leadership of the Ministry of Interior, and 2021 was declared as "Disaster Education Year" and 2022 as "Disaster Drill Year" under the leadership of Disaster And Emergency Management Presidency (AFAD). In continuation of these developments, following the Kahramanmaraş-centered earthquakes on 06.02.2023, known as the "Disaster of the Century", The Scientific and Technological Research Council of Türkiye (TÜBİTAK) opened the 1002-C Natural Disaster Training Program on 06.02.2023. 2023, 124 projects were supported within the scope of the 1002-C Natural Disasters Focused Field Study Emergency Support Program, 79 projects were supported within the scope of the "Earthquake Research Call" opened under the 1001-Scientific and Technological Research Projects Support Program on 15/02/2021 (TÜBİTAK, 2023a), 1501-Industry R&D Support Program 2023 Special Call for Earthquake Region was announced (TÜBİTAK, 2023b), 2237 "Earthquake Special Call" was launched and 4007 Science Festivals were directed to the region. From these perspectives, it is seen that public institutions and organizations are making efforts to support the region. One of these is the TÜBİTAK 2237-A Scientific Education Activities Support Program, which supports theoretical/practical scientific education activities organized in Turkey. In this context, information is obtained about developments and studies that will contribute to science in national and international fields. It is aimed to bring together trainers and participants from different disciplines to create an infrastructure for interdisciplinary joint scientific studies, to guide the work of the participants, to contribute to their scientific development, and to address educational issues in a multidimensional and in-depth manner (TÜBİTAK, 2023c).

Purpose of the Study

Future prospective teachers must be the ones who will introduce the concepts related to disasters to children and be competent in their fields. Because educational activities in disaster preparedness can affect the dimensions of the disaster. In a study, it was stated that primary and secondary school teachers, starting from preschool, should prepare in this field to their students by associating them with different disciplines, which will also strengthen the interdisciplinary perspective in disaster education (Şeyihoğlu et al., 2021). Based on all these reasons, the problem statement of the research seeks an answer to the only question of the research: "How can a disaster education activity program based on the Taba model be developed in an online environment?"

Activity Program Development Process

"Taba Model" guided the development process of the Digital Disaster Education Activity Program. The model, which consists of seven stages (Ornstein & Hunkins, 2004:193), was seen as an important model in terms of the participation of everyone involved in the curriculum development activity and especially the development of the curriculum by its practitioners. However, it has also been partially criticized for putting the teacher at the center (Erişen, 1998). In the literature review, there is no online and thematic activity

program development, implementation and evaluation process based on the Taba Model. In addition, although there are instructor-centered online main rooms in the activity program, sub-room applications are production-oriented and participant/learner-centered. There are basically three curriculum design approaches: subject-centered, learner-centered, and problem-centered curriculum design, which vary according to the elements emphasized and the differences in the relationships between these elements (Demirel, 2015:44). In this study, the subject-centered curriculum design approach was adopted. Since knowledge and content are accepted as an integral part of the curriculum in subject-centered curriculum design, most of the educational programs have been organized with this curriculum design to date (Ornstein & Hunkins, 2004, 243). In this approach, since the curriculum is organized by subject or course, it is important to structure the content in a way that is easy to understand (Taba, 1962). The Taba Model, which is planned to be designed for the subject-centered approach, is presented schematically in Figure 1 and the details of each stage are explained below.

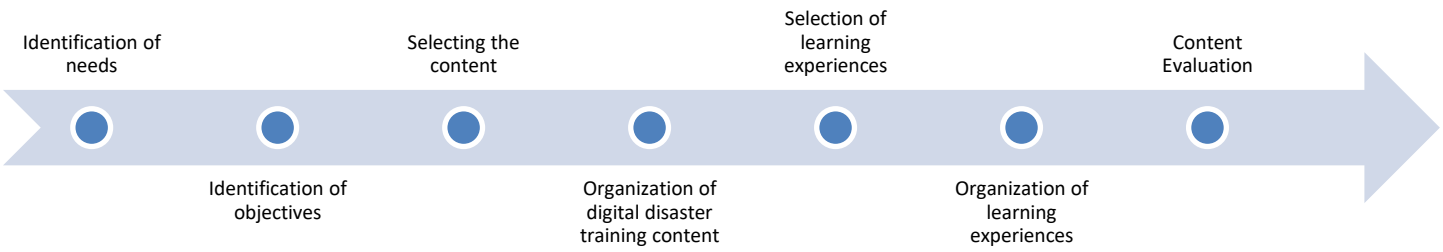


Figure 1. Stages of the Taba Model Used in the Study

According to Taba (1962), in the first stage of the model, student needs are identified, and students' learning needs, interests, and experiences are identified. In the second stage, objectives are formulated, and specific, measurable, and achievable goals are established. In the third stage, content is selected that is in line with the objectives and relevant to students' learning needs. In the fourth stage, the selected content is organized in a meaningful and logical order. In the fifth stage, appropriate learning experiences are selected to enable students to achieve the objectives. In the sixth stage, the selected learning experiences are organized in a sequence that will help students achieve the objectives. In the seventh and final stage, the effectiveness of the curriculum in achieving the objectives is evaluated.

The TABA model was employed in the design of the curriculum because it did not allow for coping mechanisms or repetition. In the TABA model, instead of a deductive process, the curriculum is designed based on teacher o school requirements; in other words, an inductive process is adopted (Oliva & Gordon, 2018). Similarly, in other studies, it can be seen that the TABA model is preferred because it is aimed to determine the needs and design a curriculum (Kasap, & Ergenekon, 2023).

Identification of Needs

According to the Taba model, the curriculum designer determines the needs of the students. The needs assessment process in this research was based on the results of the TUBITAK 4005 project on interdisciplinary disaster education that the researchers had previously conducted. In addition, the needs assessment process of this research was initiated based on the results of the needs analysis conducted by the researchers within the scope of the TÜBİTAK 1001 project. There are different studies in the literature that develop online disaster education curricula. In the study of Kankanamge et al. (2022), an online disaster education study was conducted through a single gamification application. Thangagiri and Naganathan (2016) conducted a disaster education study with an online game. Senanayake et al. (2023) conducted a study on disaster education conducted remotely on different online platforms during Covid 19. These studies conducted a disaster education by going through a single online application or online content. However, in line with the results obtained from the related projects, unlike the literature, there is a need for disaster trainings that can be realized with online Web 2.0 tools that can be updated every period. In this context, pre-service teachers' needs for the curriculum and their justifications are presented in Table 1.

Table 1. Needs and Reasons for Digital Disaster Education

	Needs for Digital Disaster Training	Reasons for the need for Digital Disaster Training
Digital Disaster Training Needs analysis	Pre-service teachers' needs for basic concepts of disaster education	In their natural disaster education activities, teachers develop a teaching-learning process based on their own knowledge and perceptions about natural disasters. It is stated that teachers' lack of knowledge poses a problem in disaster education practices (Seddighi et al., 2021). For example, although pre-service teachers have knowledge about disaster concepts, it is known that this knowledge is not sufficient, and they have some misconceptions (Bozyiğit & Kaya, 2017).
	Pre-service teachers' needs for basic competencies of Web 2.0 tools	As a result of the literature review on pre-service teachers' technological pedagogical content knowledge (TPACK), it is recommended to implement programs that improve technology integration skills (Baran & Canbazoğlu Bilici, 2015). It was seen that being able to use Web 2.0 tools increased pre-service teachers' self-confidence towards TPACK (Tatlı, Akbulut, & Altınışık, 2016).
	Needs for planning Web 2.0 supported disaster education for pre-service teachers in online environment	Digital Disaster education, which covers the dimensions of digital literacy, is a reflection that correctly understands and interprets digitalization in the digital information age and positions it in the right context in the transformation process, as stated by Bozkurt et al. (2021). Considering that disaster pedagogy is one of the least studied topics in the fields of education and disaster (Preston, 2012 cited in Senanayake et al., 2023), it is predicted that the emerging process will respond to an important need. There are findings in the literature that the process including e-book, animation and game design contributes to cognitive behaviors in digital game-supported disaster education (Lin et al., 2013). Studies approaching disaster education in a specific disaster type are more prominent in the literature. For example, although there are studies (Guo, 2023) that try to present a new perspective specific to the flood issue within the scope of digital disaster education with visuals such as graphics and concept maps, it is seen that these studies are not carried out with a contextual and interdisciplinary approach to disaster education. French et al. (1999) also consider that web-based learning is suitable for self-directed learning in which students have more choice of, or control over, not only their learning time and pace but also the objectives or learning outcomes As a result, as Noviana et al. (2022) stated, it is important to expand the use of digital learning tools in disaster education since disaster literacy for elementary level pre-service teachers will be used to build the conceptual structures of their students in the future.

Identification of Objectives

In this section where the curriculum designer determines the objectives, the objectives of digital disaster education are included. In this context, based on the TÜBİTAK 4005 and TÜBİTAK 1001 projects of the researchers, two main objectives were determined in the project in order to provide "a holistic disaster management that prioritizes risk reduction in order to minimize the loss of life and property due to disasters in our country, which is sensitive to disasters" (On İkinci Kalkınma Planı, 2023, p.24) as stated in the Twelfth Development Plan. The first objective is related to the disaster subject area and the second objective is related to digital literacy that mediates disaster education. Equipping prospective teachers with appropriate knowledge and skills, especially for disaster management activities is a necessity for the new generations to be raised. In this way, teachers who can understand the disaster risk reduction and recovery process will be able to play an active role in the disaster preparedness process of schools (Alim et al., 2020). In 2018, the Council of Higher Education (YÖK) implemented a new systematic by changing the curricula of faculties of education, and all faculties of education in Turkey were restructured in line with a core curriculum. In this restructuring, the "Disasters and Disaster Management" course was added under the title of "Field Education Elective" in the Primary School Teaching Undergraduate Program of "YÖK Teacher Training Undergraduate Programs". In the Social Studies Teacher Education Undergraduate Program, there is a course called "Disasters and Disaster Management" as a compulsory course. The content is indirectly included in the "Field Education Elective Courses" in the Science Teacher Education Undergraduate Program as a partial topic in courses such as "Applications of Science in Technology", "Science and Technology Based Problems", "Chemical Wastes, and Environmental Pollution". The fact that disaster education is limited to the Social Studies Teacher Education program is seen as a negative situation for other teacher training programs. On the other hand, Higher Education Institutions and instructors are faced with the problem of how to realize a more effective education process with different conditions and diverse student groups with the dynamics of the digital age (Taşkıran, 2017). Martin and Grudziecki (2006), while defining digital literacy, emphasized the processes such as identifying, accessing, managing, integrating, and evaluating digital resources as well as constructing new knowledge, creating media content, and communicating in daily life. Moreover, when pre-service teachers are evaluated in terms of digital literacy, the experience with Web 2.0 tools acquired in the Instructional Technologies course may be weak at the point of associating with disasters.

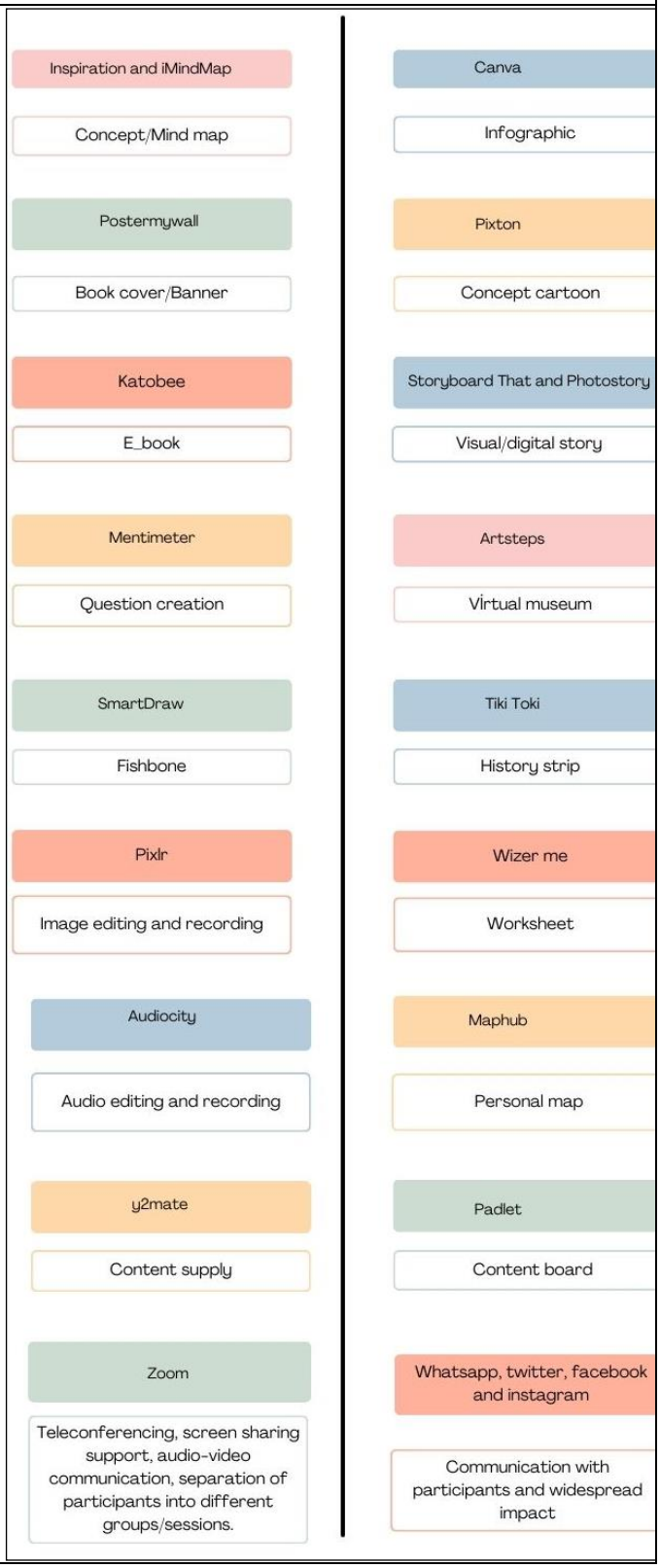
Selecting the Content

According to the Taba Model, the objectives determine the content of the curriculum. Due to the interdisciplinary nature of disasters and disaster education, the opinions of experts from different disciplines were needed in the process of determining the content. While creating the content within the scope of Digital Disaster Education, the opinions of instructional technology experts, subject area experts (Science, Social Sciences, Primary School Teaching), educational drama experts, and graphic design experts were taken into consideration. The Web 2.0 tools that instructional technology experts deemed appropriate overlap with the digital applications that can be integrated with teacher education and disaster education identified by Çelik (2021) (Table 2). Time management, cost, accessibility, and ease of use are among the factors affecting the selection.

Table 2. Digital applications that can be integrated with teacher training and disaster education (developed from Çelik, 2021)

Application Categories	**Web 2.0 Tools**
Mind mapping	Inspiration 10, *iMindMap*, Wisemapping, Pooppet, SpiderScribe, Mindmeister, MindMaple Lite, Gocongr, Coggle, Mindomo, vb.
Creating board	Padlet, Blendspase, Lino it, Wordle, Bubble, RealtimeBord, vb.
Creating poster and caricature	Canva, Postermywall, Word Art, Make Beliefs Comix, Toondoo, Sketch toy, Face Your Manga, vb.
Writing book and story	Pixton, Katobee, Storyboard That, Storyjumper, Storybird, Wattpad, Joomag, Pageflip, vb.
Note taking and blog creation	Evernote, Trello, Blogger, Tlumblr, Glogster, vb.
Test and puzzle creation	Mentimeter, Flippquiz, Puzzlemaker, Kahoot, Plickers, Quiziz, Socrative, LearningApss CrossWordLabs, Triventy, vb.
Presentation and animation	Powtoon, Prezi, Buncee, Emaze, Vyond, Voki, Mine-İmator, Scracth, vb.
Information poster and infographic preparation	Postermywall, Easelly, Visme, Piktochart, Venngage, Creately, vb.
Distance education and virtual classroom	Zoom, Edmodo, Moodle, Classdojo, Remind, Beyaz Pano, Google Clasroom, Adobe Connect, Bigbluebutton, EBA, vb.
Virtual and augmented reality	Artsteps, Aurasma, Quiver, Morfo, Augmented Reality (AR), Nearpod, Uzay 4 D, Animal 4D, vb.
Film and video editing and design	Pixlr, Photostory, y2mate, Audiocity, Thinklink, GIMP, Mowi maker, Safeshare, OpenShot, Filmora, Nimbb, Jing, SmartDraw, Vocaro, Davinci 15 Beta, AppInventor, vb.
Social media	Whatsapp, Facebook, Instagram, Blog, Wiki, Youtube, Skype, Hangout, WebQuest, vb.
Spatial analysis	Maphub vb.

Figure 2. Contents Developed with Web 2,0 Tools within the Scope of Digital Disaster Education



Among the digital applications that can be integrated into teacher education presented in Table 2 (developed from Çelik, 2021), the Web 2.0 tools included in the scope of Digital Disaster Education and the contents developed with these tools are given in Figure 2. When Web 2.0 tools in Table 2 and Figure 2 are analyzed, it is seen that most of them have accessibility, cost, and ease of use features.

Apart from the content creators, the trainers of the training program consisted of experts in the fields of instructional technologies, science, primary school education, social studies, graphic design, and drama. Disaster education is an interdisciplinary theme within the scope of Life Science, Science and Social Studies courses at the primary and secondary school level. For this reason, a teaching environment suitable for interdisciplinary cooperation was designed for Primary School, Science, and Social Studies Pre-Service Teachers.

Organization Of Digital Disaster Training Content

While organizing the content, the content should be organized in an order. For this reason, while planning the activities in the Digital Disaster Education Program, a single room was created for courses such as opening, program introduction, creative drama, and curriculum outcome analysis, and the instructor and all pre-service teachers were provided to interact. Similarly, during the introduction of Web 2.0 tools, instructional technology field experts and pre-service teachers were together in an online room. After the introduction of the Web 2.0 tool, 4 sub-rooms were created and 6 pre-service teachers, 2 from different fields (Science, Social Studies, Primary School Teaching) were placed in each room. Each sub-room was visited by experts in the fields of Instructional Technology, Science, Primary School Teaching Education, Social Studies and Graphic Design, who guided the participant pre-service teachers. In the process design, care was taken to ensure a high level of interaction between pre-service teachers from different disciplines and faculty members. The online environment structure and functioning of the Activity Program are presented in Figure 3.

Figure 3. Online Structure and Process of the Digital Disaster Education Activity Program

As can be seen in Figure 3, the trainings were carried out synchronously, divided into 4 sub-chambers (6 participants in each room) in sessions with 24 prospective teachers who will participate in online activities and science, social sciences, primary school teaching, graphic design and instructional technologies experts who will provide training/presentations to the participants during the training process.

The Digital Disaster Training, which has a five-day training content, was planned as a total of 40 lesson hours (111 hours with synchronous sub-chambers) in line with the stated purpose. The training was organized 3 times with 3 and 9-month intervals without changing the content of the training. During the event, all pieces of training and workshop activities were conducted in online learning environments. On the other hand, the planned trainings were organized in 45-minute sessions, allowing the participants to be positioned in separate rooms in interdisciplinary homogeneous subgroups in the following sessions.

Selection of Learning Experiences and Organization of Learning Activities

At this stage, the program creator selected engaging teaching methods and then organized the learning activities. Detailed information about the methods used in the five-day program and about Web 2.0 tools is as follows:

The first activity of each day is drama. In the drama sessions, which were planned online by the drama leader and tried to create the basis and motivation for the following activities, it was aimed to develop cooperation between the participants. For example, the drama session before the digital story was prepared was orientated towards producing a story with group work.
On the first day of the program, during the first lesson, prospective teachers got acquainted with each other using the drama method. Afterwards, a general introduction to the Digital Disaster Education Activity Program and its objectives were presented. On the first day, pre-service teachers used Web 2.0 tools like Inspiration and iMindMap to develop mind/concept maps, identifying basic concepts related to disasters and enhancing their maps. They became aware of the classification and subtypes of disasters, which guided them in choosing disaster types in the following days. MapHub was used to create personalized maps for disaster education. Base maps were enhanced with markers, lines, polygons, labels, photos, and data (in GeoJSON, Shapefile, KML, GPX, or CSV formats). Important disaster locations were marked on the map, and commented upon, and relevant disaster information (text, visuals, animations, links, etc.) was added. The days ended with free workshop activities. During these workshops, prospective teachers had the opportunity to review what they learned and address any gaps in the materials they developed using Web 2.0 tools under the guidance of instructors.

The second day started with drama. Later, infographics with Canva, timelines with Tiki Toki, and worksheets with Wizer.me were prepared. After instruction by teaching technology experts, pre-service teachers, divided into breakout rooms, developed Digital Disaster Education materials under the guidance of experts in science, social studies, primary school teaching education, and teaching technologies. In free workshops, they reviewed their knowledge, addressed any gaps, and interacted with subject matter experts.

On the third day, teachers began with drama and received training on using Canva to prepare e-newspapers about natural disasters, using SmartDraw to create cause-effect-based "fishbone" diagrams for disaster education, and using Pixton to prepare concept cartoons to identify misconceptions in disaster education. To transfer the relevant Web 2.0 tools to disaster education, pre-service teachers were assisted by experts in science, social studies, primary school teaching education, and teaching technologies in 4 breakout rooms. Any gaps identified in the free workshop were addressed with the help of experts.

On the fourth day, pre-service teachers similarly started with drama. Digital story scenarios for disaster education were developed using Storyboard That. In this context, they gained knowledge in creating digital stories with Storyboard That, storyboards with Photostory, and downloading, editing, and adding audio with y2mate and Audiocity. After instruction by teaching technology experts, they were divided into breakout rooms to produce content with the relevant Web 2.0 tools under the guidance of experts. The day ended with a free activity hour to address any deficiencies.

Lastly, on the fifth day of the Digital Disaster Education, pre-service teachers again began with drama. Original poster/book cover designs for disaster education were developed using Postermywall, contributing to the corporate identity of the activity program. They developed e-books using Page Flip, placing all the products they produced within the scope of disaster education into the Digital Disaster E-Books they prepared. Artsteps was used to create a Virtual Museum application where various content developed in different Web 2.0 environments related to disaster education was brought together and displayed. A bulletin board was created using Padlet. The developed posters were also used in the promotion of the Virtual Museum and E-books. The Digital Disaster education content developed over five days was shared through these activities, evaluated, and after final edits, used for dissemination. Any deficiencies identified based on scoring keys and expert opinions were addressed.

Examples of Materials Developed within the Scope of Digital Disaster Education Activity Program

In this part of the study, examples of the materials developed by pre-service teachers for disaster education with different Web 2.0 tools are presented. The presented contents were developed by the participants within the limited time during the implementation and presented in their original form.

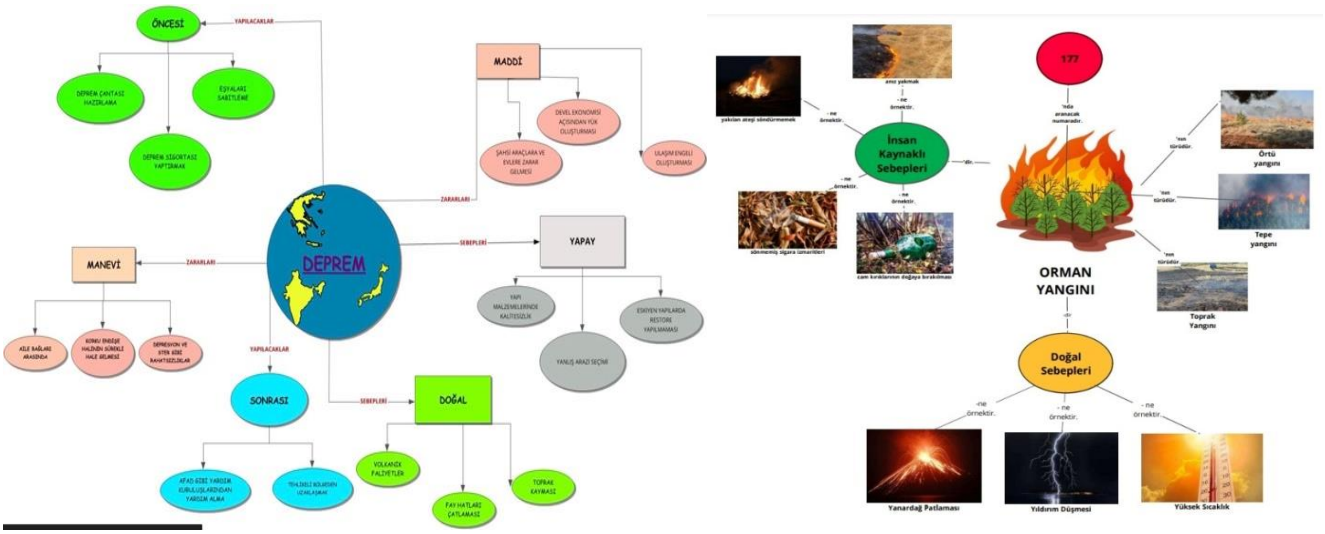


Figure 4. Concepts of Digital Disaster Education with iMindMap

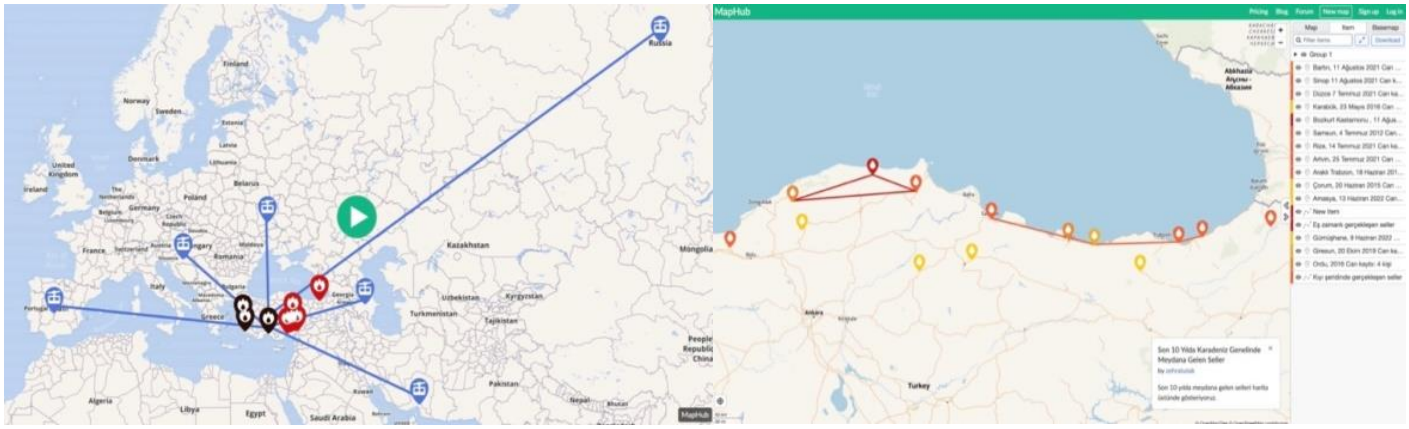


Figure 5. Maps of Digital Disaster Training with MapHub

Figure 6. Infographics of Digital Disaster Training with Canva

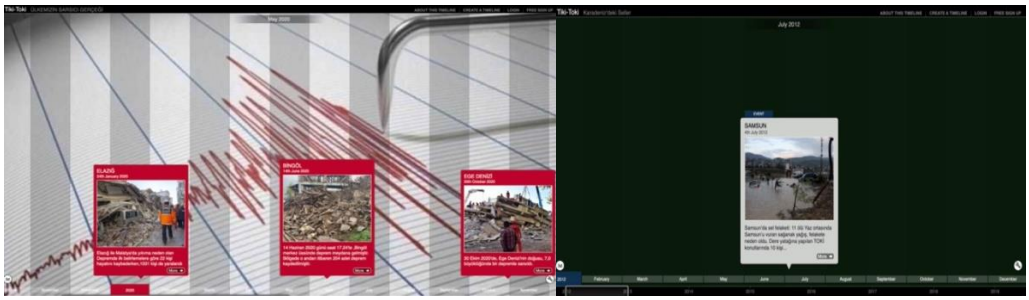


Figure 7. Tiki Toki History Strip of Digital Disaster Training

Figure 8. Worksheets of Digital Disaster Training with Wizer.me

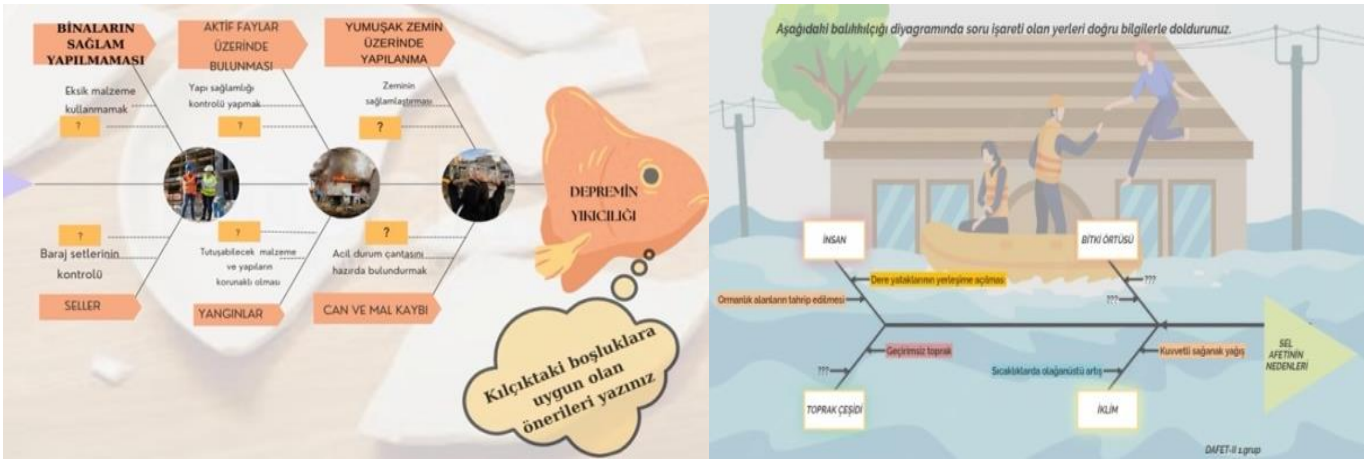


Figure 9. Fishbone of Digital Disaster Training with SmartDraw

Figure 10. Digital Newspaper of Digital Disaster Training with Canva

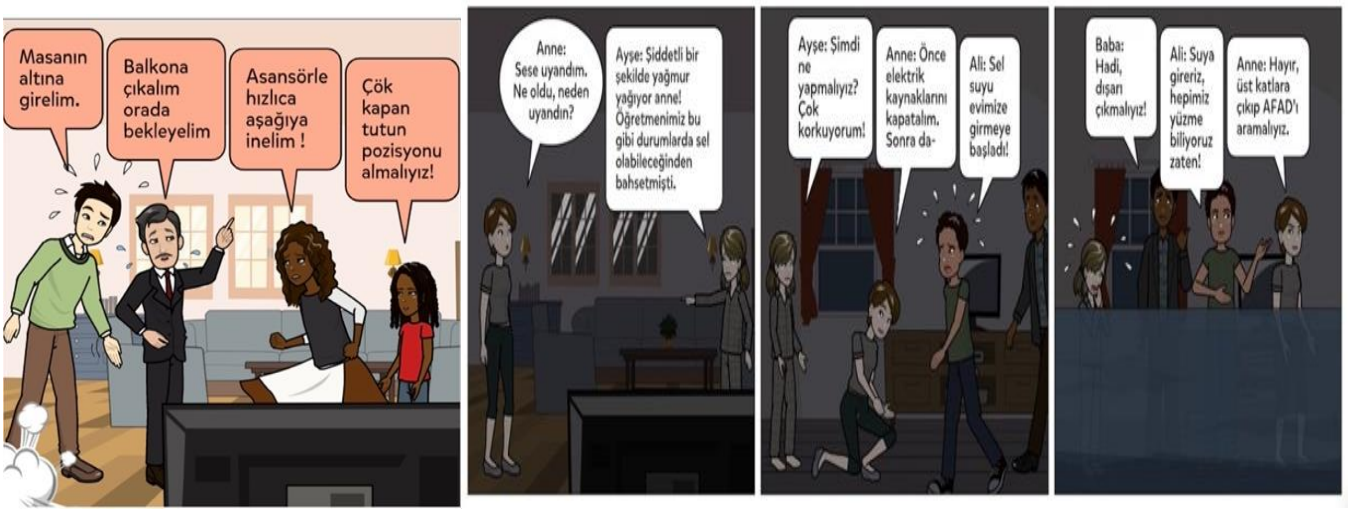


Figure 11. Concept cartoons of Digital Disaster Training with Pixton

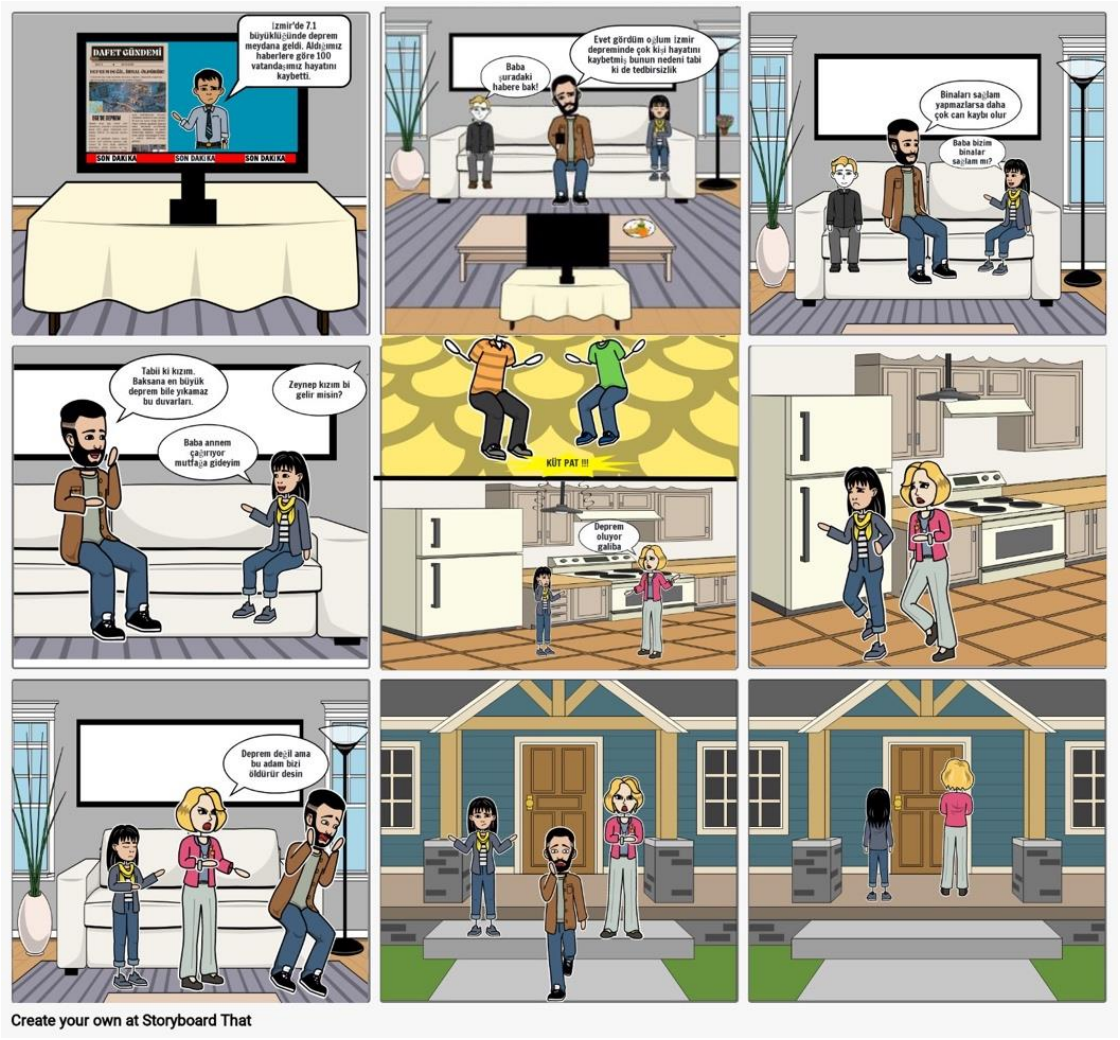


Figure 12. Digital Stories of Digital Disaster Training with Storyboard That

Figure 13. Posters of Digital Disaster Training with Postermywall

Figure 14. Disaster Training with Page flip E-Books of Digital

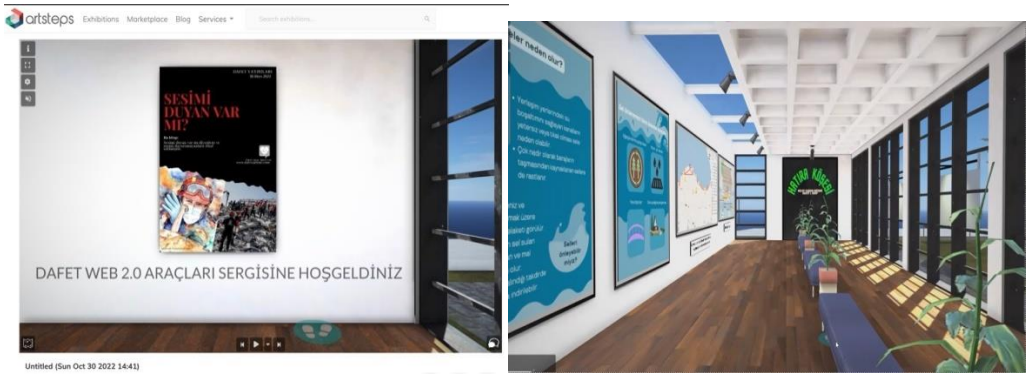


Figure 15. Virtual Museum of Digital Disaster Training with Artsteps

Evaluation and Assessment Tools

The level of realization of the goals determined according to the Taba Model is evaluated. In the Digital Disaster Education product evaluation process, the materials developed by the pre-service teachers were evaluated with the "Analytical Rubric" developed by the researchers. In the process of rubric development, the process steps put forward by Andrade (1997) were taken into consideration. Accordingly, the literature on the evaluation topics required for online disaster education was examined, and then the criteria were determined. Criteria, definitions and scoring levels were created. After the draft rubric was prepared, it was sent to the experts in the fields of ITET, Primary School, Science, Social Studies, Turkish Language and received feedbacks. Afterwards, a pre-application was conducted with three pre-service teachers from outside the application group. Afterwards, the draft rubric was revised and finalized according to the field expert feedback and the feedback from the pilot applications. These evaluation criteria were shared with the pre-service teachers and they were asked to be taken into consideration during the material preparation process (Table 3). Field experts were asked to evaluate the materials based on "Needs improvement (1 point)", "Good (2 points)" and "Very good (3 points)" performances according to the criteria of scientific content, interdisciplinary association, number and effective use of Web 2.0 tools, originality, association with learning outcomes, use of method-techniques, use of visuals and music, and compliance with visual design principles. For example, in the study in which concept cartoons were evaluated, the product that made a scientific error in the concept cartoon, made an association with only one discipline, used this concept cartoon with only one web 2.0 tool and made an association with only one outcome was scored as "good (2)". On the other hand, the concept cartoon that made a "subjective" error instead of a scientific error, made no association with any discipline, worked with a single web 2.0 tool and did not associate with any outcome was scored as "should be improved (1)". On the other hand, products that used all scientific information about disaster correctly, made three or more associations, used more than two web 2.0 tools, made associations with at least two different learning outcomes, followed visual design principles and developed original content were scored as "very good (3)".

Table 3. Digital Disaster Education Analytical Rubric

Criteria	Performance Level		
	Needs Improvement (1 Point)	**Good (2 Point)**	**Very Good (3 Point)**
Scientific Accuracy of Content	The content prepared by the student contains scientifically incorrect information about disasters.	The content prepared by the student contains partially incorrect scientific information about disasters.	All information related to disasters in the content prepared by the student has been used scientifically correctly.
Interdisciplinary Relationship	The created content has not been related to any discipline.	Content is related to a single discipline.	The content is related to three or more disciplines.
Number of Web 2.0 Tools Used	Only one Web 2.0 tool was used in the created content.	At least two Web 2.0 tools were used in the created content.	More than two Web 2.0 tools have been interrelated in the content created.
Effective Use of Web 2.0 Tools	Web 2.0 tools in the created content were not used for their intended purpose.	Web 2.0 tools in the created content were partially used for their intended purpose.	The Web 2.0 tool in the created content was fully used for its intended purpose, correctly chosen.

Originality	The content prepared by the student is the same as its counterparts and ordinary.	The content prepared by the student is inspired by its counterparts.	The content prepared by the student is very different and original compared to its counterparts.
Linking to Educational Outcomes	The prepared content is not related to any curriculum outcome.	The prepared content is related to only one/partially to curriculum outcomes.	The prepared content is related to at least two/appropriately to curriculum outcomes.
Method-Technique Use	No different method or technique was used along with the Web 2.0 tool in the content.	A different method or technique was used along with the Web 2.0 tool in the content.	More than one different method or technique was used along with the Web 2.0 tool in the content.
Visual Use	Attention was not paid to the selection of visuals related to the subject in accordance with the structure of the Web 2.0 tool in the prepared content.	The visual selected in accordance with the structure of the Web 2.0 tool in the prepared content is related to the subject, but it could be more effective or eye-catching.	The visual selected in accordance with the structure of the Web 2.0 tool in the prepared content is related to the subject and is very effective or eye-catching.
Music Use	Attention was not paid to the selection of music related to the subject in accordance with the structure of the Web 2.0 tool in the prepared content.	The music selected in accordance with the structure of the Web 2.0 tool in the prepared content is partially relevant to the subject.	The music selected in accordance with the structure of the Web 2.0 tool in the prepared content is related to the subject and is very impressive.
Visual Design Principles Compatibility	Visual design principles (unity, balance, emphasis, alignment, proximity, etc.) were not considered in the prepared content.	Visual design principles (unity, balance, emphasis, alignment, proximity, etc.) were partially considered in the prepared content.	The prepared content shows excellent harmony in terms of visual design principles (unity, balance, emphasis, alignment, proximity, etc.).

DISCUSSION AND CONCLUSION

In this study, it was aimed to develop an online disaster education model based on the Taba model and to present a draft to the literature. The TABA model was employed in the design of the curriculum because it did not allow for coping mechanisms or repetition (Kasap & Ergenekon, 2023; Oliva & Gordon, 2018). Asserted that the model is an ideal model to lean on as it innovatively emphasized the acquisition, understanding, and the use of ideas and concepts rather than facts alone; it carefully defines the terminal behaviours expected of students; it includes a number of carefully designed teaching strategies which encourage the development an acquisition of certain specified intellectual skills; it encourages the examination of students' attitudes and values; it includes sequentially designed learning activities in order to encourage cumulative learning; and it provides for continual teacher and evaluation students' progress (Fraenkel, 1969 cited Abdullah & Siraj, 2010).

Experimental application of this model with different age groups or study groups in future studies in line with this draft may create a trial opportunity for sustainable disaster education. As a matter of fact, sustainable and holistic disaster education is emphasised in the eleventh and twelfth development plans (Twelfth Development Plan, 2023). On the other hand, when the online or distance disaster trainings in the literature are analysed (Kankanamge et al., 2022; Senanayake et al., 2023; Thangagiri & Naganathan, 2016), it is seen that these studies were conducted on a single game or game-based learning and distance education platforms used during Covid 19. However, according to the results of the current study, it was seen that disaster education can be carried out with 18 different Web 2.0 tools in an interdisciplinary, distance education platform. For this reason, a holistic online interdisciplinary disaster education application was developed by gathering the studies in the literature under a single roof and an infrastructure was prepared in which this application could be tested experimentally in future studies. Within the scope of the activity programme, pre-service teachers experienced Web 2.0 tools within the framework of disaster education theme. Through communication and interaction under the guidance of field experts, this experience had positive reflections on their future professional lives. For example, among the groups that received high scores in the Digital Disaster Education Analytical Rubric evaluation presented in Table 3 from the contents developed by the participant pre-service teachers in digital disaster education, there are those who were entitled to receive support by applying to TÜBİTAK 2209-A - University Students Research Projects Support Programme. The projects titled "Natural Disasters through Web 2.0: A Virtual Exhibition Journey with Artsteps for Primary School Students" (numbered 1919B012325590) and "Disasters with Brave Paw" developed based on the learning outcomes of Digital Disaster Education can be shown as examples of the positive widespread impact of the training. In addition, the application examples sent to the project social media addresses are positive reflections from the participants.

On the other hand, there are studies in the literature that emphasise that the pre-service training of teachers is more effective (Bıyıklı & Yağcı, 2014; Bozdoğan & Altunçekiç, 2007; Torun, 2021) and the importance of teachers' ability to integrate technology into education rather than knowing it (Karakuş & Er, 2020; Öğretir Özçelik & Tuğluk, 2019). In the process of creating digital disaster content, it is expected that pre-service teachers' literacy about disasters will improve. In addition, it is thought that a pre-service teacher's transferring his/her experience and knowledge about disaster risk potentials in his/her region through group interaction will raise awareness for other pre-service teachers about disasters that they may not encounter in their natural environment. In addition to all these, it is also possible to integrate the experiences gained into other disciplines, themes and life areas.

Ethics and Consent: Ethics committee approval for this study was received from the Ethics Committee of Kahramanmaraş Sütçü İmam University (Date: 17.10.2023; Approval Number: 2023/9, E-92405296-605.01-255441)

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