



## High school students' opinions on real and virtual field trips after forest fire were formed with 360° videos on environment and ecology

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### Abstract

**Purpose:** Maintaining a healthy life is only possible with a healthy and clean environment. Field trips, which provide the opportunity to observe events and phenomena in their natural environments and gather firsthand information, were planned as virtual field trips for education and training due to the burden of procedures such as permits, time, and financial constraints.

**Method:** The researchers used technological advancements to create a virtual field trip using 360° videos to observe and raise awareness of the devastation caused by a forest fire, a current environmental problem. Ecological concepts were introduced to students in a 3D environment.

**Findings:** In our study, which aimed to reveal the advantages and disadvantages of virtual field trips through student perceptions, the findings regarding the positive aspects of virtual field trips are consistent with other studies. The majority of students stated that they learned new concepts during real field trips. Their study found that education, particularly in direct contact with plants and animals in nature, encouraged students to acquire environmental knowledge and fostered positive development in their commitment to nature. When students' opinions about the disadvantages of real field trips were examined, they highlighted negative aspects such as transportation problems, spending most of their time on the road, and falling behind in some courses. While field trips are of great educational importance, they are costly and burdensome out-of-school activities that carry health and safety risks, require significant responsibility, and are often costly.

**Conclusion:** Virtual field trips are considered an important educational tool because they provide equal educational opportunities by enabling the participation of disadvantaged students, eliminate time constraints, save energy, increase motivation, make learning fun, and allow for the development of digital skills such as reasoning and inference. Despite these superior educational features, environmental education, disconnected from nature and capable of simple and straightforward learning, cannot be envisioned using only virtual field trips.

**Keywords:** forest fire, 360o videos, environment, ecology, high school students

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**Orman yangını sonrası çevre ve ekoloji konulu 360o videolar ile oluşturulmuş sanal saha gezisi ve gerçek saha gezisine dair öğrenci görüşlerinin belirlenmesi**

### Özet

**Amaç:** Sağlıklı bir yaşamın devam ettirilebilmesi de ancak sağlıklı ve temiz bir çevre ile mümkündür. Olayları ve olguları doğal ortamlarında gözlemlene ve birinci elden bilgi toplama imkânı veren arazi gezileri, izin, zaman ve maddi yetersizlikler gibi prosedür yükü nedeniyle sanal arazi gezileri planlanarak eğitim ve öğretimin yapılması amaçlanmıştır.

**Metod:** Bu çalışmada, güncel çevre sorunlarından biri olan orman yangını sonrası bölgede meydana gelen tahribatın gözlemlenerek farkındalık oluşturulması amacıyla araştırmacı tarafından sanal arazi gezisi 360° videolarla oluşturulurken teknolojik gelişmelerin sağladığı imkanlar kullanılmıştır. 3D ortamda öğrenciye ekolojik kavramlar aktarılmıştır.

**Bulgular:** Sanal gezilerin avantaj ve dezavantajlarını öğrenci algılarıyla ortaya koymaya çalıştığımız araştırmamızda, sanal gezilerin olumlu yönlerine ilişkin elde ettiğimiz bulgular diğer çalışmalarla paralellik göstermektedir. Öğrencilerin çoğunluğu, gerçek arazi gezileri sırasında yeni kavramlar öğrendiklerini belirtmiş olup, çalışmalarında, özellikle doğada

bitki ve hayvanlarla doğrudan temas halinde gerçekleştirilen eğitimlerin, öğrencileri çevre bilgisi edinmeye teşvik ettiği ve doğaya bağlılık açısından olumlu bir gelişim sağladığı tespit edilmiştir. Öğrencilerin gerçek arazi gezilerinin dezavantajları hakkındaki görüşleri incelendiğinde, ulaşım sorunları, zamanın çoğunu yolda geçirme ve bazı derslerde geri kalma gibi olumsuzluklara değinilmiştir. Arazi gezileri, eğitim açısından büyük öneme sahip olsa da, sağlık ve güvenlik riskleri taşıyan ve büyük sorumluluk gerektiren, maliyetli ve külfetli okul dışı etkinliklerdir.

**Sonuç:** Dezavantajlı öğrencilerin katılımını sağlayarak eğitimde fırsat eşitliği sağlayan, zaman kısıtlaması içermeyen, enerji tasarrufu sağlayan, motivasyonu artıran, öğrenmeyi eğlenceli hale getiren ve dijital becerilerle akıl yürütme ve çıkarım yapma gibi becerilerin geliştirilmesine olanak tanıyan sanal geziler, önemli bir eğitim ve öğretim aracı olarak görülmektedir. Bu üstün eğitim özelliklerine rağmen, yalnızca sanal geziler kullanılarak doğadan kopuk, basit ve yalın bir şekilde kendiliğinden öğretme gücüne sahip bir çevre eğitimi düşünülemez.

**Anahtar kelimeler:** orman yangını, 360° video, çevre, ekoloji, lise öğrencileri

## 1. Introduction

Especially in our country, it has been determined that there are few studies on the use of 360° videos in environmental education with secondary school students. In this study, it was aimed to determine student views on a virtual field trip created with 360° video and a real field trip. It is thought that the study can contribute to the literature in terms of determining the student perspective on a real field trip and the use of 360° videos in the course and shaping virtual and real field trips in the light of these findings. Today, environmental problems have reached global dimensions and negatively affect all humanity and all living and non-living components of the environment [1]. With the effect of industrialization and exponentially increasing population, the balances between nature and human beings have started to deteriorate to the detriment of nature, the power of nature to renew itself has decreased, and even in some places an irreversible process has been entered [2]. With the effects of pollution on air, water and soil, increasing waste load and inadequate transformation processes, the air we breathe is filled with poisons, the ozone layer is thinning, the seasons are changing, glaciers are melting, living species are disappearing and environmental problems are diversifying and increasing, threatening both the present and the future of humanity [1], [2]. One of these current environmental problems is forest fires, most of which are caused by anthropogenic, biotic and abiotic factors and jeopardize the continuity of ecosystems [3].

According to the data of the General Directorate of Forestry (GDofF) for 2023, a total of 200,125 ha of forest area has been burnt in the last five years in Turkey. In 2021, 139,503 ha of forest area was burnt, which constitutes 69% of the total five-year data. OGM, which categorizes the causes of fire outbreaks under the headings of intent, negligence - accident, natural, unknown cause, has determined that most fires occur due to negligence and accident [4]. From this point of view, it is seen that especially negligence and intentional forest fires are directly related to education, and what is more important than extinguishing activities in the fight against forest fires is to take precautions before the fire and prevent fires by providing relevant training [5].

From this point of view, environmental education is of great importance in order to prevent increasing environmental problems, especially forest fires, and to prevent the occurrence of new ones. [6] defined environmental education as a lifelong process that aims to raise individuals who have knowledge and awareness about the environment and environmental problems, who can propose solutions to environmental problems and contribute to this process, and who have knowledge, skills, attitudes, behaviors and personal-social responsibilities that will prevent the occurrence of new problems.

An effective environmental education should provide individuals with in-depth knowledge, skills, positive attitudes and environmentally friendly behaviors. The sine qua non of such an environmental education is out-of-school field trips and nature education outside the school walls [7]. Environmental education in nature enables the upbringing of individuals who are self-confident, prone to cooperation, empathize with nature, accept nature as a value in itself and think that they are a part of it, are concerned about the welfare of nature against damages that may occur in nature and can take action for its protection [8]. In order for children to understand that they are a part of the environment, that they themselves will be harmed when they harm the environment and to gain this awareness, they need to be in nature where they can encounter concrete live examples. Students who comprehend this holism will be more sensitive to the environment in the future and will give importance to environmental values [9]. Undoubtedly, environmental education to be carried out first-hand in nature, with the components of nature, will raise individuals who can think critically, question, solve problems, be sensitive, conscious and take action in the face of problems [8]. However, field trips, which are very valuable in terms of education, have restrictive features such as time, material, distance, security, permission procedures and access barriers for students with special needs. In addition, they are not preferred in schools due to the workload before and after the fieldwork. Due to these limiting features, virtual field trips (VFTS) have gained importance as an alternative in recent years [10]. Virtual field trips (VFTS) are trips that simulate real areas, take place in a virtual environment, allow individual observation, and do not have time, space, physical conditions and financial constraints [10], [11]. Virtual field trips are basically of two types; the first is field trips where students are only listeners and observers and cannot interact with the virtual environment. The second is virtual field trips where students

can move freely in the virtual space, manipulate objects, and develop metacognitive skills such as exploration and analysis [10],[11].

Virtual field trips allow students to travel around the world within the safe boundaries of the school, while preventing damage to special ecological areas under protection and contributing to the reduction of carbon emissions [12]. In the past years, virtual field trip equipment was quite expensive and had low accessibility. Today, with the increasing technology, virtual field trips have become cheaper and more accessible. In particular, virtual field trips created with 360° videos can be easily produced using a 360° camera without requiring prior knowledge and expertise, can be shaped with a simple video editing programmed and can be easily viewed with head-mounted displays (HDM), mobile phones, tablets and computers [13]. Virtual field trips created with 360° videos provide an immersive virtual learning environment as they create a sense of presence as well as this production and ease of use, and for this reason, their use in educational activities has recently started to increase [14]. With the use of these virtual field trips in learning and teaching activities, it is seen that students' interest, motivation, participation, academic achievement and attitudes towards the lesson increase positively [14]. Virtual field trips, which are superior to all other teaching methods used in courses other than real field trips, are a valuable educational material that provides student-centered, fun learning, experimental and research-oriented, holistic and effective learning [10].

In addition to all these superior qualities of virtual field trips, they also have some limiting features. The first of these is the image resolution and the equipment required for high resolution is costly. Some users reported dizziness and nausea. In addition, the user's attention can be quickly distracted, it can create excitement because it offers a new experience and the content can be ignored [13]. When the literature is examined, it is seen that there are studies abroad on the effects of course content prepared with 360° videos or virtual field trip on academic achievement, attitudes and opinions, but there are very few studies in Turkey. In the light of this information, the main problem of the research, "What are the opinions of the students about the virtual field trip and the real field trip created with 360° videos after the forest fire?" was sought.

## 2. Materials and methods

This study was designed as a case study from qualitative research designs. In-depth interpretation and examination of the data collected for a specific purpose with a limited number of participants and examination of a special topic such as virtual field trips prepared with 360° videos were effective in the selection of this design [15]. The main purpose of using the special case method is to conduct in-depth research on the problem situation, to determine the cause-effect relationships related to the subject and to obtain detailed results about the problem situation.

### 2.1. Data collection

The study group of the research consists of 15 students studying in the 10th grade of a public school in the center of Bolu in the 2024-2025 academic year. In the study, a semi-structured interview form was used, which contains original expressions, allows the participants to express themselves comfortably and provides in-depth information [15]. The questions of the semi-structured interview form were formed by taking expert opinion. Before the interview, a field trip was made with the study group to the region after the forest fire that occurred in Göynük district of Bolu province (Figure 1). After the real field trip, a virtual field trip application created with 360° videos developed by the researchers to the forest fire area in Marmaris district of Muğla province was made with the same participants (Figure 2). After the applications, student opinions were obtained with semi-structured interview forms.



Figure 1. Images from the actual field trip



Figure 2. Virtual field trip application Images of the virtual field trip application

## 2.2. Validity and reliability of the study

The validity and reliability of qualitative research are provided by the concepts of credibility, transferability, verifiability and consistency [16]. In the study, raw data and analyses were shaped by taking expert opinion, and internal validity (credibility) was ensured by referring to the opinions of different researchers in the evaluation of the data. To ensure external validity (transferability, verifiability), the findings were directly quoted and the data were reported in detail. In order to increase reliability, it was paid attention that the research questions were simple, understandable, not directing the participant and that the participant could express his/her thoughts comfortably. In addition, in order to ensure internal reliability (consistency), the researchers avoided biases in the analysis of the data and did not add their own interpretations.

## 2.3. Analyzing the data

Descriptive and content analysis were used to analyses the data. The views of the participants were transcribed as they were and themes and codes were created by two researchers according to the answers given to the interview questions. Then, the researchers came together and compared their analyses and reached a consensus on the themes and codes they expressed differently. The analyses were finalized using the formula [17]. The reliability of the agreement between the experts was found to be 0.84, which is an appropriate value for reliability [17]. The themes and codes obtained are given in tables for clarity and ease of reading.

## 3. Results

The answers given by the participants to the questions in the interview form were evaluated on a question-by-question basis, and the themes and codes created are presented in tables (Table 1-2-3) below.

Table 1. Themes and codes obtained from the participants' answers to the question "What are the advantages and benefits of a real forest fire field trip?" Themes and codes obtained from the participants' answers to the question

Theme	Codes	Ö1	Ö2	Ö3	Ö4	Ö5	Ö6	Ö7	Ö8	Ö9	Ö10	Ö11	Ö12	Ö13	Ö14	Ö15
Advantages and benefits of a real field trip	Having fun with friends	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	To observe first-hand the impact of a forest fire	*	*	*	*				*		*		*	*	*	*
	Learning new concepts		*		*	*	*	*	*	*			*	*	*	*
	Raising awareness about fire		*	*										*		
	Seeing an area after a fire for the first time						*		*							
	Observation of the cause of the fire with scientific methods											*				*
	To learn how to prevent fires											*				*

When Table 1 is analyzed, it is seen that the students generally found it fun, they were able to observe the effect of fire one-to-one and they learnt new concepts about the advantages and gains of a real field trip. Some of the student opinions are given below;

S2; 'I had a lot of fun with my friends. During the bus journey, we sang songs and danced with the whole bus. I saw places in Göynük that I had not visited or seen. I learnt what the ecotone zone is. I saw the effects of forest fire with my own eyes and became conscious.

S3; 'I saw the real destruction of forest fire with my own eyes. Our teachers informed us. At the same time, we did a social activity with my friends. It was very useful in terms of raising awareness. We saw the damage caused by the fire with all its clarity.

S4; 'I learnt things I did not know before such as ecotone. I had a good time with my friends. Apart from that, compared to the virtual trip, it was a nice experience to be able to see and touch everything, in short, to be in that environment.

S5; 'During the trip, we both spent time with my friends and observed the causes of fires, how we can protect ourselves, etc. with scientific studies'

The themes and codes of the participants' responses to the second question in the interview form are given in Table 2.

Table 2. Participants' answers to the question "What do you think are the disadvantages of a real forest fire field trip?" The themes and codes obtained from their answers to the question

Theme	Codes	Ö1	Ö2	Ö3	Ö4	Ö5	Ö6	Ö7	Ö8	Ö9	Ö10	Ö11	Ö12	Ö13	Ö14	Ö15
Disadvantages of a real field trip	Falling behind in studies	*		*										*		*
	Being scolded by another branch teacher		*		*			*	*	*			*	*	*	*
	Not being able to visit many regions		*									*				*
	Disruption of field observation			*											*	
	Difficulty walking in the field			*												*
	Transport difficulties				*				*		*			*	*	*
	Not being able to spend much time in the area						*				*	*				

When Table 2 is analyzed, it is seen that the students stated that they were mostly scolded by the teacher of another course for participating in the field trip as a negative aspect of the real field trip. They also stated that there was a problem of access to the field and time was lost on the way. Some of the student opinions are as follows;

S2; 'It could have been a little more efficient. It would have been great if we could visit more areas. I was scolded by my math teacher at school for participating in the trip and I think I will get a low performance grade because of the trip. This is a sad situation.

S3; "When we went on the trip, we missed some lessons and even seeing this made me sad. I would like to do something for that region and make a contribution. It was a bit difficult to walk but it added a different atmosphere.

S10; 'The disadvantages were that the road was winding and long and we spent most of our time on the road, not in the fire zone.

S13; 'Falling behind in some lessons, being scolded by our teacher, spending too much time for transport, not being able to spend too much time in the fire area can be counted as disadvantages'.

The themes and codes of the participants' responses to the third question in the interview form are given in Table 3.

Table 3. Themes and codes obtained from the participants' answers to the question "What do you think are the advantageous aspects of virtual field trip?" Themes and codes obtained from the participants' answers to the question

Theme	Codes	Ö1	Ö2	Ö3	Ö4	Ö5	Ö6	Ö7	Ö8	Ö9	Ö10	Ö11	Ö12	Ö13	Ö14	Ö15
Advantages of a virtual field trip	Time saving			*											*	*
	No cost	*			*	*	*				*		*	*	*	*
	To be able to see places that cannot be visited		*	*		*		*		*	*	*			*	*
	No equipment required		*													
	No difficulty in obtaining permission from the authorities										*			*		
	Energy saving		*													
	Productivity											*				

When Table3 is analyzed, the students stated that the advantages of virtual excursions are that the places that cannot be seen can be seen, saving energy and time and being costless. The opinions of some students are given below;  
 S2; 'We had the opportunity to see different areas without leaving our own classroom. We saved petrol, time, energy etc. We had this experience even though we had very little equipment'

Q10; ' To see the places we cannot visit due to the cost of transport and the difficulty of obtaining permission from the authorities'

S11; 'Instead of not going at all and just taking photographs, the trip made in this virtual environment would be more productive'

S15; 'It was a trip where we could have the opportunity to see everywhere without wasting time, without cost and transport problems'

The themes and codes of the participants' responses to the fourth question in the interview form are given in Table 4.

Table 4. Themes and codes obtained from the participants' answers to the question "What do you think are the disadvantages of virtual field trips?"

Theme	Codes	Ö1	Ö2	Ö3	Ö4	Ö5	Ö6	Ö7	Ö8	Ö9	Ö10	Ö11	Ö12	Ö13	Ö14	Ö15
Disadvantages of a virtual field trip	Not being able to see and experience the real place	*		*	*	*	*		*		*	*		*	*	*
	Low resolution		*					*								
	Not being able to feel yourself in the full field	*			*								*			
	Dizziness													*	*	

When Table4 is analyzed, students stated that the disadvantages of virtual trips are not being able to see and feel like a real experience and not having enough resolution. The views of some students are given below;

S4; 'Not really being in that environment and not being able to fully experience that environment.

S7; 'I could not see well because the resolution was low'

S8; 'Although it provides a 3D image, I do not think it can provide the same effect without being in that environment'

S14; 'Since the image quality was low, I could not feel myself fully there and I could not make observations

#### 4. Conclusions and discussion

Regarding the advantages of a real field trip, the students stated that it was fun, they socialized with their friends, and they were able to make observations by being in the field, one-on-one and feeling. When the literature is examined, there are many studies supporting these views of the students. In their study, [18] stated that trainings carried out in nature increase student participation and enjoyment, provide intrinsic motivation and thus positively affect learning outcomes, and that students who feel freer in the natural environment can establish reliable and meaningful relationships with each other and thus develop their social skills more easily. The majority of the students stated that they learnt new concepts during the real field trip. [19], in their study, found that especially the trainings carried out in direct contact with flora and fauna in nature encouraged students to acquire environmental knowledge and provided a positive development in terms of commitment to nature, which supports our study.

When the opinions of the students about the disadvantages of real field trips were analyzed, negativities such as transportation problems, spending most of the time on the road, and falling behind in some courses were mentioned. Although field trips are of great educational importance, they are costly and burdensome out-of-school activities that carry health and safety risks and require great responsibility [10],[20]. Today, virtual field trips are replacing real field trips due to reasons such as the increasing number of students, the fact that the cost of the trip is covered especially by the families of the students, the field conditions contain various risks, the parents are concerned about these risks, and the difficulty of planning the trip in accordance with the acquisitions in the curriculum [10]. The results regarding the disadvantages obtained by the researchers overlap with our study. When student opinions on the advantages of virtual field trips, which have started to take place in education and training activities, are analyzed, it is seen that most of the students stated that virtual trips are costless, time and energy are saved, and especially places that cannot be visited can be observed. [21] stated that VFTs can transport students from the classroom to a hard-to-reach part of the world and that there is no need for any expense for this, and students also stated that VFTs provide access to hard-to-reach regions. Similarly, [22] stated in their research that virtual field trips (VFT) can be used as a teaching strategy that supports in-class and out-of-class learning instead of field trips that are carried out once a year under difficult conditions, especially parents will not have to worry about their children getting lost, injured or leaving the field. They also stated that virtual field trips would provide equal opportunities in education, would allow students who do not want to participate in real



field trips or disadvantaged students to have field experience, and that students could participate in VFT without time and space restrictions.

Regarding the disadvantages of VFTs, students mostly reported that they did not have the chance to observe and experience the feeling of being in the real field, the resolution was low and therefore they could not fully feel themselves in the field, and they were partially dizzy. While immersive VR applications offer direct experiences to the student, 360° videos are more abstract as the student is in the passive viewer position in 360° videos, which will reduce the student's feeling of being in the field [23]. As [10] stated, virtual field trips are not as effective as learning in real field trips because they do not reflect the three-dimensional tangible nature of objects and lack the power of incidental discovery by touching, smelling and stimulating real emotions. As [24] noted in their study, some students reported experiencing dizziness.

In our research, in which we tried to reveal the advantages and disadvantages of virtual field trips with student perceptions, the findings we obtained regarding the positive aspects of virtual field trips are in parallel with other studies [10], [21], [22]. Virtual field trips, which provide equality of opportunity in education by allowing disadvantaged students to participate, do not involve time constraints, save energy, increase motivation, make learning fun, and enable the development of skills such as reasoning and inference with digital skills, are seen as an important education and training tool [10], [14], [21], [24]. Despite these superior educational features, an environmental education that has the power to teach spontaneously by using only virtual field trips, simple and plain, disconnected from nature cannot be considered [20].

In the light of the opinions of almost all of the students that virtual field trips can never replace real field trips [25] and the superiority of learning activities carried out by being in the field, feeling, smelling, touching [10], the use of virtual field trips in an integrated manner with other education and training activities, especially for informative purposes before and after real field trips, increases the efficiency in learning outcomes.

Virtual field trips cannot replace real field trips, but the limitations of both methods should be determined in the light of student opinions and in this direction, hybrid use should be ensured especially in environmental education. Considering the limitations of real field trips (cost, permit procedures, pre-trip preparation load, areas that cannot be visited, etc.), virtual field trips can be used as an alternative education and training tool by integrating them into a course period.

The impact on student attitudes, behavior and academic achievement has not been investigated and the impact of virtual field trips on these learning outcomes can be investigated. By making teachers and administrators aware of the importance of actual field trips, they can be encouraged to use this valuable educational activity. Virtual trips can be used in hybrid lessons to eliminate the limitations of real trips. In particular, virtual field trips can be used to introduce and inform the field before a real field trip and to complete the deficiencies related to the learning outcomes after the trip.

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