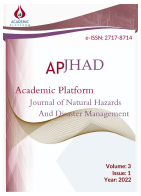

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Evaluation of Secondary School Students' Knowledge, Skills and Behaviour Proficiencies Based on Natural Disaster Scenarios

İbrahim Ethem Gürbüz[1*], Vedat Karadeniz[2], Songül Atacan Caniş[3]

[1]*Institution of Education Sciences, (Social Studies Education), Atatürk University, Erzurum, Türkiye*
[2]*Faculty of Education, (Social Studies Education), Erzincan Binali Yıldırım University, Erzincan, Türkiye*
[3] *Ministry of Education, English Teacher, Van, Türkiye*

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Abstract

In the globalizing world, the students' proficiency to convey the knowledge, skills, and behaviour they have acquired in-school education process to their social lives has a vital importance. Because; as well as accessing information, having developed skill for using the information and solving problem is one of the essential factors in the realization of the purpose of raising effective individuals too. In this context, the aim of this study is to evaluate the proficiency of the students' knowledge, skill, and behaviour based on natural disaster scenarios in the framework of the case study. The sample consists of 6th and 7th grade students selected by the convenience sampling method. The total number of students is 32. The data was collected with five open-ended questions through online applications. Also, descriptive analysis was used in a holistic manner. Theoretically, it was determined that the great majority of the students had sufficient knowledge, skill, and behaviour to deal with possible disasters and the ability to distinguish cases from each other. However, they had difficulties in interpreting the events by establishing a cause-effect relationship and basing the occurrence of disasters on a scientific basis. According to results; with the addition of scenario-based practical applications to the course process, the students can analyse events with a more realistic perspective by establishing cause-effect relationships between events. In addition, it's recommended that not only disaster definitions should be presented in textbooks but also various case study scenarios should be added to them.

Key words: Disaster awareness, Online data collection, Proficiency, Scenario-based questions, Case study

1. Introduction

As in the past, we have still been confronted with the tragic consequences of disasters. As a matter of fact; we can define disasters as a natural event that always repeats itself, or as a series of disasters caused by human behaviour and activities. Accordingly, we can say that disasters became an inevitable part of our nature, life, and society [1]. Natural disasters are natural phenomena of predictable or unpredictable magnitude that can pose very serious threats, especially in places where many people live [2].

According to the World Health Organization (WHO), natural disasters are the disasters of atmospheric, geological, and hydrological origin, including earthquakes, volcanic eruptions,

*Corresponding author e-mail: ibrahimethemgurbuz@hotmail.com

landslides, tsunamis, floods, and droughts [3]. Disasters are three times more commonly happening today than they were in the 1970s and 1980s. Compared to sectors such as tourism, trade and industry, its damage to agricultural areas is more than others, with a rate of 63%. Between 2008 and 2018, the agricultural losses of developing countries were more than 108 billion dollars. In the same period, Asia was the most affected region with a total economic loss of 49 billion dollars, followed by Africa with 30 billion dollars and Latin America and the Caribbean with 29 billion dollars [4].

In support of these data, it is stated that the damage caused by the disaster to the economy is much more than the structural damage, and that there is a great loss in the workforce due to the industries and businesses' being out of order. It is also stated that in 2016, 191 natural disasters occurred, each of which caused more than 95 million US dollars of damage, and that the total economic loss was around 166 billion US dollars, with economic losses accounting for 0.24% of the global domestic product [5].

As it can be understood from the definitions and explanations made, in the globalizing world, we are confronted with both the financial and moral effects of disasters day by day. We say "global" because now we can see more clearly the fact that a disaster in one country affects other countries in various ways. As the whole world humanity, our need for each other is increasing more. Such that the Coronavirus disease (COVID-19) pandemic, which is considered as a natural disaster, still continues at full speed and its global repercussions are closely related to all countries of the world. Undoubtedly, the main factor in coping with disasters should be properly planned and systematized education programs. In this context, in order to be able to minimize disaster risk, it is compulsory for all countries to add applicable teaching models to their educational programs. In this regard, scenario-based disaster teaching can be presented as a course material that meets this need.

An important point here is to distinguish between natural disasters and natural hazards. Because natural disasters are unavoidable natural events, but natural hazards can be prevented by human discrimination power (knowledge, experience, ability, etc.). For example, we cannot determine the rate and intensity of rain, whereas it is entirely up to us to build or not build a house thereby thinking about a river or dam that will overflow from its bed as a result of rain [5]. For this reason, the role of education on natural life stands out, too.

When the literature is examined, it is seen that studies on disasters take up a large field but the research on raising students' awareness of natural disasters through scenario-based case studies is not at the expected level. In the field, it appears that different strategies have been used to evaluate students' knowledge and perceptions of natural disasters. For example, Davis et al., as a result of their research for the purpose of developing, implementing, and evaluating a high-quality disaster simulation on four coasts where frequent earthquakes occur in the USA: they found that disaster simulations can improve the disaster knowledge of the participants and increase their level of preparedness [6]. Yildirim and Can found that argumentation-based scenario applications were not effective in developing students' perceptions in inquisitive learning [7]. Aksoy attempted to investigate students' problem-solving skills using an example scenario [8]. Dogan and Koc concluded that the academic achievement scores of the experimental groups taught with digital games were higher than the academic achievement scores of the students in the control group taught with traditional instruction (lecture method and textbooks, etc.) [9].

This research aims to draw attention to the need to incorporate scenario-based case studies, in which students can actively use information and develop solution-generating mechanisms as part of metacognitive learning, into existing educational programs. A case study can be defined as a real-life story that is addressed using a problem-centered approach. Case study material can take the form of direct observation and teacher self-report, or a combination of both. It is important that the narrative reflects the emotional and physical environment. Also, case studies should be explained in detail so that students can understand that they are part of the case [10]. A case-based learning approach is considered as a good model for prospective teachers. Because, case studies present an effective perspective on real-life learning [11].

Ill-structured problem-solving skills can transform into reliable solution methods through experiences. For this purpose, the case study can be an effective solution for ill-structured problem-solving skills [12] and it is an extremely attractive method for students to produce solutions to their problems they may encounter in real life by linking theory and practice, which is one of the basic functions of education [13]. Recently, the importance of case studies has increased for both pre-service teachers and in-service pieces of training. As its main reason, case studies' increasing their critical thinking skills and problem-solving oriented structure can be said [14].

The basic knowledge, skills, attitudes and values that are aimed to be acquired by students in a lesson will become more meaningful and functional to the extent that students can transfer and apply this process to their social lives. Because, the ability to use information and solve problems as well as accessing information is one of the important factors in the realization of the purpose of raising effective individuals. The following is a concrete example to explain this; While the student named Tilly Smith was on vacation on Phuket Island with her family, she realized that there would be a tsunami on Maikhao beach, although she was only 10 years old, and immediately informed her family about the situation and ensured that the alarm was given for the evacuation of the area. By this means, dozens of people who ran away from the beach and hotels escaped death. In a statement Tilly Smith made to a newspaper, she stated that she learned about the tsunami in her school geography lesson a few weeks before the disaster as follows: "Andrew Kearnay, one of our teachers, had told us about earthquakes and how tsunamis occur. While on the beach the water got strange, bubbles started to pop up, water started to recede. I understood what was happening, the tsunami was coming and I immediately informed my family." [15].

In this research, it has been aimed to evaluate the proficiency of students' knowledge, skill, and behaviour based on natural disaster scenarios. The more the students can transfer this process into their social lives, the more these basic knowledge, skill, behaviour and values will become meaningful and functional for them. Because, the skills of using information, solving problems and accessing to information are the most important factors of raising effective individuals. This research is important in that it encourages the students to develop problem-solving mechanisms and to present innovative offers; and in this respect, it differs from other researches. Also, in coordination with the aim of the research, the students were asked the following questions:

1. How is the proficiency of the students' knowledge, skill, and behaviour based on probable natural disaster scenarios?
2. Do the students confuse natural disasters with each other or can they distinguish them from each other?
3. Can the students give appropriate answers according to the literature?

2. Materials and Method

2.1. Research Design

The case study design was used in this study, which was conducted with a qualitative research paradigm. As a research design, the case study provides a detailed view of the focus area. When you use a case study, you deal with the thing itself as a whole. The word 'thing' has been used as a recommendation since it could be a group, an institution, a country, an event, a time period or anything. You may be looking at the medical diagnosis process of a patient, or you may be looking at relationships among a group of young people, or you may be looking at the level of learning a student is in the classroom. You may be looking at a family or the business development of a store or the current political stance of a country. Any of these 'things', all these phenomena (things), can be the subject of a case study. What is of interest is the uniqueness and holistic nature of these phenomena [16].

2.2. Study Group and Data Collection

The research sample consisted of 32 students who were studying in the 6th and 7th grades of the secondary schools.

Table 1. Results Relating to "Gender and Grade" Variables

Variables		*6th grade*		*7th grade*	
		(f)	**(%)**	**(f)**	**(%)**
Gender	Female	10	62.5	9	56.25
	Male	6	37.5	7	43.75
Total		16	100	16	100

The "Gender and Grade" variables of the students are shown in Table 1. According to this, it can be clearly seen that the number of students in both grades is the same.

Besides, students were selected by convenience sampling method. It is often extremely difficult (or sometimes impossible) to select a random or systematic non-random sampling. At such times, a researcher can use convenience sampling. Convenience sampling is a group of people who are suitable for the study [17]. The data was collected with five open-ended questions based on natural disaster scenarios prepared by researchers. Also, "WhatsApp" and "e-mail" applications were used since the COVID-19 epidemic reached very serious dimensions. Firstly, phone conversations were made with the principals of the schools. With the great efforts of the principals, a conversation was made with the teachers who instructed to 6th and 7th grades. Then, five open-ended questions were sent to the teachers via the "WhatsApp" and "e-mail" applications, and the teachers sent these questions to their students in the same way. Particularly it was stated that the students should answer the questions in a silent environment as much as possible and on their own. The process was completed with the teachers delivering the answers to the researchers.

For the validity and reliability, five open-ended questions were presented to the examination of 3 specialists from the Department of Social Studies Education and 3 specialists from the Department of Geography Education, and thus expert examination, which is one of the strategies was used in qualitative research to ensure the validity and reliability, was applied [18]. As a result of the expert examination, it was proved that all of the questions were appropriate and acceptable.

2.3. Analysis of Data

Descriptive analysis was used in a holistic manner. While analysing data in qualitative research; all the notes obtained as a result of the document, observation, and interview can be coded, stored, questioned and a model can be created. All kinds of documents, sounds, pictures, movies, etc. can be analysed. In this research, the descriptive analysis method, in which the obtained data was shown, depicted, illustrated, and described, was preferred [19]. In this context, the data were categorized according to their similarities with the descriptive analysis. Expressions with similar response characteristics to their content were coded into the determined categories, the frequencies of the responses were taken and the percentage of these frequencies in that number of respondents was calculated.

In order to ensure the reliability of the coding process by isolating it from the individual effect of the researcher, different encoders (experts) opinions were taken on the same data set to the Mills and Huberman model. According to this model, the reliability coefficient of the consensus among the encoders was calculated using the formula: "$\Delta = C / (C + \partial) \times 100$", and the coefficient of each question was at least ".80" and above for the reliability to be accepted [20]. According to the formula; it is defined as Δ (coefficient), C (consensus), and ∂ (disagreement). For this purpose, the consensus of 2 experts in the field of Social Studies Education was consulted and the reliability coefficients as a result of expert evaluation are shown in Table 2.

Table 2. Results Relating to "Mills & Huberman Model"

		1st Expert	2nd Expert	MEAN
Questions		**6th Grade Coefficients (%)**	**6th Grade Coefficients (%)**	**6th Grade**
1th Question		91	100	**95**
2nd Question	**A)**	88	100	**94**
	B)	100	100	**100**
3rd Question		100	80	**90**
4th Question		78	89	**83**
5th Question	**A)**	100	100	**100**
	B)	75	100	**88**
Questions		**7th Grade Coefficients (%)**	**7th Grade Coefficients (%)**	**7th Grade**
1th Question		91	91	**91**
2nd Question	**A)**	88	100	**94**
	B)	89	78	**83**
3rd Question		80	80	**80**
4th Question		89	89	**89**
5th Question	**A)**	100	100	**100**
	B)	100	75	**88**

When Table 2 is examined, the mean of the data obtained from the 1st and 2nd experts meets the "0.80" value, which is considered sufficient for the reliability.

3. Results

In this section, the results are presented with the frequency (f) and percentage (%) values.

Table 3. Results Relating to "The 1st Question"

		Categorized Responses	(f)	(%)
6th grade	❖	I apply the "drop, cover, and hold on" method (the triangle of life) next to the desk or a solid object and I wait for the earthquake to end. Then I go to the fire escape by calm but fast steps with the command of the teacher, and I go to the gathering area from there.	11	68.75
	❖	I take the fetal position. When the earthquake ends, I calmly go to the fire escape and to the gathering area from there.	2	12.5
	❖	I would take the fetal position in a solid place and listen to my teachers' directives. I would stay away from windows and I wouldn't use the elevator		
	❖	We should go to the nearest emergency stairs.	1	6.25
	❖	I get under the table.	1	6.25
	❖	I say to my friends: "Slowly follow me", then we go down the fire escape stairs.	1	6.25
7th grade	▪	I apply the "drop, cover, and hold on" method (the triangle of life) next to the desk or a solid object and I wait for the earthquake to end. Then I go to the safe zone by using the fire escape by calm but fast steps.	13	81.25
	▪	I take the fetal position. When the earthquake is over, I get out from the fire escape with quick steps.	2	12.5
	▪	I say that everyone should collapse in a safe place and protect their heads. When the siren sound is over, I go to the safe area from the fire escape without running fast.	1	6.25
Total			32	100

Students' responses to "The 1st Question" are shown in Table 3 [**Question 1.** Imagine that an earthquake suddenly occurs, while the teacher is giving lesson to you in an education center. What do you do in such a situation? Please, read the note. Note: The building is five storeys it has elevators, windows and fire escape. You are on the fourth floor].

By the majority of 6th and 7th grade students (in order of, 68.75% and 81.25%); it is stated that -drop, cover sand hold on- method (life triangle) will be taken and will be gone to the safe area by using fire escape (emergency exit) calmly but quickly. It was observed that when faced with such a situation, no student would tend to use elevators or jump from the window at both grade levels.

Table 4. Results Relating to "Option A of the 2nd Question"

	Categorized Responses	(f)	(%)
6th grade	❖ Earthquake occurs in many places in Turkey but it isn't as severe as in Japan. They should move to the place/region where the earthquake occurs the least, and I recommend the place where the fault line does not pass.	8	50
	❖ They should not come. There are many fault lines in Turkey. Also, Japan's technology has improved more than Turkey's. In fact, the precautions against earthquakes are not taken seriously in our country.	1	6.25
	❖ Do not get afraid my friend! So many earthquakes do not occur in Turkey. You can live in my house if you want.	1	6.25
	❖ I would tell them to stay with me for a few days. We would look for an earthquake resistant house that they would like.	1	6.25
	❖ I would tell them to pay attention to the features and location of the house they will move to.	1	6.25
	❖ Turkey is in an earthquake zone as well, but if you want to come I would suggest you the Mediterranean region.	1	6.25
	❖ I would tell the truth, it is a bit bad.	2	12.5
	❖ I would suggest him/her to come to Turkey.	1	6.25
7th grade	▪ I would tell my friend that Turkey is in an earthquake zone too; but there are not earthquakes as frequent and severe as the ones in Japan.	8	50
	▪ I think our country can take some more precautions. Although huge earthquakes occur in Japan, there is not much death. Because they take too many precautions.	2	12.5
	▪ Less earthquakes occur in Turkey than Japan. I would prefer him/her to come to Turkey.	1	6.25
	▪ You cannot be protected in Turkey like in Japan.	1	6.25
	▪ I would say I think you should not move out. Because our engineers cannot set a rail system like in Japan and do not use earthquake-resistant materials.	1	6.25
	▪ They can buy a house from the Central Anatolia Region.	1	6.25
	▪ Welcome to Turkey. I will do my best to have the least damage from the earthquake.	1	6.25
	▪ If you learn these some pieces of information about protecting from earthquake when you come to our country, you can survive the least damage when an earthquake occurs. For example, brief information such as the "drop, cover and hold on" technique during an earthquake, not using elevators during an earthquake, using the emergency exit door and going to an empty area will enable us to overcome the earthquake with the least damage.	1	6.25
Total		32	100

The students' responses to "Option A of the 2nd Question" are shown in Table 4 [**Question 2.** Your friend, who lives in Japan with his/her family, says that severe earthquakes occur in their region, and they want to move to Turkey and buy a house in which they can get protected from the earthquakes since they are very afraid of this situation. Therefore, he/she is asking you, what kind of a place Turkey is in terms of earthquakes? **Option A.** What would be your reply to your friend in this regard?].

By the majority of 6th and 7th grade students (in order of, 50% and 50%) is stated that Turkey is located in an earthquake zone and some earthquakes can reach dangerous levels, although not as frequent as in Japan. Besides, it was noticed that our country should take more precautions regarding earthquakes and Japan is technologically more advanced.

Table 5. Results Relating to "Option B of the 2nd Question"

	Categorized Responses	(f)	(%)
6th grade	❖ It must be solid, away from earthquake zone-fault lines, earthquake resistant, and built complying with earthquake regulations.	9	56.25
	❖ It should be made with expensive and high-quality materials that are not cheap, the state should control it, it should be made without retrenching materials, it should be in nature away from high-rise buildings,	3	18.75
	❖ It should not be in the stream bed. It should be flat and it's soil should not be mellow.	1	6.25
	❖ In my opinion, interior regions might have little risk such as Konya province.	1	6.25
	❖ I enter Google, write "a place without an earthquake" and I built the house 8.5 earthquake resistant.	1	6.25
	❖ No response.	1	6.25
7th grade	▪ It should not be very high-rise, should be solid and new, its ground should be flat and it should never be near a wetland.	7	43.75
	▪ Houses on the fault line should have a rail system and houses should not be built on the fault line.	4	25
	▪ It should be in cities such as Ankara, Yozgat, Nevsehir, Trabzon and it should be solid.	1	6.25
	▪ Firstly, the house should not be on the fault line and it should have a seismic isolator.	1	6.25
	▪ It should be built in places without unplanned urbanization and high quality materials should be used.	1	6.25
	▪ It should be a single-storey and detached building in a flat place.	1	6.25
	▪ I prefer solid buildings that are not close to the sea or the ocean.	1	6.25
Total		32	100

The students' responses to "Option B of the 2nd Question" are shown in Table 5 [**Option B.** Where and how should a house be built to be protected from earthquakes in Turkey?]. The majority of both grade level students (in order of, 56.25% and 43.75%) state that the buildings should be solid and new on flat areas away from the fault lines; they should not be very high-rise and in wetlands. There are also some opinions stating that the rail system technologies and durable materials should be used, as in Japan.

Table 6. Results Relating to "The 3rd Question"

	Categorized Responses	(f)	(%)
6th grade	❖ Firstly, the safety of their own life should be provided and maximum 3 people should go with their equipment, without cutting off communication, without shouting, quietly, without creating vibration.	5	31.25
	❖ As soon as the sun rises in the morning, I would take my team and search for that person.	1	6.25
	❖ Technology should be used in this case. If we go with a team, we endanger all of us. That person should be found with a drone.	1	6.25
	❖ Mert can be right. While looking for that person, I would take a few people with me to avoid getting lost and we would look for him/her together.	1	6.25
	❖ I call out to that person and follow his voice and help him/her.	1	6.25
	❖ Hasan can be right. That person should be saved at night.	1	6.25
	❖ Mehmet can be right. I would report the case to the authorities.	2	12.5
	❖ I would go there with car mechanics.	1	6.25
	❖ I would ask questions to his/her acquaintances (such as, did he give you any information about where he went?), and when I learn anything, I would inform the police immediately.	1	6.25
	❖ It would be right to speak to him properly and face to face.	1	6.25
	❖ None of their ideas is correct. I have no idea.	1	6.25
7th grade	▪ That person should be saved quietly in the daytime by a team of few people.	8	50
	▪ I would inform experts like DEMP (Disaster and Emergency Management Presidency). They do the right thing with thermal machines and dogs.	1	6.25
	▪ None of them is correct.	1	6.25
	▪ Mehmet is right.	2	12.5
	▪ Hasan is right. The person should be saved from there silently without using a vehicle.	1	6.25
	▪ We should go silently at night because automobile headlight can be seen best at that time.	1	6.25
	▪ We should use mobile phone as rare as possible and be calm.	1	6.25
	▪ We should contact with the person via a communication tool and should not be panic.	1	6.25
Total		32	100

Students' responses to "The 3rd Question" are shown in Table 6 [**Question 3.** The following comments were made for a person whose car has broken down in an avalanche-threatening area and waiting for urgent help. If there is someone rightful according to you, please write his/her name. If there is not, do not write any name. What would you do if you are in his/her place? Mert "To find the person, a very crowded team should go to the area and call him/her loudly." Mehmet: "The rescue team should go to the place where the person is by excavating snow with heavy equipments (earth digger, crane, tractor, etc.)." Hasan: "It would be better to save the person at night." You: "…"].

The majority of 6th and 7th grade students (in order of, 31.25% and 50%) unanimously agree in the opinion that the person should be searched quietly by an expert team which is not too crowded because of the possibility of avalanche hazard. It is also observed that there are some students with different views.

Table 7. Results Relating to "4th Question"

		Categorized Responses	(f)	(%)
6th grade	❖	Tsunami (I would do what Tilly did, I would warn people).	9	56.25
	❖	Tsunami (I would report it to the lifeguard).	1	6.25
	❖	Whirlpool (I would do what Tilly did).	2	12.5
	❖	Tornado (I would do what Tilly did).	1	6.25
	❖	I would warn people and bring them away.	1	6.25
	❖	I don't know, I have no idea.	2	12.5
7th grade	▪	Tsunami (I would do what Tilly did).	11	68.75
	▪	Tsunami (I don't know what should be done).	2	12.5
	▪	Tornado (I'm not sure exactly, I would try to bring the people away).	1	6.25
	▪	I don't know (I would do what Tilly did).	2	12.5
Total			32	100

Students' responses to "The 4th Question" are shown in Table 7 [**Question 4.** A British schoolgirl named Tilly, who was just 10 years old, suddenly saw that the water in the sea began frothing and get odd while she was swimming on the beach of an island where there were hundreds of people. She immediately explained the situation to her family and understood the disaster "…" that would occur within 10 minutes. Thus, the lives of hundreds of people were saved and Tilly was declared as a nymph. What do you think this disaster might be? What would you do if you were Tilly?].

By the most majority of both 6th and 7th grade students (in order of, 56.25% and 68.75%), it is understood that the disaster in the scenario is Tsunami, and students mostly responded that they would do what Tilly did. Also, it was observed that "tornado and whirlpool" answers by 6th grade students; "tornado" responses by 7th grade students were given.

Table 8. Results Relating to "Option A of the 5th Question"

		Categorized Responses	(f)	(%)
6th grade	❖	Flood.	13	81.25
	❖	I do not know. I have no idea.	3	18.75
7th grade	▪	Flood.	15	93.75
	▪	Flood and landslide.	1	6.25
Total			32	100

Students' responses to "Option A of the 5th Question" are shown in Table 8 [**Question 5.** You have learned from the news that there will be heavy rain tomorrow and it will be effective for a long time. Your location is a place integrated with nature and has a wide agricultural land, a river, a lake, and a dam around. **Option A.** Which disaster or disasters do you think might happen tomorrow?].

By the vast majority of 6th and 7th grade students (in order of, 81.25% and 93.75%) "flood" was said as a response. Also, it was observed that only 1 student among 7th grade students said "landslide" and 3 students among 6th grade students said "I do not know" or "I have no idea" as a response.

Table 9. Results Relating to "Option B of the 5th Question"

	Categorized Responses	(f)	(%)
6th grade	❖ I would go to a safe, high area.	4	25
	❖ Low areas should be avoided, the houses near the stream should be evacuated.	3	18.75
	❖ I would collect the ripe ones among the agricultural products or I would collect and plant them again, I plant trees, I would cover the front of the doors and around the house with some materials as plastics bags, etc.	2	12.5
	❖ I would go to another district temporarily.	2	12.5
	❖ We must keep the windows closed, plant trees and protect ourselves.	1	6.25
	❖ If I have an agricultural field, I can protect it, then measure the depth of dams and streams. Accordingly, we can take a temporary precaution for tomorrow and when the rain stops, we can take permanent precautions for other situations.	1	6.25
	❖ I do not know. I have no idea.	3	18.75
7th grade	▪ I go to my relative who lives somewhere else.	4	25
	▪ I warn the people in the areas close to the dam and the stream. I remove them from there. Shops should be closed.	4	25
	▪ I build a barrier with sandbags. We can close around the area we are in.	2	12.5
	▪ If I have a vehicle, I pull it in a safe place. I put the valuable items and the documents on a high place.	2	12.5
	▪ We should go and sleep in the high part of the house at night and in the morning. We should wait on the roof	1	6.25
	▪ We can cover the farmland with something waterproof.	1	6.25
	▪ I would collect the agricultural products I planted. I would plant trees and increase the green areas.	2	12.5
Total		32	100

Students' responses to "Option B of the 5th Question" are shown in Table 9 [**Option B.** What kind of precautions should you take?]. It has been observed that the majority of 6th grade students (25%) said that "I go to a safe and high area." Besides, they indicate that flood areas such as rivers and dams should be avoided, agricultural produce should be collected, trees should be planted, around of the house should be closed and people should go to another district temporarily. And it has been seen that 3 of the students said "I do not know." or "I have no idea." as a response. It has also been observed that the majority of 7th grade students (25%) said that the people can go to a relative outside the region, and the places around rivers and dams should be evacuated.

4. Discussion

Regarding question 1, according to DEMP data, the following steps should be followed inside the building during an earthquake: (1) It should definitely not be panicked. (2) Do not stand near objects that are likely to tip over or break like a cabinet, shelf or window. (3) A living triangle should be formed by crouching under a table supported by sturdy chairs or next to items that can provide protection such as a large and solid seat or sofa. (4) The head should be placed between both hands or the head should be protected with a protective material (book, etc.). (5) These three basic positions should be taken while shaking: (DROP) find a safe place and kneel. (COVER) Close your body to protect your head and neck. (HOLD ON) Hold on to something stable and firm (especially a solid table). (6) It should not be run towards stairs or exits, and elevators should never be used [21].

However, Celikmen and Gongor stated that the blood will put pressure on the lungs in the kneeling position, so when an earthquake is encountered, it is the best behavior to take the fetal position by lying on one's side and to protect the head by minimizing the target. People who took the fetal position survived the earthquake and the loss of heat, called hypothermia, was prevented when the fetal position was taken. Also, in case the building collapses; it has been mentioned that trusting objects such as a table or desk is no different from using an umbrella in a storm and it was emphasized that the correct movement is curling next to a bed (i.e. will not collapse) by taking the fetus position with your mobile phone in your hand [22].

As a result of the explanations made, there seem to be some confusing situations about a set of precautions to be taken in case of an earthquake. That is to say, while some experts put forward that at the time of an earthquake, the drop-cover-hold on technique can put pressure on the chest and the feet of objects such as desks or tables will bend when subjected to a heavy load and will compress the person under them; DEMP suggests drop-cover-hold on technique and going under the desk.

In coordination with the information provided by DEMP, according to the Centers for Disease Control and Prevention, you can protect yourself during an earthquake by following these steps: (DROP) Get down with your hands and knees parallel to each other before the shake knocks you down. Thus, you can find the opportunity to move during the earthquake. (COVER) Position yourself in a way that your head and neck (whole body as much as possible) are under a solid table or desk. If there is not any solid object around you, cover your head and neck with your hands and arms. (HOLD ON) Do not come out from under the table or keep your arms above your head and neck continually until the shake is over. Do not try to run outside. You will be safer where you are [23].

When the students' comments were compared with the information in the literature, it has been determined that the majority of 6^{th} and 7^{th} grade students already know the drop-cover-hold on technique and taking the fetus position which was taught to them at school. As a result, it was seen that the students participating in the research acquired the basic principles that should be done in the event of an earthquake during their in-school education processes. However, regarding the disputes, both institutions and organizations such as the Republic of Turkey Ministry of National Education, DEMP, CDC, and earthquake experts must make a final decision (in accordance with international standards) on which they agree about what precautions should be taken during an earthquake.

Regarding question 2, Turkey is divided into 5 main earthquake zones in terms of risk capacity. Especially there are both more frequent and more severe earthquakes in the 1st zone, which extends to the east-west direction in the northern parts of the Anatolia peninsula; starting from Marmara to Van Lake, from Western Anatolia to the province of Hatay, and from the province of Malatya to province of Van. It can be said that almost all of these earthquakes are of tectonic origin. However, it should be known that it should not be inferred that there will certainly be an earthquake everywhere in these earthquake zones [24].

Besides, according to National Aeronautics and Space Administration, Turkey is among the most earthquake-prone regions of the world. Such that, the great earthquake on August 17, 1999 in the Marmara Region, in which approximately 18 thousand people lost their lives and thousands of people were injured, is the clearest proof of this. As a matter of fact, Turkey is topographically stuck between the Arabian and Eurasian plates. The continental crust beneath Turkey is being compressed by the colliding plates and forcing the bedrock to slide along fault

lines. As a result of these sliding movements, shock waves occur on the ground and trigger the earthquake [25].

As a result of the data, it can be said that the majority of the 6th and 7th grade students are aware of the fact that Turkey is located on a seismic belt and therefore always be at risk. Also, it has been observed that they have the opinion that earthquakes in Japan are more severe than the ones in our country and Japan has a more advanced technology than our country about earthquake. Besides, it can be said that they are aware and conscious of what earthquakes can create along fault lines and have the information about the necessity of building on solid grounds instead of soluble rock grounds (wetlands). Apart from that, it was concluded that in both grade levels, the majority of the students didn't have enough information about how to classify earthquake zones according to their risk factoring degrees.

Regarding question 3, the precautions to prevent the avalanche and to minimize its damages are collected under the two titles as active and passive measures applied permanently and temporarily.

Active precautions:

They are the temporary and permanent precautions taken to minimize the avalanche risk in a place or after the risk of avalanche increases and it occurs. These are listed as follows: (1) Terracing, (2) Changing the current topography of the risky areas, (3) Afforestation, (4) Ensuring the sensitivity of the blanket of snow, (5) Reducing the effect of wind (6) Changing the structure of the blanket of snow on the slope, (7) Increasing the sensitivity of the snow blanket with some chemicals, (8) Compaction of the blanket of snow by walking, with snowshoes or with special snowmobiles, (9) Creating an artificial avalanche [24].

Passive precautions:

They are the permanent and temporary precautions taken to protect the buildings located in the flow direction of the avalanche or the slowing and stopping zones. These are also listed as follows: (1) Prohibiting entry to the highly risky avalanche zones, (2) Building several protective structures to get protected against an avalanche, (3) Deflection structure, (4) Delaying structures, (5) Block structures, (6) Avalanche tunnels, (7) Avalanche dams, (8) Using warning systems [24].

Snow avalanche is an important event that both endangers the vital safety of people and brings about infrastructural damage. It also damages the natural structure by destroying the mountain ecosystem. In many parts of the world, its damage to transportation networks such as roads and railways can be given as an example [26]. Also, when the sloping land reaches a level that cannot carry the blanket of snow, it creates an avalanche danger in a little vibration. Especially loud planes trigger avalanche disaster. The sound waves trigger the blanket of snow and activate it. Also, the firing gunshots in the region leads to a disaster by triggering avalanche danger [27].

As the result of these explanations, it can be said that most of the 6th and 7th grade students are aware of several effective/triggering situations (heavy equipment or a crowd team could increase the risk of avalanche rather than helping; the importance of moving as silently as possible etc.) which will turn into a possible avalanche event and they are also aware of the danger.

Regarding question 4, a tsunami is confused with effective waves which are caused by especially severe storms and tide events. However, when the transition of wind energy to the sea surface causes the storm waves, the energy appeared by the changing gravitational forces of Moon and Sun creates tidal waves and oscillations. While the tsunamis take their energies from vertical movements in the lithosphere, the large-scale slip, cave-in and refraction that occurred under the sea, they take the focal point from earthquakes and undersea volcanism located on the sea or ocean floor. The extraordinary energy appeared as the result of tectonic movements passing through the water causes giant waves to form on the surface [24].

As a result of the explanations, it is found that the situation in the case study is a sign of a tsunami and it is known by most 6^{th} and 7^{th} grade students. When students encounter such a situation, just like Tilly, they have the knowledge, competency, and behaviour to inform their families and notify the authorities.

Regarding question 5, floods are caused by strong and prolonged rainfalls. As the result of sudden and strong rains and melting the snow, alluvion occurs. Alluvion is the event of large volume streams' not fitting into the stream bed. Floods and alluvions disrupt the lives of people and socio-economic activities by giving harm to surrounding settlements, agricultural areas, urban infrastructure, institutions and organisms [28].

Landslides, defined as the mass movement, are a type of mass-wasting that denotes any down-slope movement of soil and natural rock under the direct influence of gravity. Among the main factors to cause any landslide; adequate slope, saturation with water, quality of bedrock, tectonic structure, and vegetation can be shown [24]. As a matter of fact, when we look at the information given in the question (case in the research), it can be said that the necessary conditions are present for flood but not for landslide events (gravity, slope, etc.).

As a result of the explanations, it can be commented that by most of the 6^{th} and 7^{th} grade students the differences between flood and landslide events are known, and that they have the sufficient level of information to understand a possible flood event before it does not occur.

As to the question of which precautions you should take;

Some precautions to be taken to prevent floods, protect oneself, and minimize it's damages are vegetation, especially forests, must be protected and bare areas should be afforested; sets and ponds should be made to prevent flow rates of the water in the stream bed; stream beds and sensitive places to the floods should not be opened to settlements under no circumstances; as soon as the floods are detected or they occur, more reliable places should be preferred; land use principles must be followed; agriculture should not be done in areas with steep slopes and soil protection principles should be followed in lands with low slope [24]. In the parts of the buildings which are likely to contact with water, artificial and natural materials that are not waterproof (adobe, wood, tuff, plaster, mud-mortar wall, etc.) should not be used. Necessary technical precautions should be taken if the foundation ground is likely to be submerged [28].

It is said that most of the 6^{th} and 7^{th} grade students have some essential knowledge on taking precautions in a probable flood event but their knowledge and skills have not developed in coping with flood disaster.

When the results of this research were compared with the similar research: Cvetković et al., as a result of their studies aiming to determine the factors affecting students' knowledge and

perceptions about earthquakes, found that there was a correlation between the information students obtained by watching educational films and videos about natural disasters and their knowledge about earthquakes. Also, it has been observed that with the increase of students' knowledge about disasters, their sense of security will change positively [29]. As for King and Tarrant, as a result of their research conducted to determine the level of knowledge and perception of the 5th-grade students about natural disasters, when children were asked to introduce the characteristics of disasters; they received answers such as “destructive”, “dangerous”, “scary” and “indescribable”. Although the children were not successful in identifying, they stated that earthquakes were caused by the collision of underground plates and that earthquakes in the seas caused tsunamis. As a result, it has been observed that disaster education given in schools has a very critical effect on children's education [30]. Pinar observed in his research that disaster awareness of secondary school students was low. In this direction, he suggested that public and private institutions cooperate, prepare regional disaster education programs and inform students about disasters that might occur especially in their own regions [31].

5. Conclusions

In this research; in which the knowledge, skills, and behaviours of the students at school are to what extent sufficient against the natural disasters they might encounter in daily life, is trying to be determined with case study scenarios.

When the research questions (sub-problems) were evaluated, it was determined that the vast majority of the students had sufficient knowledge, skills and behaviour to deal with possible disasters and they are able to distinguish cases from each other. However, it was seen that they had difficulties in interpreting the events by establishing a cause and effect relationship and basing the occurrence of disasters on a scientific basis. Finally, it was observed that the students gave appropriate answers to the literature. According to these data, it can be concluded that theoretically, when students' knowledge and skill achievements in describing events are compared with their deficiencies in establishing cause-effect relationships between events, they memorize knowledge during their in-school education. Consequently, it is of great importance that scenario-based disaster education should be included in school programs by education politicians as soon as possible, provided that practical and applicable conditions are provided.

Recommendations:

1. In addition to the definitions of disasters in textbooks, various disaster scenarios should be added so that students can evaluate the events from a real point of view.
2. Theoretical knowledge should be strengthened with practical knowledge and question-answer activities should be applied intended for disasters.
3. Various disaster videos should be watched and disaster practices should be repeated every week without defect and interruption.
4. Seminars should be organized in collaboration with disaster organizations, experts should be invited to the school and students should be given project assignments.
5. Researchers are advised to focus on scenario-based disaster education, which is not found at a sufficient level in the literature.

In particular, it is recommended to conduct studies on whether students acquire their knowledge and skills only by memorization or by establishing a cause-effect relationship.

Appendices

Five Open-Ended Questions

Question 1. Imagine that an earthquake suddenly occurs, while the teacher is giving lesson to you in an education center. What do you do in such a situation? Please, read the note. Note: The building is five storeys it has elevators, windows and fire escape. You are on the fourth floor.

Question 2. Your friend, who lives in Japan with his/her family, says that severe earthquakes occur in their region, and they want to move to Turkey and buy a house in which they can get protected from the earthquakes since they are very afraid of this situation. Therefore, he/she is asking you, what kind of a place Turkey is in terms of earthquakes?

Option A. What would be your reply to your friend in this regard?
Option B. Where and how should a house be built to be protected from earthquakes in Turkey?

Question 3. The following comments were made for a person whose car has broken down in an avalanche-threatening area and waiting for urgent help. If there is someone rightful according to you, please write his/her name. If there is not, do not write any name. What would you do if you are in his/her place? Mert "To find the person, a very crowded team should go to the area and call him/her loudly." Mehmet: “The rescue team should go to the place where the person is by excavating snow with heavy equipments (earth digger, crane, tractor, etc.).” Hasan: "It would be better to save the person at night." You: “…”.

Question 4. A British schoolgirl named Tilly, who was just 10 years old, suddenly saw that the water in the sea began frothing and get odd while she was swimming on the beach of an island where there were hundreds of people. She immediately explained the situation to her family and understood the disaster “…” that would occur within 10 minutes. Thus, the lives of hundreds of people were saved and Tilly was declared as a nymph. What do you think this disaster might be? What would you do if you were Tilly?

Question 5. You have learned from the news that there will be heavy rain tomorrow and it will be effective for a long time. Your location is a place integrated with nature and has a wide agricultural land, a river, a lake, and a dam around.

Option A. Which disaster or disasters do you think might happen tomorrow?
Option B. What kind of precautions should you take?

Ethics Committee Approval

Ethics committee approval was received for this research, Republic of Turkey Ministry of National Education, General Directorate of Basic Education. The document dated 07.07.2020 and numbered 70297673-605.01-E.9023013.

Conflict of Interest

No potential conflict of interest was reported by the authors.

Author Contributions

In this study, the study conception and design, material preparation, data collection and analysis were performed by Ibrahim Ethem Gurbuz and Vedat Karadeniz. All authors contributed the interpretation of the results. The first draft of the manuscript was written by Ibrahim Ethem Gurbuz, then all authors commented on previous versions of the manuscript and approved the final version.

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