DEVELOPMENT AND EXPLORING THE EFFECTIVENESS OF THE REVISED VERSION OF BASIC DISASTER AWARENESS TRAINING PROGRAM DESIGNED IN A NON-FORMAL SCIENCE LEARNING ENVIRONMENT

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ABSTRACT

DEVELOPMENT AND EXPLORING THE EFFECTIVENESS OF THE REVISED VERSION OF BASIC DISASTER AWARENESS TRAINING PROGRAM IN A NON-FORMAL SCIENCE LEARNING ENVIRONMENT

Two main objectives were set for this study. The first one was to develop the *Revised Version of Basic Disaster Awareness Training Program (Rv-BDATP)* offered to students by Disaster Preparedness Education Unit (DPEU) at Boğaziçi University, Kandilli Observatory and Earthquake Research Institute (KOERI). This program was developed to increase students' learning outcomes regarding the nature of earthquakes and actions to be taken before, during and after the earthquake to minimize its possible damage. The second aim was to evaluate the effectiveness of the *Rv-BDATP* with in an experimental research design. Seventy 8^{th} grade private school students participated in this study. Learning outcomes of the students were mainly analyzed in two dimensions measured by *Conceptual Understanding Questionnaire-Earthquake (CUQ-Earthquake)* and *Program Evaluation Questionnaires.* The *CUQ-Earthquake* test was conducted as a pre-test, post-test and retention test. The other instruments were given as a post-test. The first dimension concerned with students' conceptual understanding levels of identified concepts related to the "natural processes" unit of 8^{th} grade science and technology curriculum and their capability to tell the difference between dangers and precautions related to earthquake. The second dimension was about students' personal declarations and ideas about their learning experiences regarding the programs. Independent Sample t-Test, ANOVA and ANCOVA were conducted in order to test the hypothesis. The results showed that there were no statistically significant differences between the groups who took the revised version and the former version of the program. It was also found that students who attended the revised program showed significant increase in their conceptual understandings about earthquakes. The results indicated that there was not any difference among the students' personal declarations and ideas about the programs.

ÖZET

YENİDEN DÜZENLENMİŞ TEMEL AFET BİLİNCİ EĞİTİMİ PROGRAMININ OKUL DIŞI BİLİM ÖĞRENME ORTAMINDA ETKİLİLİĞİNİN İNCELENMESİ

Bu çalışmanın iki temel amacı vardır. İlk olarak Boğaziçi Üniversitesi Kandilli Rasathanesi ve Deprem Araştırma Enstitüsü (KRDAE) Afete Hazırlık Eğitim Birimi (AHEB) tarafından ilköğretim ve lise öğrencilerine verilen *Temel Afet Bilinci Eğitim Programı'*nın yeniden düzenlenmesini amaçlanmıştır. Bu program, depremlerin olası zararlarını en aza indirmek amacıyla öğrencilerin depremlerin doğası ve deprem öncesinde, sırasında ve sonrasında yapılması gerekenlerle ilgili kazanımlarını artırmak için geliştirilmiştir. Çalışmanın ikinci amacı deneysel araştırma deseni ile *Güncellenmiş Temel Afet Bilinci Eğitim Programı'nın* etkinliğini ölçmektir. Çalışmaya 70 tane 8. sınıf özel okul öğrencisi katılmıştır. Öğrencilerin kazanımları, *Kavramsal Anlama Anketi (CUQ-Earthquake)* ve *Program Değerlendirme Anketleri* kullanılarak temel iki boyutta incelenmiştir. *CUQ-Deprem* testi ön-test, son-test ve kalıcılık testi olarak uygulanmıştır. *PEQ-kontrol ve PEQ-deney* sontest olarak verilmiştir. İlk boyutta öğrencilerin 8. sınıf Fen ve Teknoloji dersinin 'doğal süreçler' ünitesindeki belirli kavramları anlama düzeyleri ve depremle ilgili tehlike ve önlemler arasındaki farkı görebilme yetenekleriyle incelenmiştir. İkinci boyutta ise öğrencilerin programlara ilişkin olarak öğrenme deneyimleriyle ilgili ifade ve fikirlerini incelenmiştir. Çalışma hipotezleri Bağımsız Örneklem t-Test, ANOVA ve ANCOVA kullanılarak test edilmiştir. Çalışmanın sonuçlarına göre, belirli kavramlara dair kavramsal anlama ve depremle ilgili tehlike ve önlemler arasındaki farkı görebilme yetenekleri konusunda programın eski versiyonuna katılan öğrenciler ve güncellenmiş versiyonuna katılan öğrenciler arasında istatistiksel olarak anlamlı bir fark bulunmamaktadır. Diğer taraftan, programın güncellenmiş versiyonuna katılan öğrencilerin depremlerle ilgili belirlenen kavramlara yönelik kavramsal anlama düzeylerinde anlamlı bir iyileşme olduğu ortaya çıkmıştır. Diğer sonuçlara göre öğrencilerin programlarla ilgili öğrenme deneyimlerine dair ifade ve fikirleri arasında fark bulunamamıştır.

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df	Degree of freedom
f	Frequency
M	Mean
N and n	Number
Sig.	Significance
Std. Deviation	Standard Deviation

LIST OF ACRONYMS / ABBREVIATIONS

BDATP	Basic Disaster Awareness Training Program
CUQ-Earthquake	Conceptual Understanding Questionnaire-Earthquake
DPEU	Disaster Preparedness Education Unit
KOERI	Kandilli Observatory and Earthquake Research Institute
NEMC	National Earthquake Monitoring Center
PEQ-Control	Program Evaluation Questionnaire-Control
PEQ-Experimental	Program Evaluation Questionnaire-Experimental
Rv-BDATP	Revised Version of the Basic Disaster Awareness Training Program

1. INTRODUCTION

Individuals live in a constantly changing world with new technological, scientific inventions and socioeconomic changes. They try to follow up these improvements and adapt themselves to the situations. At some points, individuals have many difficulties in choosing the most appropriate option among many other alternatives in order to meet their needs. When it is compared to the last two decades, people can easily access various kinds of knowledge and information about different topics. Therefore, their ability to choose the valid and reliable information and interpret them in the right way is a very important factor while making decisions. Scearce (2007), says that an individual's decisions have the capacity to affect both their personal health and others' lives. Decisions on energy consumption, using natural resources and environmental concerns may not seem critical in an individualistic aspect however when these decisions and choices are multiplied by a number of nation, or nearly seven billion worldwide, they have the power to change the face of the planet.

The effect of scientific and technological developments on daily life is obvious. It is clear that globalization, international economic competition, rapid developments in science and technology will continue to affect lives of both individuals and societies. At that point, many countries realized the need for the development of scientifically literate citizens for encouraging a powerful social and economical life. With this realization, like many other counties, Turkey focuses on the improvement of science and technology curricula to promote scientific literacy of the whole society. The primary school science and technology curriculum has been redesigned in 2005 with the main mission to ensure the development of scientific literacy for all students. The quality of the science education seems to be a key that opens all the doors for a powerful future in the hope of promoting social, material, and personal well-being. The properties of science and technology education have a great impact on the development of scientific literacy. Therefore many learning theories instructional strategies and methods such as constructivism, Gardner`s multiple intelligence theory and Dewey`s 5 E instruction model have been developed and discussed in order to increase the quality of science and technology education (TTKB, 2005).

One way to increase the quality of science education might be focusing on non-formal and informal science learning. The necessity for a variety in learning experience which is facilitated by the combination of school and out of school experience is emphasized to encourage students' science learning. The Committee on Science Learning in Informal Environments has been established to examine the non-school settings' potential for science learning. The committee consisting of 14 experts in science, education, psychology, media, and informal education carried out a comprehensive review of the literatures that give information about learning science in informal environments. The analysis conducted by the committee focuses on science learning occasions along with overlapping features of these learning environments. Such "places" include everyday-life experiences such as wandering in the park, watching sunrise and going hunting; organized settings including science center, zoo or botanical garden visits, and programs like post-school science or environmental monitoring by a local body. Cross-cutting features which form informal environments refer to the media and its role as a context and learning tool and the opportunities provided by these learning environments in order to include various communities into the process socially, culturally and linguistically. The key concepts of the conclusions of the committee are summarized by starting with the evidence that informal environments can contribute to and constitute an incentive for science learning (Bell *et al.*, 2009).

As scientific literacy which has been basic goal of all formal, non-formal and informal education programs, it has become crucial to give a clear definition by referring to the literature. "Scientific literacy is primarily something people do; it is an activity, located in the space between thought and text. Literacy does not just reside in people's heads as a set of skills to be learned, and it does not just reside on paper, captured as texts to be analyzed. Like all human activity, literacy is essentially social, and it is located in the interaction between people" (Barton and Hamilton, 1998, p. 3)

Throughout the world, many countries revise their education program with the aim of improving scientific literacy. One of these studies is Project 2061. American Association for the Advancement of Science (AAAS) has been working on Project 2061 which focuses on the reform of mathematics, science and technology education since 1985. With this project, deficiencies in K-12 education are defined such as the curricula consisting of too many topics with shallow information, ineffective instructional strategies or methods and insufficient course books and material. National Research Council in the USA has been taking part in the project and it states that the goal of science education is to improve individuals' scientific literacy (Roseman and Koppal, 2008).

In addition to program revisions, there have been international studies to assess the contribution of educational programs to the improvement of scientific literacy. According to the Program for International Student Assessment (PISA), literacy involves inter-disciplinary capacities of people to use their knowledge and abilities in various fields. One of the domains assessed by PISA 2006 which was implemented in 57 countries is the scientific literacy referring to four interrelated features. The first feature is scientific knowledge of an individual and how s/he uses it to determine questions, obtain new information, explain scientific phenomenon, and make conclusions based on evidence. The second feature is an individual's comprehension of characteristic features of science as a form of human knowledge. The third feature concerns with the awareness of the effect of science and technology on shaping our material, cultural and intellectual environments. The last feature is the interest in science related issues as a responsible and reflective individual (Bybee, 2009). The 2006 PISA focused on student's science performances, and scientific literacy. It tried to measure students' attitudes towards learning science, how aware they are of the life opportunities that science competency may provide, and the science learning opportunities and environments which their schools offer (OECD, 2007).

PISA studies become relevant to our work in that they demonstrate the level of scientific literacy in Turkey and the necessity to take actions to increase this level. Science Level 6 is the maximum level which is classified by PISA 2006. At Science Level 6, student can consistently identify, explain and apply scientific knowledge and knowledge about science in a variety of complex life situations. While according to the same criteria, science level of Turkey was determined as level 2 by PISA 2006. At science level 2, students have adequate scientific knowledge only to provide possible explanations in familiar contexts or draw conclusions based on simple investigations and they can make direct reasoning and literal interpretations of the results of scientific inquiry or technological problem solving (OECD, 2007). 4642 students from 160 different schools took the survey in Turkey. According to the result of PISA 2006, the average score of members of the Organization for Economic Co-operation and Development (OECD) countries is 500 in terms of science literacy while it is 424 in Turkey. Turkey ranked 29th out of 30 OECD countries and ranked 43th - 47th out of 57 participating countries in terms of scientific literacy scores measured by PISA 2006 (MEB, 2007). It indicates that like to many other countries, Turkey should give special attention to the quality of science education in order to make meaningful contribution to the development of students' scientific literacy.

The significance of science literacy and the necessity to improve the quality of science education in Turkey have been discussed above. Integration of formal learning and out of school learning namely non-formal and informal science learning can be useful to achieve this aim of development of scientific literacy. This combined method has been recognized and approved by Ministry of National Education in Turkey. Scientific literate people are able to associate their classroom science experiences with their daily life. In their everyday lives, they are able to use their scientific thinking skills while solving problems and making decisions. Parallel to this perspective, in Turkey the new science and technology program contains activities such as school trips related to informal and non-formal science learning in addition to formal science learning activities (TTKB, 2005).

Despite the recognition of the advantages of the above mentioned combination of these three types of science learning settings, a recent study shows that the level of usage of science and technology museums as a non-formal science learning environment appears to be below the expected level in Turkey. According to the results of the study which has been conducted to reveal the extent to which the science and technology museums in Ankara, are benefitted from an informal education institution, about 60% of the 349 primary school students have not visited the institutions at all. Moreover about 75% of the students who visited the places, went there with school trips. The study emphasizes how essential it is to use natural parks, botanic gardens, science and technology museums as non-formal science learning environments in order to contribute to the improvement of scientific literacy skills of students (Bozdoğan and Yalçın, 2009). This fact is totally conflicting with the research carried out by Piscitelli and Anderson (2001) which determined that 75% of the elementary school students visit museums with their parents and only 9% of them go such informal learning environments with their teachers in the USA. Therefore, the role of teachers and educational institutions for developing and improving scientific literacy is very important in Turkey, as it is very essential to make scientific learning penetrate into the daily lives of students through informal science learning opportunities. On the base of this purpose, teaching ways of the science topics play a critical role for development of scientific literacy of students.

Because of its special and unique geographical position, climate and properties of the ground, Turkey is a country of natural catastrophes especially in terms of earthquakes (Durduran and Geymen, 2008). It is a country which experiences a great number of earthquakes in a year. It should be assured that every individual knows about the nature of the earthquakes and what they should do before, during and after the earthquake. Therefore earth science education is especially crucial for Turkey.

Environmental catastrophe could be defined as a rapid removal of normality, passing into a new situation to which humans and ecosystems cannot easily adapt. More specifically, environmental catastrophe could be defined as natural hazards combined with large disaster, the latter containing measurable human and economical costs such as death, financial loss, infrastructure destruction and financial costs (Leroy, 2006). On the basis of these definitions, in order to identify an event as a catastrophe, its conclusions should be considered and analyzed in terms of its reflections on the lives of all beings and humans' biological and social lives. What makes an event catastrophe is not related to the event itself but its outcomes. During the last century, the frequency of recorded natural disasters rose significantly, from about 100 per decade up to 1940 to nearly 2800 per decade during the 1990s (ICSU, 2008). In Turkey, earthquakes are the most harmful natural catastrophes because of their high probability of occurrence and magnitude of their harmful effects on people's social and economical lives. In Turkey, 96% of the total surface area has a high risk of earthquake and 98% of the total population is located on the earthquake areas (Özmen *et al*., 1997). Consequently, last century, a hundred and forty earthquakes which caused serious damage occurred in Turkey. These earthquakes caused the death of 85000 citizens, serious injury of 125000 citizens, destruction or damage to more than 500.000 buildings and loss of million dollars. They caused enormous material and psychological damages which made people experience serious traumas for years that they were not able to deal with. Because of the geographical position of Turkey, it is impossible to prevent occurrence of earthquakes however the damages of earthquake could be decreased or minimized by various complex actions (Durduran and Geymen, 2008).

Although, earthquake is a reality, by the means of certain actions for minimizing its harmful effects, it could be identified as a natural event instead of a natural catastrophe. Although it is impossible to determine earthquake in advance, taking such steps to minimize the loss and damage caused by the earthquake is one of the major responsibilities of the governments. With this responsibility, nowadays world leaders give special attention to natural disasters. The participants at the July 2005 Gleneagles G8 Summit stated that the aim of the international community should be to reduce the vulnerability to the threat of disasters. They identified several priority strategies for disaster risk reduction (ICSU, 2005). World Conference on Disaster Reduction was organized by International Strategy for Disaster Reduction (ISDR) and held in Kobe on 18-22 January 2005. The policy context for this was the impact of natural disasters on sustainable development and on the Millennium Development Goals. The strong message that emerged was that consideration of natural hazards must permeate all thinking about development. Hyogo Declaration and the framework for action 2005 – 2015: building the resilience of nations and communities to disasters were two of the main formal outputs of the conference. In the Hyogo Declaration, world leaders stated: “We are deeply concerned that communities continue to experience excessive losses of precious human lives and valuable property as well as serious injuries and major displacements due to various disasters worldwide” (UNISDR, 2005, p. 3). Using knowledge, innovation and education to build a culture of safety and resilience at all levels is one of five high-level priorities of the Hyogo Framework. International organizations focusing on the education such as UNECSO is involved in numerous programs related to the aspects of hazards such as a coalition on education to integrate disaster reduction education into school programs and to make school buildings safer (ISCU, 2005). Considering these scientific and institutional attempts to understand the natural disasters and reduce their effects, it is made obvious that scientific literacy and institutional intervention about earthquakes is essential for earthquake preparation. Education is crucial for reducing hazards of disasters, and it is emphasized that education should be implemented concurrently at three different levels: communication among scientists of varying disciplines; creation of a bridge of quality between scientists and the media; and education for all people (Leroy, 2006).

The quality of earth science education gets special attention in order to encourage permanent consciousness about the natural disasters. Although people had terrible experiences because of the disasters, they could easily forget the events and started not to give attention to precaution for minimizing the harmful outcomes of disasters. For example, in Turkey, the last biggest earthquake occurred in 1999 and caused enormous material damages. It is required to make an extensive rebuilding in order to deal with the damages. Although it is well established that new earthquakes will occur within a lifetime because of the movement of the North Anatolian Fault, just after a few years later, amazingly, some structures were rebuilt in exactly the same locations as the previously destroyed buildings (Leroy, 2006).

Consequently, various worldwide studies performed to minimize hazards of natural disasters focus on the education which ensure the development of scientific view towards the reasons of natural disaster and development of consciousness about precautions to minimize the damages of them. At that point, the quality of earth science education especially about the natural processes such as earthquakes which can be identified as a catastrophe because of its outcomes, is one of the main focuses of education. In Turkey, which is an earthquake-prone country, the quality of earth science education in K-12 has a critical role in minimizing the outcomes of earthquakes by developing scientific literacy related to the nature of natural process especially earthquakes. Earthquake science and basic disaster education is provided by formal and informal educational institutions.

The introduction to earth science topics to students has a critical role in development of first ideas and images about the nature of science. First experiences about science learning especially earth science learning are the first steps towards the development of scientific literacy. Moreover various courses include earth science especially earthquakes as natural hazards, as their subject of study in K-12 curriculum such as life science, social science, science and technology courses in primary school. In the curriculum, earthquakes are taught as natural catastrophes not as natural processes and the students are just provided with the information about precautions to minimize the damage from earthquakes. This way of teaching establishes earthquakes as a part of destiny and the motivation to take precautions and gain consciousness about earthquakes might be reduced. As a study focusing on this very point shows us, in Turkey, an earthquake is defined as a catastrophe which caused enormous material and spiritual damages by most of the students who took place in the research aiming to discover primary school students' understanding of earthquake and their perspectives towards earthquake. The students who participated in the research live in Western Anatolia, Burdur, which is located in the third earthquake zone in Turkey. Most of the students stated that they and their families do not take any precautions in order to minimize damages of probable earthquakes although the earthquake in 1977 caused serious damages in the same region (Demirkaya, 2008). In addition to primary school education, earthquakes are covered as natural processes in geography and physics courses in high school. In the course of the K-12 curriculum, each year students are taught about earth science in different courses in Turkey (MEB, 2009).

In addition to K-12 formal education, Disaster Preparedness Education Unit (DPEU) at Boğaziçi University, Kandilli Observatory and Earthquake Research Institute (KOERI) provide the core information about the nature of earthquakes and basic disaster education. The Basic Disaster Training Program has different versions for different target groups such as adults, instructors and students.

The aim of this study to improve the existing Basic Disasters Awareness Training Program of DPEU to increase students' learning experiences related to nature of earthquakes and Basic Disaster Awareness Training Program. Therefore the student version of this program was used in this study. The Basic Disaster Training Program, program or abbreviations about the program such as *BDATP* and *Rv-BDATP* refer to this student version. This aim of this study has been determined depending on following reasons:

The main task of DPEU is to develop, improve and control educational programs about disaster preparation. Necessity for the improvement of the program was suggested by DPEU. They also see it as their duty to collaborate with scientists, academics, experts to improve effective education programs to minimize the damage of earthquakes.

Upon the request from DPEU to revise the program, the researcher and the advisors had meetings with experts in DPEU to learn about the program. The original program was developed between 1999-2003 in a project. It was designed as a school trip which was conducted in DPEU building within the Boğazici University KOERI. Through this program, students were given information about natural disasters and what actions should be taken before, during and after an earthquake. In the Earthquake Park, some activities were carried out with the participation of students. However, after a couple of years, a part about studies and formation of NEMC (National Earthquake Monitoring Center) and the formation earthquakes were included to the beginning of the program. With this modification, the program began to present NEMC and DPEU trainings combined as a whole. When this thesis project started, this combined version of the program was being used. In this study the combined version called as 2009 version of the program. The program was conducted as a total out-of-school education independent of formal education. The content of the trainings given in an out-of-school setting should be related to the curriculum taught at schools in order to increase the effectiveness of science education. (Orion, 1993; Anderson *et al.*, 2000; Anderson and Zhang, 2003; Bozdoğan, 2008). It was realized that the program lacked this kind of association with the school curriculum which required the revision of the program to make it related to the curriculum. Originally, the program was given as a lecture by an expert. In this lecture, the students were passive audiences and they were introduced with a great deal of critical information in a high level of terminology in a short time. The order of the presentation was completely different from the order of the school curriculum. This point is also emphasized in the literature which says that the experts in the informal setting should gain interest of the students and encourage their active participation by asking questions and giving feedbacks. Moreover, as they have time restriction, they should be concise and to the point in their presentations (Tran, 2004). It was observed that these factors could cause the students difficulty to follow the lecture and comprehend the topic.

Considering the factors mentioned above, the content of the *Revised Version of Basic Disasters Awareness Training Program (Rv-BDATP)* focused on the core concepts about the nature of earthquakes and precautions to minimize the outcomes of earthquakes. It aimed to contribute to development of students' scientific literacy by means of effective informal science learning environments. Moreover the *Rv-BDATP* contained a guidance document for teachers who will use the programs for their students. It is also aimed to contribute to teachers' background about the nature of earthquakes and give suggestions for effective usage of informal and non-formal science learning environments to provide effective science teaching.

Considering all these, it can be said that the purpose of this study is to improve effectiveness of the Basic Disaster Training Program offered to students in an out of school learning setting concerning with earthquakes and the process of earthquake preparation and explore its effectiveness.

2. LITERATURE REVIEW

The main questions coming to mind in pursuit of the aim of this study are: *What are the characteristics of out of school learning?, How is it possible to increase the effectiveness of science learning in out of school settings?, How is the earthquake science education offered in Turkey?, What are the ideas, beliefs and conceptions of the students about earthquakes?* Related literature has been reviewed in the light of these questions.

Out of school learning environments are very important because students spend more time in informal settings than they do at school. For example, in Turkey, students spend approximately 700 hours per year or 29 days per year in the class through 8 year compulsory education. Approximately science education in primary school is limited to 4 class hours per week (MEB, 2009). In the USA children gain most of their science learning experience in out-of-school environments. Mostly, students' science related experiences take place out of classroom therefore properties of the out of classroom experiences play critical role in science education (Stroud, 2008). Nowadays, the significance of out-of-school science learning experience has already been recognized. Out-of-school science learning experience includes every day experiences and complicated organized programs (Bell *et al.*, 2009; Stroud, 2008).

In the literature out of school learning generally characterized as informal and non-formal learning. There are many debates about the definitions of "informal" and "non-formal" learning or education. The review begins with the debates origin of the term "informal" and various definitions of informal and non-formal learning and science learning in these settings. It continues with the effects of these learning experiences on learning and formal education. Then the factors that affect the effectiveness of non-formal science settings and the suggestions for increasing the learning outcomes of students from informal science settings are discussed. The review ends with the properties of earthquake science education in Turkey and the results of studies regarding students' ideas, beliefs and understandings about earthquakes.

2.1. Definitions and Properties of Informal and Non-formal Learning

Learning experiences are generally defined in either in-school or out of school contexts. Formal education has long been associated with schools and school curricula (Griffin and Symington, 1997; Gioppo, 2004; Condon, 2010; Colley *et al*., 2003). On the other hand, various terms have been used in order to define out-of-school learning such as informal, non-formal, free choice learning and museum education. In the literature informal and non-formal terms are more common than the other terms. In this part of the literature review, firstly definitions and properties of informal and non-formal learning are given.

In the education literature, the experiences and learning out of the school are defined by the term “informal learning” after 1960s. This term is originated from the terminology used by anthropologists and researchers in international development. Firstly, museum and environmental educators use the “informal” term in order to distinguish learning that takes place in schools and the learning that they are involved in (Falk, 2001). In the following years, the term “informal” has been used in various contexts and the definitions are used interchangeably (Colley *et al*., 2003; Colley *et al*., 2002). Informal science learning has been used to express the learning which takes place in science museums. At the beginning of the nineties, the study of learning in science museums has been identified as a field in its infancy by Feher (1990). In the following years researches about learning in science museums have become popular therefore considerable development and growth in this field have been produced by different researchers (Hofstein and Rosenfeld, 1996; Falk, 2001; Piscitelli and Anderson, 2001; Anderson *et al*., 2003; Bell *et al.*, 2009). All these studies contribute to comprehension of the properties of informal learning.

Previously, there used to be a strict distinction between formal and informal learning (Dierking *et al*, 2003). In this perspective, difference between formal and informal learning was mostly explained by the setting (Knappenberger, 2002 as cited in Stroud, 2008). These two terms were characterized as the opposite of one another. This approach is a very reductionist one concentrating only on location and ignoring the complex sets of interactions and negotiations that takes place in the whole process (Dierking, 1991; Hofstein and Rosenfled, 1996).

The features of formal and informal learning used to be explained in binary oppositions modified from Wellington, 1991 by Hofstein and Rosenfled in 1996 as shown in the list below (p.89).

Table 2.1. The features of formal and informal science learning.

Informal Learning - Field trips	Formal learning – school
Voluntary	Compulsory
Unstructured	Structured
Unsequenced	Sequenced
Nonassessed	Assessed
Unevalued	Evaluated
Open-ended	Close - ended
Learner - led	Teacher - led
Learner- centered	Teacher - centered
Out-of-school context	Classroom context
Non-curriculum-based	Curriculum-based
Many unintended outcomes	Fewer unintended outcomes
Less directly measurable outcomes	Empirically measurable outcomes
Social intercourse	Solitary work
Non-directed or learner directed	Teacher directed

The term informal learning was first defined as the opposite of formal learning. Hofstein and Rosenfled (1996) gave two definitions of informal learning referring to Crane Nicholson and Chen (1994). According to them, informal learning occurs outside the school, it is not primarily for school use or a part of the school curriculum. It is defined as voluntary rather than a compulsory activity. Informal learning experience can be constructed so as to satisfy certain objectives. It may have an effect on attitudes. It can be used to convey information or cause behavioral changes. But the same definition proceeds by allowing informal learning to integrate features of formal learning under specific situations. Informal learning is also defined as a supplement to formal learning. It can be used in schools or by teachers. Informal leaning may include museum visits, aquarium and zoo trips, using television, radio and community-based programs, benefiting from magazines, newspapers, books, and hobbies.

The term "informal learning" is frequently employed in education literature. Within the literature of science education most definitions of informal learning are based on one of the two domains of context or control (Stroud, 2008). In the context-based definitions, the focus is on the terms "out-of-school" (Rennie *et al*, 2003) or "outside the classroom" (National Science Teachers Association, 1998). According to these definitions, learning takes place through the interaction with environment and other people, which is similar to socially situated learning (Brown *et al*., 1989 as cited in Stroud, 2008).

On the other hand, definitions based on control focus on the learner as the center of control learning and can thus be regarded as "self-directed" (Knowles, 1975 cited in Stroud, 2008) or "free-choice" (Falk, 2001; Rennie *et al.*, 2003). Griffin (1998), emphasize also personal control of learning in museums. These conceptualizations are based on learners' interests and needs, and explained through social constructivism. On the parallel of this perspective, Ramey-Gassert, Walberg and Walberg (1994) define informal learning settings where learning is intrinsically motivated and proceeds through curiosity, observation and activity in museums (as cited in Griffin *et al*., 2005).

Stroud (2008) makes the following definition for informal learning:

> "Informal learning begins with the motivations, needs, or interests of the individual and is socially constructed in everyday situations beyond the school classroom (p. 14)."

He argues that his definition is not only based on socio-cultural theory but also is closely related to six facets of informal learning environments identified by the National Association for Research in Science Teaching's "Informal Science Education" Ad Hoc Committee (Dierking *et al*., 2003). The committee identified the following six aspects which need to be considered to frame research to investigate such meaningful learning:

> "1. Such learning is self-motivated, voluntary, and guided by learners' needs and interests, so certain aspects of learning are critical to investigate (e.g., the role of motivation, choice and control, interest, and expectations in the learning process).
>
> 2. The physical setting in which such learning takes place is extremely important, so this learning needs to be investigated in authentic contexts.
>
> 3. Such learning is strongly socioculturally mediated, so research designs need to offer opportunities to explore social and cultural mediating factors including the role of conversations, social learning networks, cultural dimensions and the use of groups, as well as individuals, as the unit of analysis.

> 4. Learning is a cumulative process involving connections and reinforcement among the variety of learning experiences people encounter in their lives: at home, during schooling, and out in the community and workplace. Research designs need to offer opportunities to investigate all dimensions of learning and their connections in a variety of settings across a span of time which will allow us to understand how these experiences are used and connected to subsequent experiences longitudinally.
> 5. Learning is both a process and a product, so we need to investigate the processes of learning as well as the products of learning.
> 6. The very nature of such learning requires multiple, creative methods for assessing it in a variety of ways under a variety of circumstances. Thus, innovative research designs, methods, and analyses are critical (e.g., conversation/discourse analysis, constructivist tools such as concept mapping and personal meaning mapping, social learning network analysis, and hierarchical linear modeling) (p.110)."

Apart from these definitions, Combs, Prosser and Ahmed (1973) make a clear separation between these two terms benefiting from the report of UNESCO which is mentioned in Falk (2001). According to them; informal education enables individuals to obtain skills, values, attitudes and knowledge from their environments. The informal learning setting include neighbors, family, work and play, the mass media, library and market place. On the other hand they define non-formal education as an organized educational activity which occurs outside the school system. Non-formal education aims to serve certain target learners which certain leaning objectives. It can be seen that the separation between the two terms focuses on the location of the learning places, even though the boundaries between the definitions are not clear (Colley *et al*., 2002; Malcolm *et al*., 2003).

Non-formal education seems more appropriate for the purpose of this research considering the overall literature. As Giappo suggests (2004), a non-formal setting is a structured setting which is outside the formal education system. Generally these settings have certain educational goals. The institutions which provide non-formal learning settings have clear educational goals. As informal learning does not include a prior structure and determine objectives the term non-formal learning fits this research better. Basic Disaster Awareness Training Program includes certain objectives, learning activities and a specified structure. In addition, it is offered by a formal institution Boğaziçi University and supervised experts and school teachers. It is not an intentional learning but the learning experience is highly structured and guided.

The fact that the term non-formal is chosen to represent the learning environment of the Basic Disaster Awareness Training Program does not mean that this research is limited to non-formal settings. The literature review has covered many studies regarding out of school learning experiences such as free-choice learning, museum education, school trips, informal, non-formal and formal settings. The reason for this combination is that boundaries between formal, non-formal and informal learning are not clear and it is more helpful to examine the context and purposes of the learning experiences and how they interrelate with each other (Colley *et al*., 2002; Malcolm, *et al*., 2003).

The process to define the informal or non-formal learning has been carried out in parallel with the process to analyze the learning process in a formal learning setting. In the literature it is said that informal or non-formal learning should have a theoretical basis. Informal and non-formal learning should be carried out in collaboration with a range of institutions and the industry (Hein, 1991; Schauble *et al*., 1997).

For the theoretical basis, informal or non-formal learning has been associated with the constructivist and socio-cultural theory (Hein, 1991, 1995; Schauble *et al*., 1997). The earlier studies focused on constructivist theory. Hein (1991, 1995) says that the principles of constructivism can be applied to learning in museums. For instance, he argues that learners should be active in an informal and non-formal setting; which one of the principles of constructivism. He stresses that the activities which are offered to visitors need to provide not only physical but also mental engagement of the visitors. In the literature the word museum refers to museum, science center, exhibition, zoo, botanical garden generally informal learning settings.

As Hein (1991) points out, an informal and non-formal learning setting should enable the learner to learn how to learn. The activities should be analyzed to examine how the visitors, learners, organize the knowledge. In addition, as learning is a social process, a museum need to include interactions. The activities should make visitors discuss, share opinions and learn together. As constructivism suggests, an informal science setting should offer information in a context. This context should enable visitors to understand the intended message by associating the new information with the previous one. Learning requires some knowledge according to constructivism therefore an informal or non-formal learning activity should be developed and applied taking the knowledge levels of visitors into account. Additionally, according to another principle, learning takes time. The informal or non-formal learning process need to be rethought and analyzed over and over again to make visitors internalize the knowledge. Similar to Hein, Anderson and his friends (2003) also argues that constructivism relates informal and non-formal learning in that it recognizes the significance of visitors' prior knowledge, their alternative conceptions and individual nature of construction of meaning from experiences.

According to socio-cultural theory, the context, culture and artifacts in a learning situation shape the learning process. Schauble and his friends studied on a suitable theoretical framework of informal learning on the base of socio-cultural approach. They see socio-cultural theory as significant because it concerns with the meaning making process in a social context. Rather than facts learned, socio-cultural theory concentrates on the interplay between the actors in a social context and the mediators such as signs, talks, tools and symbol systems. It is thought that individuals shape and they are shaped by mediators at the same time. Socio-cultural theory emphasizes three main points which becomes relevant to informal and non-formal learning. First of all, it highlights the variability of learning as well as the commonalities. The experience, knowledge and interest of a visitor to an informal and non-formal setting can vary just like the activities in these settings. In addition, the methods used by the informal and non-formal setting are included in this variability. Secondly, the theory sees learning as a process rather than just focusing on the outcomes. The variability of learning prevents us from seeing learning just as a product. A focus on the learning process itself can enable us to consolidate, encourage and deepen the activities in an informal learning setting. Thirdly, socio-cultural theory is developmental. It tracks changes emerging in time and it emphasizes on the identification of the role of meaningful encounters and events in a person's life (Schauble *et al*., 1997).

As out-of-school learning settings show great diversity, both constructivist and socio-cultural theory can be referred to regarding informal and non-formal science learning settings. In the development of the program, it has been realized that both theories should be taken into account.

2.2. The Effects of Informal and Non-Formal Learning Experiences on Learning Outcomes

Changes in those widely-accepted paradigms and older definitions of learning have enabled us to reveal the potential of informal and non-formal setting experiences to improve learning outcomes. By the middle of the 1990's the cognitive, affective and social value of experiences in museums and similar institutions were widely acknowledged (Rennie and McClafferty, 1997; Falk and Dierking, 1992).

The positive effect of informal and non-formal learning experiences is increasingly accepted as critical for comprehending the learners' trajectories in science. Moreover several American groups committed to science education have become more and more aware of informal learning, providing research (Dierking *et al*., 2003) and stressing the significance of informal and non-formal learning environments and developing groups dedicated to these studies (NSTA, 1998). Additionally, the National Science Foundation has founded a program to finance the informal and non-formal science learning projects.

Self-directed science learning opportunities have become increasingly common as alternative learning settings for science learning are provided with urbanization and sophisticated communication technologies such as television and digital media increased the variety of tools available. What is striking about informal or non-formal learning is the assumption that a considerable amount of knowledge and feelings about science is obtained by individuals through impressions caught outside the classroom (Stroud, 2008).

It is understood that students enjoy to their visit to museums very much which increases their interests and engagement (Ayres and Melear, 1998; Ramey-Gassert, Walberg, and Walberg, 1994; Rennie, 1994; Wolins *et al*., 1992 as cited in Anderson *et al*., 2003). Apart from the increased motivation and interest, in the research carried out by Rowsey (1997) on 35 scientists, 78% of them declared that they were not affected by their formal learning experiences in middle and high school in deciding their careers, while most of these scientists said that their interest in science was determined by their informal learning experiences. This study shows that the experience in non-formal learning environments might have great impact on the inclination of students to build their career towards being a scientist (Sladek, 1998). At that point, effective non-formal learning experiences might contribute to the development of scientists therefore the arrangements of informal learning experiences such as school trips play a critical role that affects individuals' and the whole society's carrier development.

Another parallel research was conducted in UK with the participation of 300 primary school children. They visited UK National Space Center. The attitudes of the children toward space changed after this school trip. Measurements were conducted to evaluate the attitude changes before, immediately after, and 2 months and 4–5 months after the trip. It was concluded that immediately after the trip, the children showed more interest in space and a moderate increase in their views about the value of science in society. Approximately 20% of the students had an increase in their desire to become scientists in the future. Besides, this trip also gained a positive advantage to the students who attended the trip over the other children regarding science enthusiasm and space interest (Jarvis and Pell, 2005).

One of the studies performed by Gerber and his friends (2001) aimed to understand the effects of informal learning experiences on students' reasoning abilities and formal classroom learning. According to the results of this study, informal learning experiences and classroom science teaching procedures had statistically significant effect on students' scientific reasoning abilities. It is found that students who had experiences in enriched informal learning environments had significantly higher scientific reasoning abilities compare to students who had experiences in limited informal learning environments. The researchers concluded that, generally, the extent of informal science experiences and receiving inquiry-based teaching might promote science learning and the achievement of science in schools. These findings supported the idea that free-choice learning experiences might have significant effect on science learning in formal settings. The researchers stated that both science and non-science oriented informal learning experiences encourage social interactions and cognitive conflict which are crucial for development of scientific reasoning abilities parallel to constructivist learning theory.

In addition to these studies which focus on the effects of non-formal and informal learning experiences, some studies aim to investigate some factors that affect the learning outcomes of the learners regarding their informal learning experiences. Falk and Adleman tried to explore how the variability of visitor groups influences their learning outcomes from the National Aquarium in Baltimore. They categorized the visitors according to their experience, prior knowledge, motivations, interests and expectations. The results of the study showed that there were significant increases among all the visitors in gathering information, interest and concerns. On the other hand, significant increases were not found between all different levels of subgroups. It is found that visitors which have beginner and moderate levels of prior knowledge learned most from their visit experiences. They found that there were significant group changes for the entire group but not for all subgroups. The researchers suggested that further studies to explore learning in museums should include grouping of learners into more specified categories and at least the categories should base on visitors' prior knowledge and interests. In addition to these, they discussed that prior knowledge; experience and interest are normative phenomena according to constructivist learning theory. This learning perspective is limited in terms of categorization of the learners in the diverse range of knowledge, interest, and experience groups (Falk and Adleman, 2003). These results are consisted with another research which was concluded that visitors' motivation affects how much, what, how they learn at the museums. Participant of the study who had high educational or entertainment motivation for their visit showed significantly greater learning compare to other participants. In addition to these the researchers concluded that education and entertainment were parallel to each other, and they stated that generally the term education is regarding with schools or formal instructions, therefore visitors who come to be entertained, do not expect or see themselves as being educated although they learn new things (Falk, Maussouri and Coulsan, 1998).

It is identified that activities and programs regarding the informal and non-formal settings have impact on visitors learning outcomes. The researchers suggested that a pre-visit goal setting increased students' motivation to ask for help necessary in order to focus on learning resources that were available for them, moreover they gave more attention to understanding of the context (Lebeau,Gyamfi,Wizevich, and Koster, 2001). The Results of some other related studies indicated that pre-visit, during-visit and post-visit activities, contribute to students' learning of new science concepts, the principal of exhibits and reconstruction of related science concepts (Anderson *et al*., 2000; Tran, 2004; Bozdoğan, 2008).

The Committee on Science Learning in Informal Environments has given four recommendations to exhibits and program designers in terms of effective design and usage of informal science learning settings. The first recommendation includes principals related to the content of the program. According to these principals informal learning environments should be design regarding identified learning goals, they should be interactive. Besides, they should include various activities, materials, settings to support science learning by promoting engagement of learners with concepts, practices and phenomena within a particular setting. The designs of in formal learning environments should guide learners to correlate their new learning experiences and prior knowledge, experiences, and interests. Besides, they should support and motivate learners to learn more and more over time (Bell *et al.,* 2009).

The second recommendation is related with the policy of the institutions. It is suggested that community-educator partnership should guide the development of the informal science learning settings. Moreover they should be related with scientific problems and ideas which are very important for citizens. The third recommendation is related with the development procedure of the educational tools. It is suggested that educators, designers, experts in science and learners should collaborate for development and revision of the educational tools and materials. The science of human development and learning should be concerned while developing the materials.

In addition to these three recommendations, the Committee on Science Learning in Informal Environments has defined a special role: being a "front-line" educator who is the person interacts with the learners in informal settings and guides their science learning experiences. The guide teachers, experts, staff of institutions, parents, friends or other care providers can be front-line educators. It is thought that front-line educators might become role models for expected science learning behaviors and they might guide to make practice, interact with other learns and keep the order. In addition to these it is mentioned that front-line educators should act carefully while considering the diversity of community members. The last recommendation is regarding the behaviors and attitudes of front-line educators. It is suggested that front-line educators should be supported in terms of development of cultural competence and learning about background, motivation and interests of the learners. Because front-line educators should actively integrate their own and learners' concerns, questions, worldviews, everyday language, histories (Bell *et al.,* 2009).

After we recognized the characteristics of informal and non-formal learning and their significances, it is necessary to mention about earthquake science education in Turkey and support this literature on non-formal learning with the studies about earthquake science. The following part will bring into light studies about earthquakes.

2.4. Earthquake Science Education

Turkey is an earthquake prone country which is located over the three plates as Eurasian, Arabian, and African Plates which have different motions. More than eight thousands earthquakes shook Turkey in 2008 and only a few of them were noticed by the citizens (DPEU, 2009). Therefore citizens might not be aware of the reality of earthquakes in Turkey which leads to increase in damages of earthquakes. The Kocaeli Earthquake occurred in 1999 and affected the whole county and the world in terms of its psychological and materials damages. The earthquake caused 17127 deaths, 43953 injuries, and displaced more than 250000 people. Approximately 121 tent cities were required for emergency housing. After this great tragedy people notice the reality of earthquakes (Holzer, 2000). The damages of the earthquake were much bigger than the expected amounts because of the lack of social awareness related to disasters. It is founded that if Turkey had enforced for its building regulations, the number of the deaths would have been significantly less and materials damages would have been less amount (IFRC, 2002). It is understood that education is very important to minimize the hazard of earthquakes.

After the Marmara earthquake disaster, importance of the education regarding the nature of earthquakes and actions to be taken before, during and after has been identified to minimize the hazards of earthquakes. At that point international collaborations have been made to develop education programs for all citizens in Turkey. The Disaster Preparedness Education Project (DPEU) was carried out with the collaboration of Boğaziçi University, Kandilli Observatory and Earthquake Research Institute (BU-KRDAE), United States Agency For International Development (USAID) and Office of Foreign Disaster Assistance (OFDA) between the years 2000 and 2003. The purpose of the project was to contribute the preparedness of Istanbul for expected major earthquakes in terms of community disasters awareness, local preparedness, first response organizations, skills in order to mitigate casualties and loss of property. Four main objectives were identified to realize the purpose of the project as:

- Development of public education materials and training curricula,
- Training of trainers in basic disaster awareness and community emergency response,
- Disasters awareness education and citizen first responder training to the public,
- Outreach and coordination of effort.

In the first three years of the project some educational programs were developed such as Basic Disaster Awareness Program and Instructor Training also the project expanded to other four provinces which are located in first and second degree of earthquake zones with the contributions of other organizations (DPEU, 2009). The program reaches more than 120000 school personnel and 1.8 million students in four provinces (ABUHC, 2006).

After these three years, the project converted to the Disasters Preparedness Education Program (DPEP) in order to support the Turkish Ministry of Education in terms of providing the Basic Disaster Awareness Training in Schools. This program aimed to provide basic disaster awareness training for 25000 teachers and 5 million children by the end of 2005. The Disaster Preparedness Education Unit (DPEU) has been formed and four education programs are developed within the scope of the program with contribution of experts from Boğaziçi University and other organizations. The DPEU has taken the major role to support the development of education programs and materials in high quality for public education in order to provide community- based disasters mitigation. The four main education programs are named as:

- Basic Disasters Awareness Training Program
- Nonstructural Mitigation Training Program
- Structural Awareness for Seismic Safety Training Program
- Community Disaster Volunteer Training Program.

There are booklets, CDs, powerpoint presentation related to the programs which are offered by the Disaster Preparedness Education Unit (DPEU). These are the main sources which are used by the Turkish Ministry of Education and other organizations while preparing booklets and other educational materials related to precautions to minimize the damages of earthquakes and provide community- based awareness about it (DPEU, 2009).

These four main programs focus on the actions to be taken before, after and during the disasters especially earthquakes in order to minimize their damages. However, the content related to the nature of earthquakes has not been given in detail in the programs. At that point K-12 curriculum becomes one of the main sources in terms of providing information about the nature of earthquakes. However 8^{th} year compulsory basic education includes information about the nature of earthquakes since 2008. The last unit of 8^{th} grade science and technology curriculum which is named as "natural process" includes information about the theory of plate tectonics and the nature of earthquakes (TTKB, 2005). The topics about the precautions, action to be taken before, during and after the earthquakes are placed in current K-12 curriculum. In primary school the topics are integrated into in life science, social science, science and technology courses. In secondary school the topics are mentioned in the geography and physics courses (TTKB, 2009). It is essential to clarify the ideas, beliefs and misconceptions of the students about earthquakes to identify the required properties of an effective Revised Version of the Basic Disaster Awareness Training Program.

2.5. Research on Individual's Ideas, Beliefs and Understandings about Earthquakes

Although earthquake science education is crucial for many countries as well as Turkey there are not many studies about students' ideas, conceptualization and beliefs regarding earthquakes. The studies in the literature can be examined according to six main questions such as *What is an Earthquake?, What causes an earthquake?, What happens when there is an earthquake?, How can earthquakes affect objects or living things during an earthquake?, Is it possible to know when and where an earthquake will take place?, What can we do to protect ourselves from earthquakes?.* The literature is examined on the basis of these six questions to explore individuals' conceptualization, understandings and beliefs related to the nature of earthquakes and precautions to minimize damages of them. Some of the studies provide results for most of these questions. Therefore, these studies will be referred to many times regarding the questions.

One of the recent studies aiming to investigate students' ideas regarding to "What is an Earthquake?" question was performed by Demirkaya in 2007. The sample of the study includes 111 primary school students who live in Western Anatolia, Burdur, which is located in the third earthquake zone in Turkey. The earthquake in 1971 caused serious damages in this region. Around 90% of the participants define the earthquake on the base of its psychological or physical damages. About 31% of the 111 students use the word "natural hazard" while defining the earthquakes, the other 59% of the 111 students define the earthquake by giving examples about its damages such as hurting or killing people, damages inside and outside the buildings, panic, sadness which are the major outcomes of natural hazards. On the other hand, only about 9% of the students define the earthquake as strong shaking of the ground. In addition to this, only 1% of the students state that earthquakes are necessary for formation of land forms.

Another research which was performed by Şimşek in 2007 found similar results as Demirkan's study. Totally forty kindergarten and grade 1st, 2nd, 6th, and 8th grade students participated in the study. About 37 of the 40 students define earthquakes as a bad natural event and a natural disaster because of its negative outcomes such as death, destroyed houses, trembling buildings, people in panic, swinging lamps, sliding land and shaking ground. None of the 8th grade students mention about positive outcomes of the earthquakes. Moreover; only three grade 4 and 6 students state that earthquake might be a good thing, the one who is in grade 4 states that "it might be a good thing as it affects shape of the earth." and the 6th grade student said that "it might be good because it prevents compaction of the ground." All of the explanations are far away from the nature of earthquakes.

In addition to these two studies performed in Turkey, international studies also contribute to the literature in terms of determination of students' ideas and beliefs regarding the earthquakes. One of these recent studies was carried out to investigate both Turkish and American students' existing knowledge about earthquakes. A questionnaire which was developed by Oğuz was administrated in 2005 to 823 students from 5th to 8th grades from two different geographic locations: Aydın which is located in a high-risk Earthquake zone; and Columbus which is located in a low-risk Earthquake zone. The majority of students in Turkey have not received formal instruction related to earthquakes through the school curriculum whereas majority of American students have been instructed about it. The questionnaire included items related to the various answers of the main question "What is an earthquake?" According to its results, although the 45% of American students are aware that an earthquake is a release of energy stored in rocks, about 50% of the American students think that an earthquake is an eruption. On the other hand, approximately 26% of students in Turkey think an earthquake is a release of energy stored in rocks regarding how earthquakes happen. According to the result of the study, it is calculated that American students' scientific knowledge levels about earthquakes is significantly higher than Turkish students. American students hold fewer naive beliefs than Turkish students regarding the definition and occurrence of earthquakes (Oğuz, 2005).

Another study which was performed by Ross and Shuell in 1993 tried to determine elementary school students' conceptions and beliefs about earthquakes. The researchers interviewed a total of 91 students from K-3 to K-6 grades which are from two different locations: New York placed in a low-risk earthquake zone, contrary to Utah placed in a high-risk earthquake zone. According to the result of this study, an earthquake was defined as a shaking or trembling of the earth or ground by about two thirds of the students. Approximately only 15% of the K-3 students said that they did not know what an earthquake is although they did not take any formal instruction about earthquakes. In addition to these, the result of the study indicates that students use following words to describe earthquakes such as splitting open, cracking; fires, eruptions, explosions, volcanoes; faults, plates, continents sliding, hitting; property damage outside of structure; damage inside a building; hurting/ killing people. Moreover, they use other words such as rumbling; tornadoes, high winds; God's way of getting rid of things that are not supposed to be there. Although some of the students define an earthquake as a release of energy stored in rocks, they are in low percent. On the other hand, about 20% of the student state that earthquakes and volcanoes are similar things; they used similar words like eruption while explaining them (Ross and Shunell, 1993). Furthermore, the results of the another study which is performed by the same researchers indicate that 34% of the 194 grade 4 to 6 students state that "An earthquake is an eruption." is a true statement and also 9% of them state that "An earthquake is a volcano." is a true statement. Moreover 50% of the 194 students state that "An earthquake is a release of energy stored in rocks." is a false statement (Ross and Shuell, 1990). These results are consistent with the results of Oğuz's (2005) study, that is over 25% of the students in the USA and Turkey believe that volcanoes cause earthquakes.

At this point, it is meaningful to mention that literature includes some other studies regarding the volcanoes and earthquakes. For example, according to the results of a study in United Kingdom which aims to indicate understandings of primary school students; some students state that earthquakes take place when a volcano becomes hot and shakes the ground (Sharp, Mackintoch, and Seedhouse 1995, cited in Oğuz, 2005). Also, the results of an interview which was conducted by Bezzi in 1989 demonstrated that some of the Italian secondary school students relate earthquakes to the occurrence of volcanic eruptions and they confuse volcanoes and earthquakes.

Another study which was conducted in Trabzon, Turkey suggests that about 9% of the total 150 5^{th} grade students confuse the earthquakes with other natural disasters such as flood disaster, erosion, avalanche, and tsunami. Additionally, some students define natural disaster only in terms of earthquakes (Alım *et al.*, 2007). These results are also parallel with the results of research performed by Ross and Shunell in 1993, which showed that some of the students use the terms such tornadoes, high winds, explosion, volcano in order to define earthquakes.

Consequently, results of different studies indicate that students have some misconceptions about the nature of earthquakes and they tend to define the earthquake only according to its outcomes, damages and effects on their lives. At this point, it seems that most of the students think an earthquake is a natural disaster and it is a bad event, although earthquake is a natural process and very curial for life on the Earth. In fact, what makes an event a catastrophe is not related to the event itself but its outcomes. Therefore, consequences of an event should be considered and analyzed in terms of its reflections on all beings' biological and social lives before identifying an event as a catastrophe (Leroy, 2006).

It can be very useful to examine studies on the causes of earthquakes in order to understand students' conceptions and ideas lying behind their definition of earthquakes. Literature includes some studies aiming at exploring the causes of earthquakes. According to the results of Demirkaya's (2007) study, the answers of students regarding the causes of an earthquake can be classified in two groups. First group includes reasons related to the natural process such as faults, plate tectonic, core energy of the Earth, while the second group includes reasons related to social structure, ethics, behavior of people, their beliefs, religion which are not a part of the natural process. Approximately 22% of the 111 primary school students state that they do not know what the reason of earthquakes is. Moreover, 22% of them relate the reason of earthquakes to weak structure of the buildings, using insufficient amount of material for constructions and taking no precautions for it. The other 18% of the students mention various reasons for earthquakes such as volcanic eruptions, nuclear bombs, erosion, deforestation, climate conditions, huge waves in seas, God's testing of people. On the other hand, about 40% of the students mention the reasons which such plate tectonics, movement of faults.

The results of Şimşek's (2007) research points at various misunderstandings regarding the causes of earthquakes among forty kindergarten and primary school students in total. Among the forty students, only two students in grade 8 state that earthquakes takes place because of fault lines and they are not able to give further explanation. Moreover, two of the students from 6th and 8th grade relate the occurrence of earthquakes to the God. One of them states that God created a circle and earthquakes occur due to some causes such as to eliminate pollution, while the other states that it happens because the God wants it that way. Other students list various reasons. For example some think an earthquake occurs because of digging with a scoop; ground shaking due to the effect of rails; boiling of water in the underground, water coming from underground or because children light a fire and forget it. In addition to this, the results show that some of the students confuse earthquakes with other natural disasters such as heavy rains in grade 1; storms, winds in grade 4; big explosions caused by nuclear fission underground; layer cracks in the atmosphere in grade 6 and erosion, contaminate in nature in grade 8.

The results of this study go parallel with to a comparative study conducted by Oğuz in 2005 with the participation of 823 primary school students from Turkey and the USA. In both countries some of the students think that earthquakes are manmade. It is found that about 6% of the American and 19% of the Turkish students think that earthquakes are caused by construction workers destroying a building. Similarly, about 8% of the American and 13% of the Turkish students think that Earthquakes are caused by nuclear testing. Furthermore, about 7% of the American students compared to 4% of Turkish students believe that Earthquakes are caused by thunders. Moreover Ross and Shunell in 1990 also find out that some students believe earthquakes are caused by construction workers destroying a building, nuclear testing and thunders. Besides, the study indicates that 11% of the 194 primary school students' state that the statement "An earthquake is caused by the Earth turning the wrong way" is true. Some of the students also think that drilling in the sidewalk or toxic wastes and strong winds are among the causes of earthquakes.

In the same study, 21% of the 194 primary school students state that "An earthquake is caused by atmospheric conditions" is a true stamen and 4% of them believe that "An earthquake is caused by hot weather" is a true statement. This is one of the common results which are found by various researchers. According to the interview results of the Ross and Shunell study in 1993, some of the 91, grade 4 to grade 6 students claim that heat from the sun on the earth, thunder, rain, wind, and mountains cause earthquakes. Besides, some of the primary school students in United Kingdom believed that earthquakes occur in hot countries (Sharp, Mackintoch, and Seedhouse 1995, cited in Oğuz, 2005). The result of another study which was performed by Leather in 1987 indicates that 28% of the 200 students ranging between 11 to 17 years old think that hot climate or hot weather conditions are the cause of earthquakes. Moreover, more than 50% of the students state that earthquakes are located in hot countries to explain the reason why some countries have more earthquakes than others.

In addition to these misunderstandings, considering the causes of earthquakes which are mentioned above, many studies show that some of the students are familiar with other reasons of earthquakes related to their natural process. For example, according to the result of a study conducted by Ross and Shunell in 1993, general core movement, pressure; plate, rocks, moving, colliding, and faults are listed as causes of earthquakes by some of the grade 4 to 6 students. However, only about 15% of the students stated that plate/ rocks moving/ colliding are the causes of earthquakes. Moreover, according to result of the study performed by Ross and Shunell in 1990, 95% of the 194 primary school student claim that “An earthquake is caused by the movement of the Earth’s crustal plates” is a true statement and also 90% of the students claim that “An earthquake is caused by tectonic plate movement” is a true statement. On the other hand, 29% of the students believe that “An earthquake is caused by the release of energy at zones of weakness in the Earth” is a false statement. It seems that although some students try to explain earthquakes on the basis of plate tectonics, they have some problems in explaining the nature of earthquakes.

The ideas of students which are explored by various studies regarding the causes of earthquakes are mentioned in the literature. In order to investigate students’ reasoning regarding the causes of earthquakes, some studies aim to examine the probe questions “What happens on the ground when an earthquake occurs?” and “What happens below the ground when an earthquake occurs?” is mentioned in this part of the literature review.

The results of a research performed by Oğuz in 2005 indicate that over 90% of the students in Turkey and the USA groups think that earthquakes can kill people and correspondingly about more than 60% of the state realized that earthquakes can make people have trouble in walking. On the other hand, in both countries over 50% of students believe that earthquakes can cause dogs to bark just before they happen.

As it is mentioned before, many studies have indicated that most of the students from different ages tend to define earthquakes in terms of their visible effects and damages on the ground (Demirkaya 2007; Şimşek 2007; Oğuz, 2005; Ross and Shunell 1990, 1993; Alım *et al*., 2007). On the basis of these results, it might be stated that most of the students can create the following images in their minds regarding the earthquakes collapsed houses, property damages, dead or injured people, sadness, people in stress and panic. Therefore, students' responses about the probe question "What happens below the ground when earthquake occurs?" might be examined in order to explore students' level of understanding about the nature of earthquakes.

According to results of the study performed by Ross and Shunell in 1990, such as 81% of the 194 students bring up the release of the built up pressure as a cause for earthquakes and 45% of the students believe that earthquakes are caused by the layers of earth fighting. Moreover, 30% of them believe that the earth's core's moving to the surface causes the earthquakes.

As the results of the study conducted by Ross and Shunell in 1993, demonstrate only about 25% of the students from K-4 to K-6 grades think that the ground either cracks, splits, divides, or opens, when there is an earthquake. None of the students mention the seismic waves or ground failure as an answer to the question "what happens below the surface when an earthquake occurs. Some of the students, in addition, claim that core releases heat and it gets hot when there is an earthquake. These results might explain the reasons why many students believe that earthquakes happen in hot weather or countries which is mentioned before. Some of the students describe the changes under the ground during an earthquake by using following statements; a kind of tornado underground; mountain formation, lava boiling, rumbling, movement of the mantle, and the occurrence of volcanic movements. Besides, some of them believe that nothing changes under the ground or everything stays the same when there is an earthquake. These explanations might be useful to examine students' misunderstandings regarding the natural process of earthquakes, plate tectonics and also to understand why most of the students confuse earthquakes with volcanoes.

Studies which are also mentioned before indicate that some of the students can relate the occurrence of earthquakes to plate tectonics, core movements and fault lines (Alım *et al*., 2007; Demirkaya 2007; Oğuz, 2005; Ross and Shunell 1990, 1993; Şimşek 2007; Öcal 2007). Although some of the students can relate these concepts, they have problems in explaining the relation, or in other words cause and effect relationship between them. For example, about 52% of the 150 fifth grade students give answers for the definition of an earthquake in the understanding level which shows that they can use the term plate tectonics to define earthquake in terms of natural process, while 28% of the students do not give any response to the question of "what is a fault line". Moreover, although only 6% of the students made mistake while defining an earthquake, about 31% of them had misconceptions about fault lines. These students use following words to define fault line; plate, stage, equator, natural hazards, line of latitude and longitude, flood, electric line and phone line (Alım *et al*., 2007).

In addition to these, the results of another study which seeks to identify students' misconceptions regarding the earth science education indicate that students have various misconceptions about the boundaries of plates and their motions. This study was conducted by Marques and Thompson in 1997 with the participation of 270 Portuguese students aged 16 to 17. According the result of this study, 20% of the whole sample state that the boundaries of continents and plates are the same; the coast line is a boundary between plates and also the external parts of a plate are less protected than the central ones. It means that students tend to identify both plates and continents according to their external features which are based on students' own experiences of sea coasts. Furthermore the researchers state that the boundary, coastline is very useful to differentiate two different geological concepts, continent and plate which are combined by these students by mistake.

Some other misconceptions regarding the plates and their motions were found by Marques and Thompson in 1997. For instance, 21% of the 270 secondary school students claim that a plate is identified by its external observable features; 64% of them indicate that plates are arranged like a stack of layers as youngest placed at the top and oldest at the bottom. Besides, 35% of them believe that a plate rotates around its central part or around an axis attached to one of the points in its periphery and 34% of them indicate that magnetic polar wandering causes the motion of plates. In addition to 40% of them believe that the same plate tectonic mechanism also causes continental and oceanic mountain ranges.

A large scale study aims to discover the effects of using Web-based Science Environment (WISE) program to teach plate tectonics. This research is conducted with the participation of 1100 middle and high school students in the USA. According to result of this study, although some of the students can draw models of plate tectonics, they have some problems in explaining plate tectonics and what happens under the Earth (Gobert *et al.,* 2002). Another current research is carried out to discover college students' ideas regarding the factors that may cause an earthquake. According to its results, among 253 students only 27 of them did not mention the tectonics or faulting in their written responses for the question regarding the causes of earthquakes. However, very few students were able to explain these terms properly when probed during the interviews. Some of the students had problems while describing the location of the plates. They believed that they were somewhere below the surface, there was an empty or dirt filled space between the Earth's surface and tectonic plates. Many students understand the tectonic plates in depended of their own space. They did not think that they live on plates. Most of the students believe that there is discontinuity between tectonic plates and the Earth's surface. Some students think that tectonic plates interact with the Earth's core or atmosphere. Moreover, many students tend to disconnect tectonic plates and their movements form the Earth's surface. Students cannot connect volcanoes with plate tectonics or plate boundaries (Liberkin *et al*., 2005). In addition to primary and middle school students, prospective teachers had misconceptions mostly related to the structure of Earth's crust and the nature of earthquakes (Öcal, 2007).

Consequently, it seems that students have many problems in explaining the events that take place during an earthquake. Although some of them can mention the plates and their movements, they cannot explain the situation clearly and describe earthquakes on the basis of its natural process. At this point, the result of another research which aims to investigate misconceptions in an elementary seismology textbook indicates that there are several misconceptions in the book regarding the connection between tectonic plates and earthquakes. The researcher Wampler states that many researchers cannot integrate effectively the new observations and discoveries into the tectonic theory because the theory has only about thirty years of history (Wampler, 2002 as cited in Oğuz, 2005). Depending on these studies these studies, it can be said that students might tend to describe the events during an earthquake on the based on their first hand experiences or observable changes. In this perspective, students' responses regarding the question "How can earthquakes affect objects or living things?" is examined in the literature.

According to the results of Oğuz's comparative study which includes items regarding the effects of earthquakes, most of the students mention hazards of earthquakes. For example, over 90% of the American and Turkish students think that "Earthquakes can kill people", correspondingly; over 62% of the students in both groups think that earthquakes can make people have trouble in walking. Besides, the fact that earthquakes can change the physical shape of the land is recognized by over half of the students in both counties.

On the other hand, although majority of the students in both countries state that "Earthquakes can cause rain" is a wrong statement; their percentage of majority is only 65 for Turkish students and 49 for American students which shows that some students in both countries believe that earthquakes can cause rain. Furthermore, about half of the students in both countries do not agree with the statement "Earthquakes can raise the temperature", while approximately one fourth of the Turkish students in 8^{th} grades believed the idea. Interestingly about 13% of American students believe that "Earthquakes can make the earth turn faster" although in general about 62% of the American and 55% of the Turkish students do not agree with the statement. What is striking is in both countries over 55% of the students believe that earthquakes can cause dogs to bark just before they happen (Oğuz, 2005). Moreover, the results show that such belief trend increases from 5^{th} through the 8^{th} grade levels in Turkey. At this point it can be useful to investigate individuals' ideas regarding the predictability of earthquakes.

Is it possible to know when and where an earthquake will take place? If it is, most of the damages of earthquakes might be prevented. This is a very popular question in the literature; both recent and previous studies try to investigate individuals' responses to this question. A recent study in Turkey shows, most of the primary school students state that earthquakes cannot be detected before it happens. For example, about 64% of the students state that earthquakes cannot be detected before it occurs. Additionally about 14% of the students believe that although today it cannot be detected, in following years will be possible to detect an earthquake with a special device which is invented thanks to technological improvements. On the other hand, about 14% of the students state that they do not know whether it can be detected, or not, while about 7% of them believe that earthquakes can be predicted before it happens and one of these students state that an earthquake can be predicted by observing animal behaviors and their unusual voices (Demirkaya, 2007). Besides, prospective teachers have much unclear and wrong information about indicators or changes before the earthquakes (Öcal, 2007).

As it is mentioned before, over 55% of both American and Turkish students agree with the statement "Earthquake could cause dogs to bark just before it happen". Consistently, about 44% of the American students and 69% of the Turkish students believe that animals can predict earthquakes. The frequency of this belief increases from 5th through 8th grade in Turkey. It is also found that more than half of the students in both countries agree that scientists can predict earthquakes. Interestingly, about 19% of Turkish students and 28% of the American students believe that some people can sense the earthquakes before they happen (Oğuz, 2005).

Another research indicates that although generally the scientifically valid statements have higher level of acceptance compared to erroneous statement by a total of 234 college students in the USA, many students agree with the erroneous statement regarding predictability of earthquake occurrence- either through use of weather patterns, strange animal behavior, planetary alignments, or science (Whitney et *al.,* 2004). Parallel to these results, a previous study shows that many adults in the USA have similar misconceptions about the predictability of earthquakes. For example, about 72% of the 536 adult residents give a high degree of credence to unusual animal behavior in the prediction of earthquakes. This study also includes a question regarding the credibility of people in terms of their assumptions regarding the occurrence of earthquakes. The results show that about 73% of the respondents believe that a well-known scientist can predict earthquakes; also about 49% of them give credit to a self-educated individual who spent a lot of time studying earthquakes. Moreover, about 49% of them give high degree of credence to a strong personal premonition or feeling, and this level is higher than about 37% that is given to the mayor of their city or governor of California. Furthermore, both a well-known psychic or astrologer and the long-time residents who agree they have earthquake weather are found creditable by about 26% of the respondents. About 18% of them give credit to a well-known religious leader (Turner, Nigg and Paz, 1986).

Consistent to the results of the previous research, another similar study performed in California in 1986 with the participation of 1450 adults, indicates that about 68% of the respondents believe that unusual behaviors of animal could be used to predict earthquake occurrence. Moreover, nearly 44% of them believe “earthquake weather” which is unusual weather that is a predictor of earthquakes. Besides, over 38% of the participants state that instinct, premonition, or extrasensory perception could predict the earthquakes (Turner, Nigg and Paz, 1986).

Throughout the history, severe earthquakes have occurred in Chicago. Some researchers aimed to investigate residents’ ideas regarding the earthquakes. According to results of one of these studies, both college students and adults believe that Chicago could not be severely damaged by an earthquake in the near future (Philips,1991 as cited in Oğuz, 2005). The results of a wide-ranging study conducted in the USA with the participation of over 1200 undergraduates and school children aged 5-18, indicate that about 36% of them believe that Chicago will not be affected by an earthquake. In addition to this, about 50% of the participants indicate that earthquakes can be predicted accurately by observing wild animal behaviors.

All of these results regarding the predictably of earthquakes and its indicators are very stunning because they do not have any scientific support. It is significant that misconceptions about the nature of earthquakes and actions to be taken to minimize the damage of the earthquakes should me mentioned in earthquake science programs. At that point the original Basic Disasters Awareness Training Program gives importance to discussions about four myths related to the occurrence of earthquakes. The first one is “Earthquakes always occur at night”, the second one is “They actually know when an earthquake will occur but they don’t tell us” and the third one is “Warming in water before the earthquake is a sign of an earthquake” and the last one is “Earthquakes occur after a lunar eclipse or solar eclipse”. In the program, detailed information has been given to the learners about the realities regarding these myths (DPEU, 2009).

Individuals might have various ideas or beliefs about earthquakes and their scientific background regarding the nature of earthquakes might be in different levels, but all the individuals should know how to protect themselves from the damages of earthquakes. At this point, education on the preparedness for earthquakes is very critical in order to minimize the loss and damage caused by earthquakes.

The literature includes various studies about individuals’ ideas and actions in terms of minimizing likely hazards of earthquakes. The results of one of the current studies performed in Turkey indicate that about 45% of the primary school students state that they do not take any precautions about earthquakes in their region although they live in a high risk region in terms of earthquakes. Results show that the other students take precautions partially. For example, about 30% of them state that they prepare earthquake bag. Besides, about 20% of them state that they fix some objects on the wall. Only five of the 111 primary school students state that they make earthquake practices (Demirkaya, 2007). Furthermore, in the same research, about 40% of the primary school students state that they do not have any idea about the durability of their houses during an earthquake. Nearly the same percentages of the primary school students think that their houses are not durable for earthquakes. However, only about 5% of the students say that they built up their houses with practical and hard material to have a durable type of structure as a precaution against an earthquake. Consistently almost 50% of the students think that no precautions are taken in their region regarding earthquakes. Only about 19% of the students think that some houses are built to resist an earthquake. Only a total of 15% of the students mention about some precautions. Some of them mention about the preparation of an earthquake bag or fixing the things on floor and on the wall, and earthquake practice. Besides, about 10% of the students believe that no precaution is taken because earthquakes do not take place frequently. These results indicate that people can forget or neglect the precautions regarding the earthquakes although severe earthquakes took place in their town in 1884, 1914 and 1971. Parents of these students had a great deal of experiences about hazards of the 1971 earthquake. Their town was destroyed and they moved to another place arranged by the government. Many precautions were emphasized shortly after the earthquake; they had a lot of stress, problems, and sadness however it seems that the experiences regarding the hazards of earthquakes can be easily forgotten in a short time (Demirkaya, 2007).

In addition to precautions, individuals should know how to act during an earthquake. The result of the research conducted by Oğuz (2005) indicate that more than 75% of Turkish students agree with the idea that during earthquakes we should get under something sturdy like tables or desks and we should cover the back of our neck with one hand, however only 43% of American students agree with the idea. In contrast, about forty two of American students think that immediately after the earthquakes we should wear shoes and gloves whereas only about 12% of the Turkish students agree with that the idea. Finally, it is found that more than half of the students in both countries do not know about earthquake safety. Students who have experienced an earthquake do not have better knowledge about earthquakes compared to the other students.

The results of Şimsek's (2007) study show that almost all of the kindergarten and primary school students who participated in the study have some sort of knowledge regarding the proper actions during an earthquake. For example, about 43% of them state that stay near solid furniture (take cover near the couch, sofa, refrigerator or washing machine). Similarly, about 33% of them state that they should take cover under a table or a desk. Moreover, about 18% of them state they should that cover their head with their arms and stay in the position of an embryo near a door. About 7% of them said that they should go to clear spots, and the same percent of them state that they should not do panic. Furthermore, some students were aware of dangerous places for instance 15% of them state that one should stay away from stairways, the lift and the balcony. There are some erroneous answers regarding the actions to be taken during an earthquake, most of which are given by kinder garden students. For example they say "we escape to some place where earthquake does not occur", "We should call for help at the window", "We should have a suitcase and an earthquake bird", we should "try to exit" and we should "run towards the top floor of the building".

According to the results of Ross and Shuell's (1993) study, it is shown that students who experienced an earthquake give similar responses to with the students who did not experience. The result complies with the result of the Oğuz's (2005) research which is mentioned before. Moreover, the results indicate that most of the students do not know what a person should do during an earthquake. About half of the students from K-4 to K-6 grades answer that they should stand in the doorway but they do not mention the supporting walls or any other properties. Approximately 20% of the students from K-4 to K-6 grades respond that they should get under a desk or table. Besides, some of them say that they should run to basement or go out of the building. However, there are also some idiosyncratic responses for example "Go down to a place where they study earthquakes and tell them what's happening", "Take a plane anywhere", " A person should hold on to metal because it's sturdy. Earthquakes does not do metal. It does concrete." On the other hand, one of the students complain about the curriculum by claiming that "all disasters were presented together in the curriculum she always got things confused and could never figure out what you can do for each disaster". At that point it seems that the organization of natural disaster topics cause some misconceptions, unclear learning about specific actions for each type of hazards. In Turkey, earthquakes are taught as one of the basic natural disasters under the topic of natural disasters in primary education curriculum. This way of teaching might cause misconceptions. In order to help students to learn in a better way, each type of disaster can be taught in different time lines. Formal education about earthquakes can be encouraged by informal learning experiences.

Actions of individuals after an earthquake have critical importance in terms of providing help to many people and minimizing damages of the earthquake. The results of the study conducted by Demirkaya (2007) indicate that about 30% of the students do not know how to help people who are injured due to an earthquake. Besides, about 16% of them state that they would help those people but they could not explain how they would help. The rest 64% of them mention various ways to help those people who get injured during an earthquake. For example, about 31% of them state that they provide clothes, food, drinks, money, tent and blood to those people. About 9% of them say that they would call the ambulance, Kızılay, and ask for help for the casualties. Also about 6% of them state that they would do first aid and transport them to a hospital. Another 6% of the students say that they would try to calm them down and they would try to prevent panic.

On the basis of the results of all these studies mentioned above, most of the students have similar ideas about precautions for the earthquakes however they have some misconceptions and many of them do not take any precaution, or they do not know how to act during an earthquake and what they should do after it and how to help the people in a proper way. Keeping this in mind, it is clear that an earthquake education program should include the nature of earthquakes and actions that should be taken before, during and after an earthquake in order to minimize its possible damages.

In Turkey and all around the world earthquake is one the most harmful natural disasters. Earthquakes result in deaths of hundred thousands of adults, children; serious injuries of hundred thousands of people; destructions or damages of millions of buildings and loss of millions of dollars (ICSU, 2005). Because of the natural processes it is impossible to prevent occurrence of earthquakes in the world. Nowadays, approximately fifty parameters and their patterns are concerned while predicting earthquakes therefore it is impossible to know accurately before it happen. However people can learn to live with reality of earthquake, they can take precautions in order to minimize damages of earthquakes. At that point education plays a critical role for reducing hazards of earthquakes. Many international organizations emphasize the requirement of earth science education and basic disaster awareness training.

Turkey is an earthquake prone country which is located in a high-risk earthquake zone therefore all citizens should have knowledge about the earthquake science and the actions to be taken before – during and after the earthquake. At that point, effective earth science education in primary school education which is 8 years compulsory basic education in Turkey, takes the most critical role for development of scientific literacy for all citizens in terms of nature of earthquakes. However in Turkey after 2008, 8^{th} grade science and technology curriculum includes main concepts about the earthquake science as a last unit which might not be covered because of the lack of time at the end of the year. Besides there is a few study about student's ideas related to nature of earthquakes and actions to be taken before, during and after the earthquake.

Ministry of Education has made collaboration with B.U. Kandilli Observatory and Earthquake Research Institute since 2001 in order to increase quality of earthquake science education and extent the ABCD Basic Disaster Awareness Education which is developed by contributions of Boğaziçi University and the Office of U.S. Foreign Disaster Assistance (OFDA) is the office within the United States Agency for International Development (USAID). Teacher and student training programs have been carried out in this collaboration. The education programs provided by DPEU at Boğaziçi University concerns as the main sources in terms of earthquake science education and basic disaster trainings. The unit gives education to primary and secondary schools in a school trip context as Basic Disaster Awareness Education with Earthquake Park. The visit provides non-formal science learning experiences for the visitors.

All around the world, many institutions, educators and curriculum developers give importance to out-of-school learning experiences of students in terms of leaning science. Out of school learning experiences are defined in a wide range of experiences which contains simple daily life experience though specified complex programs. At that point increasing the effectiveness of the Basic Disaster Awareness Training Program (*BDATP*) might contribute the students’ learning experiences related to earth science and basic disaster training. There are not enough studies to evaluate the effects of the program in terms of student conceptual understanding levels about some earth science topic and their preparedness for an earthquake. This study aims to explore the effects of the *BDATP* which is offered to students and contribute to the effectiveness of the program by addition of various activities which will be done before, during and after the program regarding the selected concepts in the natural processes unit.

3. STATEMENT OF THE PROBLEM

The purpose of this study was to improve the *Revised Version of Basic Disaster Awareness Training Program (Rv-BDTAP)* to facilitate students' learning in a non-formal science learning setting, and explore its effectiveness by using experimental research design. The program was revised to guide and increase students' learning outcomes related to nature of earthquakes and *BDATP* provided by DPEU of Boğaziçi University KOERI.

This study has two main objectives. The first objective is to develop the *Revised Version of Basic Disaster Awareness Training Program (Rv-BADT)* in order to increase students' learning outcomes related to nature of earthquakes and steps to be taken before, during and after the earthquake in order to minimize its possible damage.

The second objective of this study is to evaluate the effectiveness of the *Revised Version of Basic Disaster Awareness Training Program.* The effects of the *Rv-BDATP* were explored by comparing the learning outcomes of the 8th grade students who attended the *Rv-BDATP* with the ones who participated in former version of the program. The learning outcomes of the 8thgrade students who attended the both versions of the program were examined in terms of their conceptual understanding levels regarding the selected concepts in the natural processes unit; their capabilities to differentiate the concepts of danger and precaution regarding the actions to be taken before, during and after the earthquake. Besides, students' personal declarations and ideas about their own experiences regarding the program were examined. On the basis of the second purpose of the study, the following research questions and hypothesis were composed.

3.1. Research Questions and Hypotheses

(i) Is there any statistically significant difference between the conceptual understanding levels of the 8th grade students who received the *Rv-BDATP* and those who received the *BDATP* regarding the selected concepts in the natural processes unit?

Concerning the first question, it was hypothesized that;

8th grade students who received the *Rv-BDATP* would have significantly higher scores in their conceptual understanding levels regarding the selected concepts in the natural processes unit than students who attended the *BDATP* as measured by the Conceptual Understanding Questionnaire-Earthquake Test.

(ii) Is there any statistically significant difference between the 8th grade students who received the *Rv-BDATP* and those who received the *BDATP* in terms of their capabilities to differentiate the concepts of danger and precaution regarding the actions to be taken before, during and after the earthquake?

It was hypothesized regarding the second question that;

8th grade students who received the *Rv-BDATP* would have significantly higher scores in the Conceptual Understanding Questionnaire-Earthquake Test in terms of their capabilities to differentiate the concepts of danger and precaution regarding the actions to be taken before, during and after the earthquake than the students who received the *BDATP*.

(iii) Is there any effect of pre-testing on the post measurements of the 8th grade students for both who received the *Rv-BDATP* and those who received the *BDATP* in terms of their conceptual understanding levels regarding the selected concepts in the natural processes unit?

In response to this third question, it was hypothesized that;

There would not be any significant difference between the post measurement scores of 8th grade students who took pre-test before they attended the *BDATP* and the *Rv-BDATP* and those who did not take pre-test before they attended *BDATP* and *Rv-BDATP*.

(iv) Is there any difference between 8th grade students who attended the *BDATP* and those students who attended the *Rv-BDATP* in terms of their personal declarations and ideas about their own learning experiences regarding the program?

The hypothesis of the study for the fourth question is that;

8th grade students who attended the *Rv-BDATP* would have more positive personal declarations and ideas about their own learning experiences compared to students who attended the *BDATP* as measured by Program Evaluation Questionnaire.

3.2. Variables and Operational Definitions

3.2.1. Dependent Variables

The learning outcomes of the students after their participation in the *Rv-BDATP* or *BDATP* are the dependent variables. In this research learning outcomes of the students is evaluated in two dimensions. The first dimension is concerned with students' conceptual understandings of identified concepts related to the natural processes unit of 8th grade science and technology curriculum and their abilities to differentiate between dangers and precautions related to earthquake. The second dimension is concerned with students' personal declarations and ideas about their learning experiences regarding the programs. These two dimensions of the students' learning outcomes were measured by two separate instruments.

- *Conceptual Understanding Questionnaire-Earthquake (CUQ-Earthquake)* was used in a pretest-posttest and retention test design to assess students' conceptual understanding levels related to the selected concepts in the "natural processes" unit and the ability of students' to differentiate between dangers and precautions concerning earthquakes before and after attending the program (See Appendix A).

- *Program Evaluation Questionnaire (PEQ)* was used to explore the students' personal declarations and ideas about their own learning experiences related to the programs (See Appendix B).

3.2.2. Independent Variable

The independent variable of the study was type of treatments which are *Rv-BDATP* and *BDATP*. The students in the control group attended the *BDATP* while the students in the experimental group took the revised version of the program. While the experimental groups took the entire *Rv-BDATP*, the control groups just attended the *BDATP* without doing pre-trip and follow-up activities. They took only brief information about the Earthquake Park trip before attending the program. That is, the control groups just pursued the regular curriculum after the trip.

3.2.2.1. The Basic Disaster Awareness Training Program (BDATP). It is provided by DPEU of Boğaziçi University KOERI. Schools attend this program as a school trip to Earthquake Park in DPEU. The content of the program includes two parts as presentation and applications in Earthquake Park. In the first part students are shown a powerpoint presentation for forty minutes about the nature of earthquakes, studies on earthquakes and the actions to be taken before, during and after the earthquakes to minimize the damages. The presentations are made by experts in DPEU (DPEU, 2011).

During the second part of the program, students observe and participate in the simulation of an earthquake; they are taught how to minimize the nonstructural mitigations; importance of structural awareness and actions to be taken during and after the earthquakes. They learn about dangers and precautions related to earthquake.

3.2.2.2. The Revised Version of Basic Disaster Awareness Training Program (Rv-BDATP). The content of the *Rv-BDATP* was developed by the researcher, and experts in DPEU on the basis of the selected concepts in the "natural processes" unit of the 8th grade science and technology curriculum in Turkey and objectives of *Rv-BDATP* (See

Appendix C). The details of the program were developed through the suggestions in the literature for integrating the formal and informal learning settings.

Rv-BDATP actually includes all parts of the *BDATP*. In addition to the *BDATP*, the *Rv-BDATP* includes some in-school activities to integrate non-formal (Earthquake Park Trip) and formal science learning environments (school). The revised program includes three parts; pre-trip, during trip and follow-up activities. In this study, the “trip” refers to Earthquake Park trip attending which means taking the program provided by the DPEU at Boğaziçi University KOERI.

Pre-Earthquake Park trip activities aimed to prepare students for the trip and provide them with an objective before the trip. The activities included a twenty five minutes of presentation and discussions regarding the trip. The content of the presentation included plate tectonics, fault lines in Turkey about formation of earthquakes and the reality of earthquake in Turkey (See Appendix D). A handout about the presentation was distributed to the students (See Appendix E). Boğaziçi University KOERI was mentioned as one of the institutions studying earthquakes. The website of NEMC affiliated to Boğaziçi University KOERI was introduced to the students. Then, the students were informed about the date and content of the Earthquake Park trip. The students discussed about the advantages of this trip then the students were asked to identify their personal objectives and to prepare questions to be asked to the experts. The students were also informed about the post-trip poster activity. The activities enabled the students to learn the reason and purpose of the trip and its connection with the science and technology courses.

Activities during the Earthquake Park trip included the *BDATP* with slight differences. The first difference was regarding the presentation in DPEU. In the revised program, students watched an earthquake animation instead of being given information about aftershocks. The second difference was in the application in Earthquake Park. An additional model on plate tectonics was shown to the students in the revised program. The notion of plates and the reason why Turkey is an earthquake prone country was discussed one more time. The students used their learning experience and awareness they gained in school activities when they attended the Earthquake Park Trip and they asked questions.

Students made a short discussion about the trip and prepared posters during a class hour as follow up activities after they attended the trip. The target of these follow-up activities is to make students reflect on what they learnt in the trip. The posters concerned with three major themes which were formation of earthquakes preparation for the earthquake, actions to be taken in case of an earthquake. Students were divided into groups and each group made a poster on one of the themes. Students were given informative notes and pictures about the posters. Each group wrote the question they prepared before the trip and the answer to this question on their posters.

4. METHODOLOGY

This study has been conducted in two phases which are:

- Development of the *Revised Version of Basic Disaster Awareness Training Program* (*Rv-BDATP)*
- Exploring the effectiveness of the *Revised Version of Basic Disaster Awareness Training Program* (*Rv-BDATP)*

The work that has been done for development of the program is mentioned in a detailed way in the first part of the methodology chapter. This chapter includes the work on instrument development and pilot application of materials. The pilot study is explained in detail with its own design and sample. Afterwards, the experimental research conducted to measure the effectiveness of the program is explained in detail. The sample and research design is also explained separately for the main study.

4.1. First Phase: Development of the Revised Version of Basic Disaster Awareness Training Program (Rv-BDATP)

Literature was reviewed and examined in order to determine the useful steps for developing the *Rv-BDATP.* The significant points emerged in the literature were used to develop the *Rv-BDATP.* In the book titled Learning Science in Informal Environments: People, Places and Pursuits book which was prepared by Committee on Learning Science in Informal Environments, the importance of informal science settings and program designers is highlighted (Bell *et al.,* 2009). Four main recommendations that are offered by the book are as follows:

(i) Exhibit and program designers should create informal environments for science learning according to the following principles. Informal environments should:
   - be designed with specific learning goals in mind (e.g., the strands of science learning).
   - be interactive.

- provide multiple ways for learners to engage with concepts, practices, and phenomena within a particular setting.
- facilitate science learning across multiple settings.
- prompt and support participants to interpret their learning experiences in light of relevant prior knowledge, experiences, and interests.
- support and encourage learners to extend their learning over time.

(ii) A community - educator collaboration should be built to develop science learning in informal environments. These environments should be developed depending on the common scientific problems concerning the whole community.

(iii) Iterative processes which involve designers, experts in science including the sciences of human learning and development, learners, educators are required to develop educational tools and materials.

(iv) Front-line staff who can be professionals or voluntary staff of the institution supporting science learning experiences has an important role in improving the science learning experiences of the visitors. They should care for the preservation of diversity of different groups. They should use "questions, everyday language, ideas, concerns, worldviews, and histories, both their own and those of diverse learners". The staff may need support some institutions to familiarize with the target groups.

The revision and development process of the *Rv-BDATP* consists of 3 steps which were determined according to four above mentioned recommendations:

- Step 1: Identification of main concepts included in the Basic Disaster Awareness Training Program provided by Disaster Preparedness Education Unit.
- Step 2: Identification of main objectives of the Revised Version of Basic Disaster Awareness Training Program (Rv-BDATP).
- Step 3: Development and improvement of the materials, activities and instruments of the Revised Version of Basic Disaster Awareness Training Program (Rv-BDATP).

4.1.1. Step 1: Identification of Main Concepts Included in the Basic Disaster Awareness Training Program Provided by Disaster Preparedness Education Unit

Researcher collaborated with the experts in DPEU to understand their needs to revise the program and the problems they faced with. .Detailed information was gathered about the development of the programs and other practices by frequent visits to the institute held by the researcher. Researcher also participated in the Instructor Training Program for Basic Disaster Awareness Training Program in order to learn about earthquakes and actions to be taken before, during and after an earthquake to minimize its possible damages. In addition to this, the researcher attended the 2009 version of Basic Disaster Awareness Training Program which was given to primary and high school students as an observer to learn details about the program. Students' reactions and instructors' actions were observed and examined. Besides, the researcher acted as an educator in some parts of the program which is given to both primary and high school students in order to have first-hand experience as a trainer while analyzing the program in a detailed way.

With the help of these studies, the main topics and concepts included in the 2009 version Basic Disaster Awareness Training Program were identified as; plate tectonics, fault line, formation of earthquake (nature of earthquakes), magnitude, earthquake intensity, seismograph, earthquake waves, earthquake maps (seismology) and actions to be taken before, during and after earthquakes to minimize its damages (disaster education).

4.1.2. Step 2: Identification of Main Objectives of the *Revised Version of Basic Disaster Awareness Training Program (Rv-BDATP).*

The K-12 curriculum was analyzed and earth science topics especially related with the earthquake science and basic disaster awareness education were identified. In K-12 curriculum, earthquakes are included in many grades however they are taught under the title of natural disasters with an emphasis on the damages of earthquakes and precautions against them. It is not until 8^{th} grade that earthquakes are covered as a natural phenomenon. In the eighth grade the nature of earthquakes, their formation and earthquake science are introduced to the students. It has been understood that the objectives of the natural process unit of science and technology curriculum complies with the content of the program best in 8th grade. The most related objectives were selected to be used for the *(Rv-BDATP)*. Additionally, experts in DPEU were consulted to learn the most significant topics. The objectives of the revised program were listed in detail. Afterwards, the suggestions from the experts and information in the literature were evaluated. The duration of the program and application process was also taken into account to review and narrow the objectives. Following these, the main objectives of the revised program were determined. The details are given in the Appendix C.

4.1.3. Step 3: Development and Improvement of the Materials, Activities and Instruments of the *Revised Version of Basic Disaster Awareness Training Program (Rv-BDATP).*

The material development process has been conducted in two phases. In the first phase, the general framework of the program was determined depending on the literature and then pre-trip, during trip and follow-up activities were prepared. In the second phase a pilot study was conducted in order to test the draft *Rv-BDATP*. Also, the data to be used in the development of the instruments and the program were gathered from this study. The materials were rearranged as well as the instruments to be used to measure the effectiveness of the program were finalized.

<u>4.1.3.1 Development of Pre-trip, During trip and Follow up Activities.</u> Suggestions and cautions in the literature were carefully considered. By doing this, the activities and materials about natural processes unit of the 8th grade science and technology course were developed by the researcher. The literature suggested visits to non-formal learning environments should be organized in three phases as: pre-trip activities, during-trip activities and follow-up activities (Jarvis and Pell, 2005; Bozdoğan, 2008). Accordingly the *Rv-BDATP* was prepared in three phases as pre-trip, during trip and follow up activities. There were school activities prior and following the Earthquake Park Trip which integrated the school curriculum and the content of the program in order to contribute to the students' learning outcomes. The materials developed for the pre-trip

activities consist of a short presentation and a hand-out. Duration of the activities was approximately 25 minutes. Slides of the short presentation given in Appendix D.

Several authors suggested that the content of the trip should be associated with the content of the curriculum taught at school in order to provide an effective learning atmosphere (Orion, 1993; Anderson *et al.*, 2000; Anderson and Zhang, 2003; Bozdoğan, 2008). Accordingly, in the revised program, it is suggested that teachers should integrate the trip and content of the program. On the date of the trip, the students were being taught a topic which could not be associated with earthquakes. Therefore, the researcher organized the trip in association with the earthquake week in Turkey. In this study, the trip was conducted in the first week of March which is the Earthquake week in Turkey therefore the presentation was associated with the earthquake week.

The purpose of the trip as well as the skills and concepts which will be used during the trip should be determined before the trip (Anderson and Zhang, 2003; Griffin, 1998; McQuade and Champagne, 1995, as cited in Tekkumru Kısa, 2008). Students are not introduced the nature and formation of the earthquakes until the last unit of the eight grade science and technology lesson. For this reason, depending on the above suggestion, in this study the students were informed about the nature of earthquakes and their formation before the Earthquake Park Trip. In this informative presentation it was emphasized that an earthquake is a natural process rather than a natural disaster. A handout about the presentation was distributed to the students. The content of the presentation included plate tectonics, fault lines in Turkey, the formation of earthquakes, the reality of earthquake in Turkey.

Some students see school trips as only entertaining activities and they do not aim to learn from these experiences. Therefore it is pointed out that sharing the objectives of the trip with the students is crucial. They should be well aware of the fact that this trip is not a day off but a learning activity. The teacher should tell the students what kind of activities will take place in the trip, and how this trip is related to the school content as well as how students should act during the trip. This kind of information will raise the interest of the students and reduce any kind of anxiety about the trip (Jarvis and Pell, 2005; Tran, 2004; Anderson and Lucas, 1997). Considering these suggestions, in the second part of the presentation before the trip, the students were provided with the information about the Boğaziçi University KOERI. In addition, the website of NEMC was introduced and general information about the Earthquake Park trip was given to the students. Researcher and students exchanged ideas about the advantages of the trip.

According to Griffin (1998), the students prepare their own questions and points of interests to share with the experts before the trip in order to motivate them to control their own learning process In the light of this suggestion, students were asked to determine their own objectives about the trip and to prepare some questions that they could ask to the experts in the institution. After identifying the objectives, the researcher gave information to the students about what they were supposed to do before, during and after the trip. Besides, they were made aware of the role of the researcher, teachers and the experts in the Earthquake Park. As Tran (2004) suggests, everyone can know their responsibilities if the roles of all participants including the teachers, students and staff of the informal learning setting are defined and distributed before the trip. The students were also informed about the post-trip activity. The objective of these activities was to prepare students for the program and provide them with an objective before the trip. The activities enabled the students to learn the reason and purpose of the trip and its connection with the science and technology courses.

Griffin (1998) emphasizes that brochures or leaflets should be taken from the informal learning setting or prepared by the teacher to inform students about the purpose of the trip and prepare them for the activities. The content of the brochures should arouse the interest of the students (Griffin, 1998). Benefiting from this suggestion, along with the presentation, the students were given hand-outs. This hand-out offered information about the earthquakes in the world and their formation. It also included information about the Earthquake Park and the students were required to write their own objectives and questions about the trip in the blanks on the hand-outs (See Appendix E).

During trip activities included two main parts. In the first part, the students were given an approximately 45 minutes of presentation. In the second part, they made practical applications in the earthquake park trip. All these activities were conducted under the supervision of the experts.

The Basic Disaster Awareness Training Program was continuously updated by DPEU. In the 2009 version of the program which was the starting point of this study, two types of presentations were used together. In the presentation, foundation and studies of NEMC and the formation of the earthquakes were mentioned. In the second one, actions to be taken before, during and after the earthquake were being taught. The thesis project has expanded to a period of nearly two years. When it is first started, the initial changes were made by the researcher on the 2009 version of the program. This program was revised by the researcher three times. The 2010 version of the program developed after the first revision was completed on January 2010 and this was used by DPEU throughout that year. The second revision was made on January 2011. The developed program was named in this study as the draft of the *Rv-BDATP* and it was used in the pilot study. After the pilot study with some reorganization the program was finalized and it was called the *Rv-BDATP*. In the 2010 version, the content of the 2009 version of the program remained same but the order of the topics and the way of presentation were changed. These changes were made depending on the suggestions take place in the literature. It is said that as the staff in the non-formal science learning environment has limited time to teach their topics, they have to build a refined method to communicate more effectively with the visitors. In order to achieve the goals they determined, their teaching, assessment and management strategies need to be well-rounded, concise and to the point. They should encourage students to interactively participate in the program by asking questions and making quick and accurate assessments. The staff is required to get professional guidance directly related to their teaching and learning environment (Tran, 2004).

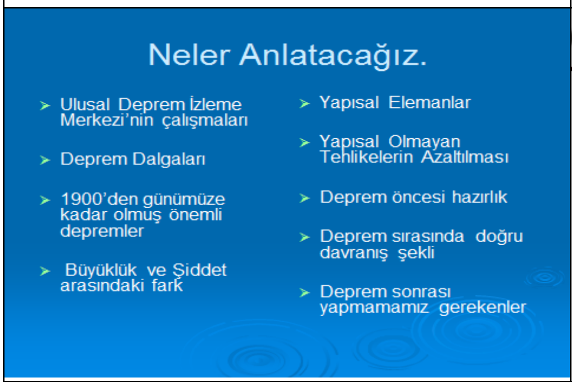
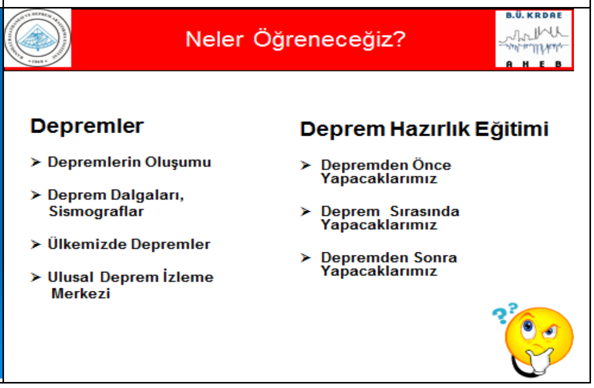
The 2009 version of program	*Rv-BDATP*
	

Figure 4.1. The content slides of the 2009 version of program and *Rv-BDATP*.

As for the change in the order of topics, instead of starting with the introduction of NEMC, the presentation started with the formation of earthquakes. The changes could be seen in a clear way by comparing slides of the 2009 version of the program and *Rv-BDATP* which are given in Figure 4.1. The title of the slide “What shall we teach” which gives the content of the program was replaced by “What shall we learn?” The aim of this change was to create a more student oriented and interactive narration.

Table 4.1. The content of the 2009 version of program and *Rv-BDATP*

The 2009 version of program	*Rv-BDATP*
Part I	Part I
1- Work of NEMC (pictures,video, maps)	1- Formation of earthquakes - video *(11)*
2- Seismograph systems and animation	2- Earthquakes in our country - a map of the earthquakes at Turkey in the last century*(6)*
3- Earthquake waves	3- Map of earthquake zones in Turkey *(8)*
4- A simulation on the spread of earthquake waves	4- Earthquake photos*(9)*
5- The theory of tectonic plates	5- Earthquake formation process – animation (new)
6- A map of the earthquakes at Turkey in the last century	6- Recording of earthquakes - seismograph animation *(2)(new)*
7- Tables about the magnitude and damages of significant earthquake	7- Recording of earthquakes –Work of NEMC *(1)*
8- Map of earthquake zones and 2008 earthquakes map of Turkey and data tables	8- Spread of earthquake waves – animation *(2)* animation *(12) (new)*
9- Earthquake photos	9- Units of earthquake – magnitude and intensity,
10- Table of earthquake magnitude on TNT basis	10- Motions of fault line pictures *(9)*
11-Video an earthquake formation, earthquake types, magnitude and effect of earthquake.	11- Earthquakes in Turkey – NEMC website (new)
12- Information magnitude and intensity of earthquake	12- Earthquakes in Turkey – 2009 earthquake Map of Turkey *(8)*
13- Unpredictability of earthquakes	13- Myths and Facts *(new)*
	14- Unpredictability of earthquakes*(13)*
Part II Actions should be taken before during and after the earthquake.	Part II Actions should be taken before during and after the earthquake.

*(1,2,..)*The numbers represent the related topics in the 2009 version of the Program. *(new)* additions to the 2009 version of the Program

The changes in regarding the content order of the 2009 version of program can be examined in Table 4.1. Some parts of the 2009 version of program were removed and some additional animations, brief explanations and figures were added to the *Rv-BDATP*. Details about the changes will be mentioned in the following paragraphs.

In the revised program, it was suggested that the presenter should ask some warm-up questions to the students to create an efficient and interactive communication. With these questions, it was aimed to make it easier for the students to make an association between the content of the training and their own expectations. These questions also enabled them to identify an aim for the trip.

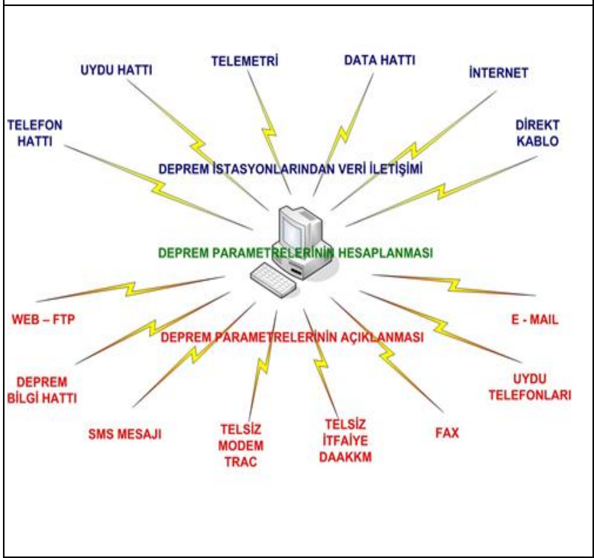
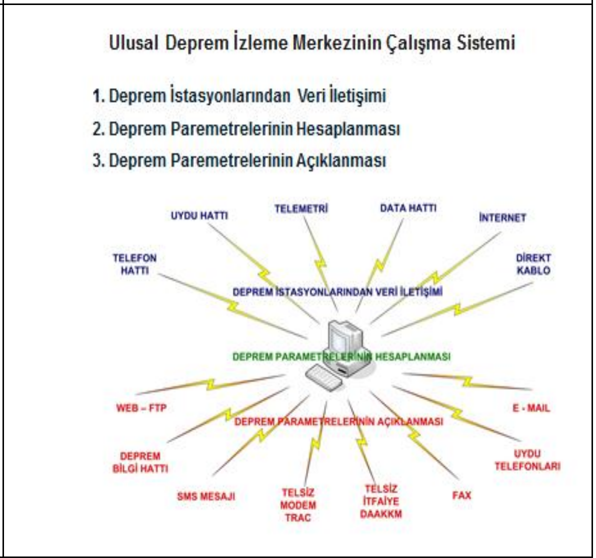
<table>
<tr><td>The 2009 version of program</td><td>The 2010 version of program</td></tr>
<tr><td>
</td><td>
</td></tr>
<tr><td></td><td>
</td></tr>
</table>

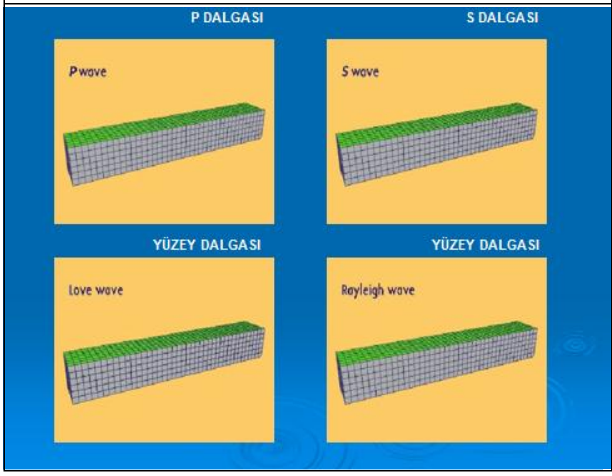
Figure 4.2. The NEMC work slides of the 2009 and 2010 versions of program.

About the slides regarding NEMC work, a title was added to the slide and three steps were highlighted at the beginning to make the information more clear. Figure 4.2

indicates some example slides about the NEMC work part of the presentation; slides on the left were from the 2009 version of program and slides on the right from the 2010 version. In *Rv-BDATP* all NEMC slides mentioned above gathered in single slide due to time limitations.

The slide about the earthquake wave was divided into two slides and informative statements were added to these slides. Figure 4.3 indicates some example slides regarding these changes. One of these slides was added next to the slide about earthquake recording. However later this information was founded too complicated and detailed for 8th grade students and these slides were removed from the presentation of *Rv-BDATP*.

The 2009 version of program	The 2010 version of program



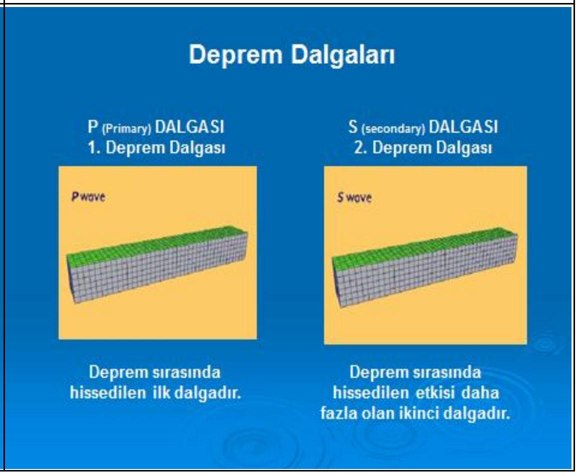


Figure 4.3. The earthquake wave slides of the 2009 and 2010 versions of the program.

The slide about tectonic plates was also rearranged, the names of the tectonic movements were written below their figures and an analogy between tectonic plate movements and hand movements was added to the slide to make it clearer. Finally, a short earthquake definition was added to the bottom. Figure 4.4 shows related slides of the 2009 and 2010 version of program.

The 2009 version of the Program	The 2010 version of the program

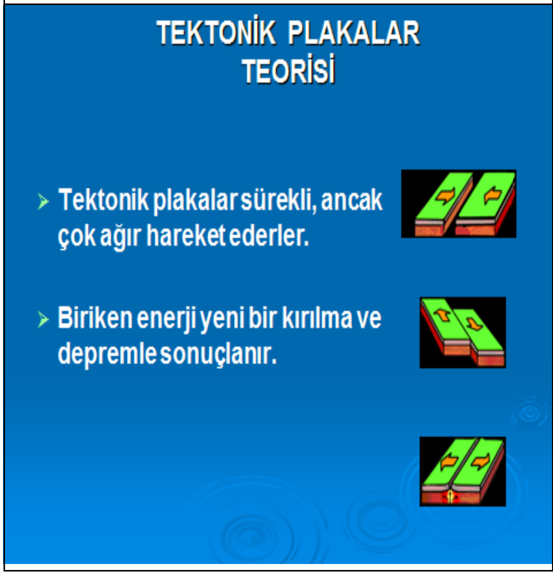


Figure 4.4. The tectonic plate slides of the 2009 and 2010 versions of program.

However, in the *Rv-BDATP* the term tectonic plates "tektonik plakalar" was replaced by plate "levha" used in school curriculum in order to make the terminology parallel to the school curriculum. In addition, instead of giving general information on three types of tectonic movements, one of these movements that cause most of the earthquakes is specifically focused on the basis of Turkey. For this purpose, a map that shows the plate tectonics, fault lines in Turkey is added. Earthquake formation was associated with fault lines by giving fault line photos. In the *Rv-BDATP* a short animation and a slide were shown to explain the formation of earthquakes. In the animation, earthquake formation was explained in two steps. In addition, it was highlighted that earthquakes were natural processes. Figure 4.5 shows some slides of *Rv-BDATP* regarding formation of earthquakes.

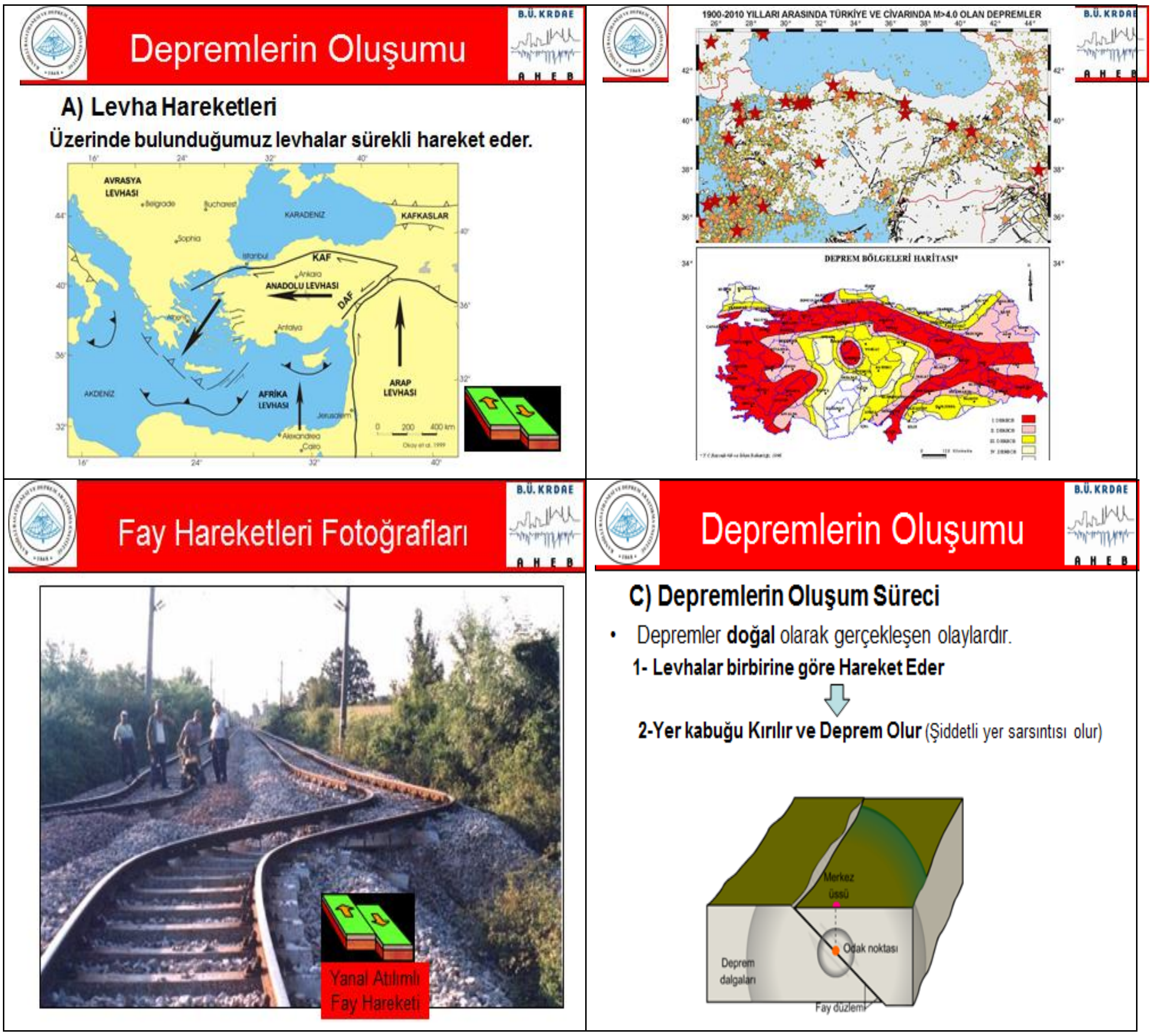
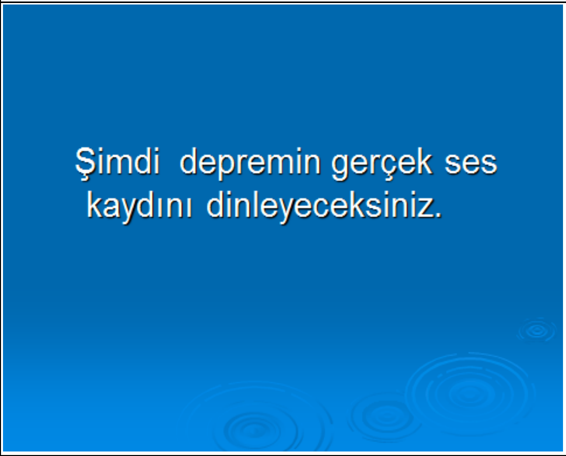


Figure 4.5. The formation of earthquakes slides of *Rv-BDATP*.

The simulation on the spread of earthquake waves was rearranged. As the first change, to arise the interest of the students, an attractive title was added to the slides before the videos. Short information about the video content was added to provide student with basic information to ease their understanding. As the second change, the short video was given orally and instead of this info, some questions were put in the slide to get the attention of the students and to make the simulation more understandable for them. Figure 4.6 includes the spread of earthquake wave slides of the 2009 version of program and *Rv-BDATP*.

The 2009 version of program	*Rv-BDATP*



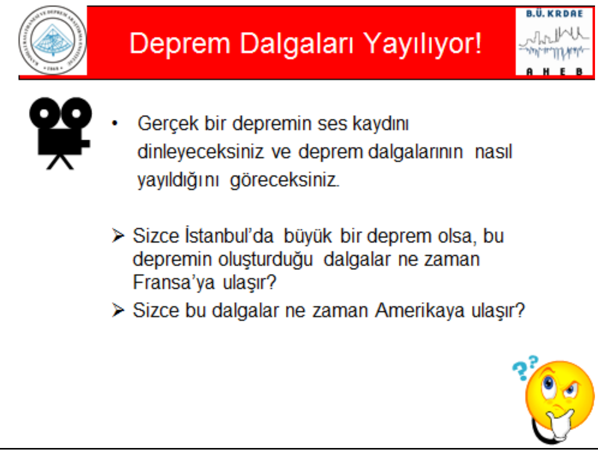
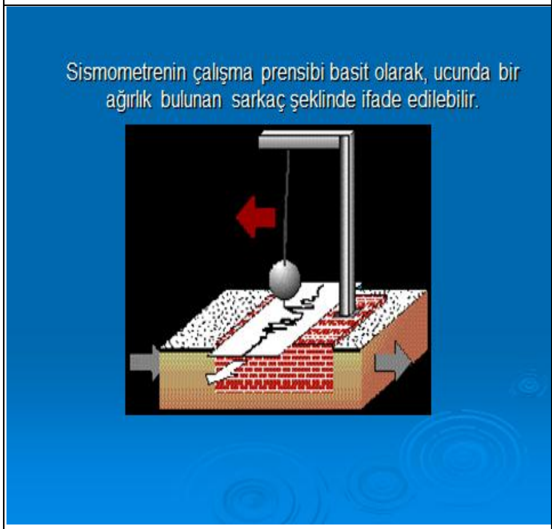


Figure 4.6. The spread of earthquake wave slides of 2009 version of program and *Rv-BDATP*.

2009 version of program	2010 version of program



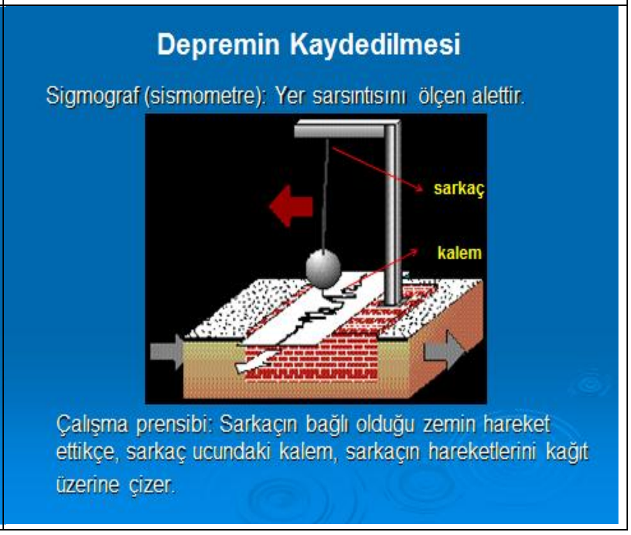
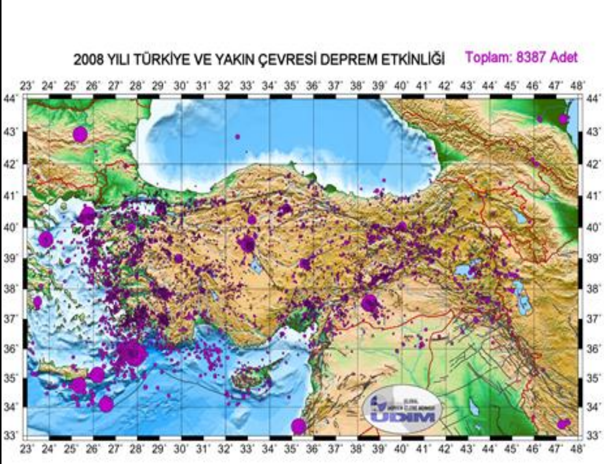
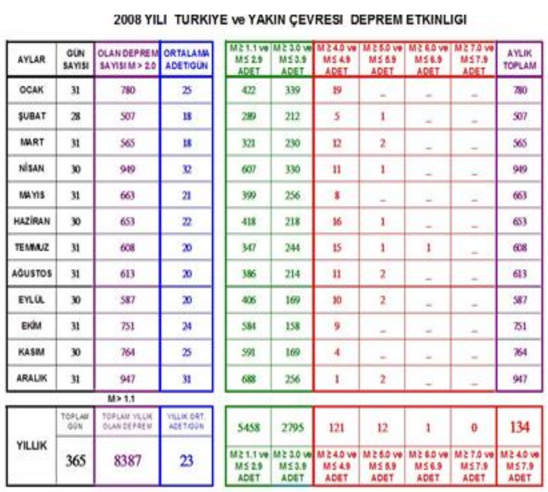


Figure 4.7. The seismograph slides of the 2009 and 2010 versions of program.

In the 2010 version of program the seismograph animation in the 2009 presentation was rearranged. A title and a simple definition were added. Some informative statements were added to the slides about the devices in the seismograph system to make it more understandable and visually comprehensive. Short information about the operation of the seismograph was added. However, as the final change, this animation was replaced by a more clear animation which shows the process and the parts of the seismograph step by step. Figure 4.7 includes the slides about seismograph from the 2009 and 2010 versions of the program.

The 2009 version of program	*Rv-BDATP*





2008 YILI TURKIYE ve YAKIN ÇEVRESI DEPREM ETKINLIGI

AYLAR	GÜN SAYISI	OLAN DEPREM SAYISI M > 2.0	ORTALAMA ADET/GÜN	M ≥ 1.1 ve M ≤ 2.9 ADET	M ≥ 3.0 ve M ≤ 3.9 ADET	M ≥ 4.0 ve M ≤ 4.9 ADET	M ≥ 5.0 ve M ≤ 5.9 ADET	M ≥ 6.0 ve M ≤ 6.9 ADET	M ≥ 7.0 ve M ≤ 7.9 ADET	AYLIK TOPLAM
OCAK	31	780	25	422	339	19	_	_	_	780
ŞUBAT	28	507	18	289	212	5	1	_	_	507
MART	31	565	18	321	230	12	2	_	_	565
NİSAN	30	949	32	607	330	11	1	_	_	949
MAYIS	31	663	21	399	256	8	_	_	_	663
HAZİRAN	30	653	22	418	218	16	1	_	_	653
TEMMUZ	31	608	20	347	244	15	1	1	_	608
AĞUSTOS	31	613	20	386	214	11	2	_	_	613
EYLÜL	30	587	20	406	169	10	2	_	_	587
EKİM	31	751	24	584	158	9	_	_	_	751
KASIM	30	764	25	591	169	4	_	_	_	764
ARALIK	31	947	31	688	256	1	2	_	_	947

M > 1.1

	TOPLAM GÜN	TOPLAM YILLIK OLAN DEPREM	YILLIK ORT. ADET/GÜN	M ≥ 1.1 ve M ≤ 2.9 ADET	M ≥ 3.0 ve M ≤ 3.9 ADET	M ≥ 4.0 ve M ≤ 4.9 ADET	M ≥ 5.0 ve M ≤ 5.9 ADET	M ≥ 6.0 ve M ≤ 6.9 ADET	M ≥ 7.0 ve M ≤ 7.9 ADET	M ≥ 4.0 ve M ≤ 7.9 ADET
YILLIK	365	8387	23	5458	2795	121	12	1	0	134

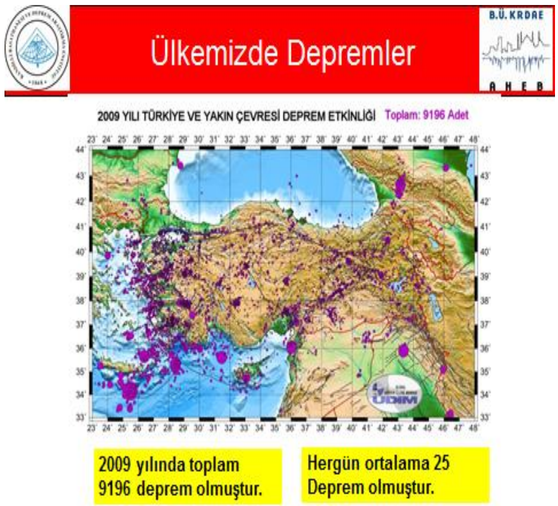


Figure 4.8. The earthquake map of Turkey slides of the 2009 version of program and *Rv-BDATP*.

Before the 2008 earthquake map of Turkey, a new slide was added to *Rv-BDATP*. In this slide 2 questions were asked to the students to remind them that earthquakes happen very often in our country no matter we sense them or not. The table regarding this map was changed at first by highlighting only the data about the number of earthquakes per day. However, in the final version, the table and one of the questions were removed. Instead the necessary data were given below the map itself.

Generally during the 2009 version of program, the students watched various videos. The researcher suggested that the students should be informed about the name of the videos and they should be given some questions to answer while watching them. After watching the videos, the answers of the students should be collected and checked. This will help students identify significant points in the videos more easily and benefit from them best. It was aimed to turn the presentation into an interactive one. For this purpose, students should be encouraged to participate in the presentation by asking them questions and giving examples. Important points on the maps and tables should be pointed out and some guiding questions should be asked to make students concentrate better on the informative tables. Some information on the slides was rearranged. Short informative texts and titles were added. The pictures and topics were placed in association with the maps.

The table of earthquake magnitude on TNT basis and tables about the magnitude and damages of significant earthquake were removed because the tables had too much information for the students to catch. Therefore the data about the biggest earthquake were given in another slide.

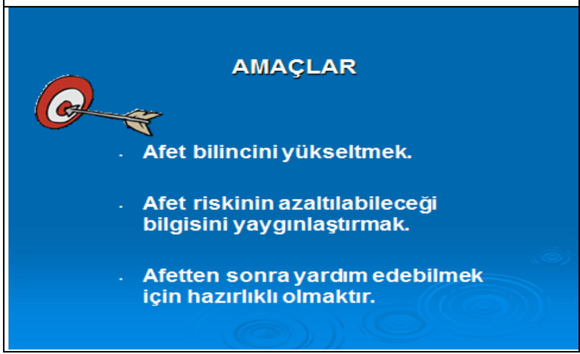
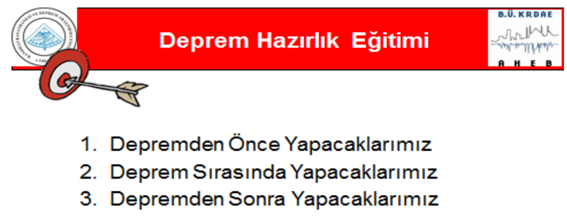
<table>
<tr><th>The 2009 version of program</th><th>Rv-BDATP</th></tr>
<tr><td>
</td><td>
</td></tr>
</table>

Figure 4.9. The DPEU education introduction slides of 2009 version of program and *Rv-BDATP*.

There were also some changes regarding second part namely DPEU education part of the presentation. At first, the slide giving the purpose of the program was changed, by adding what would be learnt from the program. However, in the final revision, the purposes were given orally and the slide only included what would be learnt from the program in three steps as before, during and after an earthquakes. The following subtitles were rearranged in accordance with these three steps. The risk and possible damages were given together through photos to stress the gravity and by doing this; clear directions were given to the students about the steps to be taken before, during and after the earthquakes. Figure 4.9 includes the slides mentioned above.

Due to time limitation, the slide which shows the equipment to secure the objects was removed. Instead, this equipment was shown in the earthquake park room to students in their real context.

In a video showing the moment of Kobe 2005 earthquake was changed by adding a slide with short information and guiding questions. With these questions, students were taught the importance of securing the objects and they focused better. As a final change short information was given orally instead of text in the slide. You can see the questions in Figure 4.10.

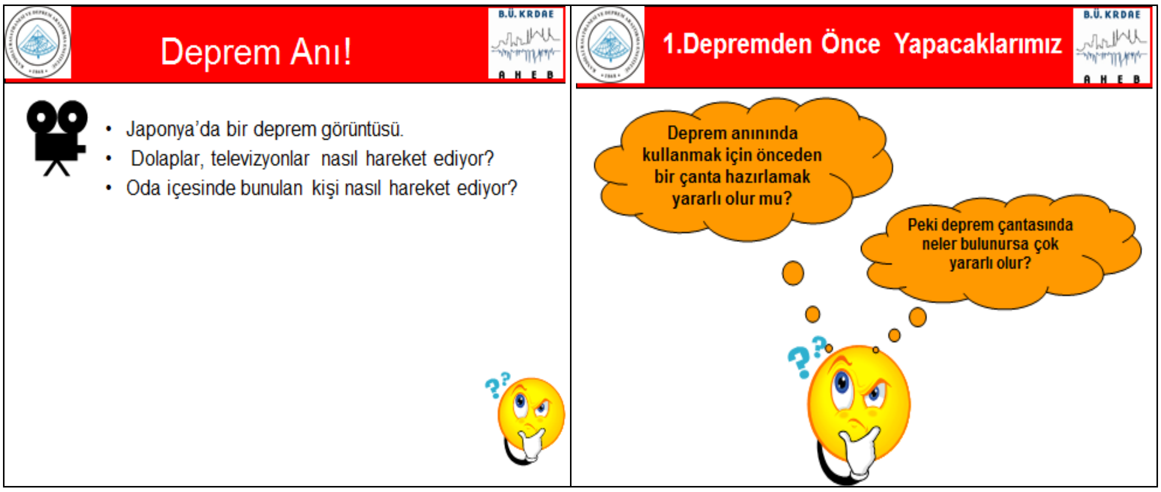


Figure 4.10. The Kobe Earthquake moment and earthquake bag slides of *Rv-BDATP*.

Before the slide about the earthquake bag, a new slide was added which includes questions about the necessity of this bag. These questions created a more interactive atmosphere and raised awareness of the necessary items in this bag. You can read the questions from the Figure 4.10.

Some direct instructions regarding what should be done before, during and after an earthquake were added to *Rv-BDATP* presentation instead of the former statements with passive structures including lots of terminology. In addition the part about the myths and facts which had been omitted from 2009 version of the program was readded to the presentation. Figure 4.11 indicates the slides about myths and facts. Depending on all these suggestions, the researcher reorganized the presentation with some guiding notes for the experts in DPEU.

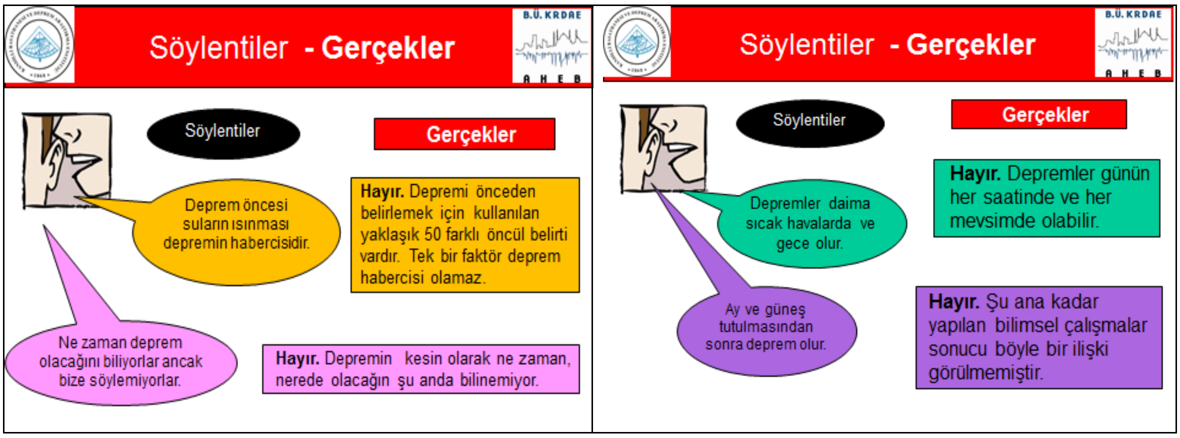


Figure 4.11. The myths and facts slides of *Rv-BDATP*.

For the application activities in the Earthquake Park Room, it was suggested that students should actively take part in the applications. The staff should not give the answers immediately to the students. They should let the students find the answers by themselves by exploring (Jarvis and Pell, 2005; Bozdoğan, 2008). Keeping this in mind, the students should be asked questions regarding the experimental sets; they should make students use the sets and develop their own hypotheses. After the applications they should be asked to interpret the results. In general the activities should be carried out in an enjoyable and relaxing way. The researcher suggests that the teachers should not be too strict on students by giving them too much responsibility which can affect their learning process negatively. They should try to generate opportunities for students to have fun and be interactively engaged in the trip (Bozdoğan, 2008). In order to keep the students concentrated, various activities can be designed and conducted (Jarvis and Pell, 2005). The guide should enable the students to gain practical skills by making the students actively participate in the process by trial and error method. The features, structure, working principles of the exhibitions or activities should be taught to students, and they should learn how to use these in daily life. The students should be involved in a simulation in an informal learning setting. The students should be encouraged by the guide to make observations, discussions and inferences about real life based on the informal science setting by asking limited open-ended questions.

The first changes on the program were completed in January 2010. As of this date, the experts in DPEU preferred to use the new program. The researcher restarted working on the revision of the program in fall 2010. During this time, the researcher and the experts in DPEU were in collaboration and the changes made on the program were immediately practiced by the experts. This time the content of the program was shortened and made more clear under the guidance of the objectives of *Rv-BDATP*. A new terminology which is more suitable for children was used in the new program. The order of topics was rearranged. It was decided to divide one of the videos into two parts. Additionally, a new animation about the formation of earthquakes was added. The formation of the earthquakes was taught in three steps. The animation used for seismometer was changed. Some maps were changed and updated. During the program the actions that should be taken before, during and after an earthquake were told. It was suggested that while these actions were taught, the reasons for these actions should be given. This information should be given in the context of dangers and precautions. By this way of instruction, it was assumed that students could be more motivated to practice these actions in a real life situation.

During revision studies, the changes made on the program were immediately used by the experts, therefore in the time of the application, the former and the revised versions of the programs were similar to each other in terms of trip activities. The *Rv-BDATP* is slightly different that the *BDATP*. In the presentation part of the trip, students who participated in *Rv-BDATP* watched an earthquake animation instead of being given information about aftershocks. Both *BDATP* and *Rv-BDATP* include similar activities in the room of Earthquake Park. During these activities students observed a real seismograph, fault line models and participated in the simulation of an earthquake. They were discussed about minimizing of possible damages of earthquakes and reviewed what they learn about actions to be taken before, during and after an earthquake to minimize the damages. They learn about dangers and precautions related to earthquake. The activities common in both programs are as follows:

- *Seismograph*: The students have the opportunity to see a real seismograph and how it functions along with a number of recorded seismogram. They jump in front of the seismograph and as they jump, they can observe the changes in the seismograph system. This procedure is guided by an expert. Near the seismograph, there are fault line maps of Turkey, the maps of the earthquakes occurred in this century in Turkey and the maps of tectonic plates in the world.

- *Fault Line Models*: The instructor uses three fault line models including normal, reverse and strike-slip lines. Some students are given the wooden models and they examine them.

- *Building Models*: The students are shown two building models, one taller than the other. They are asked to hypothesize on the rate of possibility of these buildings to collapse during an earthquake. Then one of the students tries the model and all students watch the process and they discuss about their hypothesis and structural faults. The significance of building structure in order to minimize the damage of the earthquake is highlighted by the instructor.

- *Earthquake Simulation Table*: The earthquake simulation table has a model child room and a model classroom on it. First of all, the students are asked some questions about non-structural mitigations and the instructor shows the real applications of some mitigations. Then, some students are asked to enter the model rooms and the simulated earthquake starts. The students apply the knowledge they gain during the presentation in the rooms. The actions of the students during the earthquake are observed. After the earthquake stops, the actions of the students are discussed in the group with the instructor to correct some application mistakes. The potential danger of the unsecured objects during the earthquake is highlighted through this simulation. Some apparatuses are introduced to the students which can minimize the danger.

- *After-Earthquake Corner*: The students are informed about what they should and should not do after an earthquake. The instructor stresses the importance of the first 72 hours after the earthquake and some suggestions are made about what should be done before the earthquake as preparation and after the earthquake.

Some follow-up activities were developed to check what students learn from the trip. A short class discussion was made after the trip because it is stressed in the literature that student's misunderstandings regarding the trip can be changed through a class discussion so that critical thinking skills of them can be improved. Additionally, students prepared posters and they had a test regarding the topics included in the trip. The poster activity is especially important because by these informative posters many other students and staff members can learn about earthquakes and precautions. It was suggested for the revised program that the posters and the test scores could be used to evaluate the learning outcomes of the students. All these follow up activities in the class regarding the trip supported the construction and reconstruction of science learning of students (Anderson, 1999; Jarvis and Pell, 2005).

As another follow up activity, it was suggested that the parents should be informed about the trip. The parents should encourage their children to talk about the day and reflect on their experience. Learning outcomes from the trip could be permanent and fresh if the content of the trip was referred to throughout the whole academic year while related science topics are being covered. These suggestions were also mentioned in the literature by Jarvis and Pell in 2005. Depending on these suggestions, students were informed about the subjects and grades that cover the earthquakes both at the beginning and at the end of the trip.

In addition to this, while developing the *Rv-BDATP*, a teachers guide booklet including all materials and suggestions were prepared (See Appendix F). The requirement of this guide booklet is also mentioned in the literature. It is suggested that the informal learning setting should offer a copy of the trip plan which includes objectives, activities and useful assessment rubric to the teachers in order to shape their curriculum panning accordingly and assist teachers to facilitate learning in informal learning settings (Tran, 2004). In addition, some researchers suggested that teachers should see the informal science setting before the trip and learn details about the program to benefit from all services (Jarvis and Pell, 2005). The teachers guide booklet in the revised program provides the teachers with the necessary information about the informal science setting and the activities with no need to visit the place before the actual trip.

4.1.3.2. The Pilot Study. It was conducted in collaboration with BDEU in order to;

- investigate knowledge of the students related to earthquakes and steps to be taken before, during and after the earthquake in order to minimize its possible damage,
- identify the expectations of teachers and students from an earthquake science education program,
- test the draft of the Rv-BDATP,
- test the instruments developed.

The sample was selected from the list of schools which had reservations for Earthquake Park visits which contains the Basic Disaster Awareness Training Program. The nature of the sample school shaped the structure of the pilot study. The pilot school was a state primary school and the sample group consisted of 6th, 7^{nd,} and 8th grade students who were the members of science and technology club and civil defense club.

The pilot study was conducted in three weeks period. Each week represents a part of the study.

- Part 1: Preparation for the Earthquake Park Trip
- Part 2: The Earthquake Park Trip
- Part 3: Follow-Up Activities of the Earthquake Park Trip

Each part of the pilot study included different number of students. Some of these students participated in only one part of the study while the others took part in all parts. Therefore, the total numbers of sample students in each part given in the Table 4.2 are different.

Table 4.2. Design of pilot study of the Revised Version of Basic Disaster Awareness Training Program.

Part	Sample	Content
1	46 Students (6th, 7th, 8th grades)	• Application of open-ended Earthquake Diagnostic Test (pre-test) • Preparation Activities for the Earthquake Park Trip as suggested in the draft of *Rv-BDATP* program guided by the researcher
2	40 Students (6th, 7th, 8th grades)	• Visit to Earthquake Park as in the *Rv-BDATP* guided by the researcher • Interviews with experts in DPEU who observed the trip.
3	35 Students (6th, 7th, 8th grades)	• Application of the *draft of CUQ-Earthquake* (post-test) • Follow-Up Activities of the Earthquake Park Trip as suggested in the draft of *Rv-BDATP* guided by the researcher • Interviews with teachers who participated to the trip.

Part 1: Preparation for the Earthquake Park Trip (January 12th 2011): 46 students participated in this study. First, an open-ended *Earthquake Diagnostic Test* was applied to identify conceptualizations/misconceptions about earthquake and expectations from an earthquake science education program. The *Earthquake Diagnostic Test* instrument was developed by the researcher after careful consideration of the some suggestions, instruments and research results placed in the literature. After that, the instrument was reviewed by the experts in DPEU who are the program coordinators. The instrument included demographic information about the participants and open-ended questions, as well. The open-ended *Earthquake Diagnostic Test* was given in Appendix G. The instrument was generally used to get responses from students regarding the following questions;

- In which course/club activity did you cover the earthquake topic this year?
- In which grades did you cover the earthquake topic before?

- Which resources did you use to get information about earthquake?
- Which resources did you use to get information about the earthquake?
- Have you ever experienced an earthquake before? When and where?
- What is an earthquake? How would you define earthquake in a sentence?
- How do the earthquakes occur? List the causes of the earthquakes briefly?
- What happens on the earth during an earthquake?
- What happens under the earth during an earthquake?
- What should we do to be prepared for an earthquake? Write down four steps for preparation before an earthquake?
- How should we act during an earthquake to protect ourselves? List four proper/ ideal actions.
- What should not we do during an earthquake? Write down four actions to avoid.
- What should we do after an earthquake? List four proper/ ideal actions.
- What should not we do during an earthquake? Write down four actions to avoid.
- What do you know about the possible time and location of an earthquake?
- Imagine that you have a chance to make an interview with the earthquake experts, what would you want to learn? Write four questions to ask to the experts.

The data gathered from the sample was classified and evaluated depending on the conceptualizations about earthquakes, actions to be taken before, during and after an earthquake and expectations from an earthquake science education. This data were useful for identifying misconceptions, curiosities about the earthquakes and suggestions regarding the *Rv-BDATP*. They were analyzed to determine which terms were used most frequently to define the earthquakes and the actions to be taken before, during and after the earthquake. In accordance with the findings, some changes were made on the content of the program. It was observed that the children mostly referred to natural disasters and damages while defining earthquakes. It was noticed that the children were not familiar with some significant terms such as plate tectonics and fault lines. Keeping this in mind, it was decided to explain the formation of earthquakes as a natural process. It was also understood that the children had a general idea on the necessary steps that should be taken before, during an earthquake but they could not go beyond mentioning earthquake bags, fixing the furniture and being calm. In accordance with this data, it was decided to emphasize the topics which were not mentioned by the children such as what an earthquake bag should include, how to determine the safe places and emergency contact people. In addition, a closed-end test was developed depending on the responses of the students.

On the same day, apart from the *Earthquake Diagnostic Test*, a presentation was given about the nature of earthquakes and the Earthquake Park trip. A handout (see Appendix E) was distributed to the class during the presentation. The students were guided to identify their goals for the trip and prepare questions to ask to the experts Earthquake Park. All this process was recorded. The video recordings were analyzed to see the reactions of students to the presentation. The presentation was revised according to their reflections. These reflections can be summarized as follows: The students firstly defined earthquakes as natural disasters. It was noticed that they comprehended the formation process of earthquakes better when we made them notice the role of shaking of the ground. In this direction, they watched an animation about the formation of earthquakes. It was observed that the students found it easier to understand the topic when it was explained step by step in a cause and effect relationship referring to plate tectonics. The students were very curious about the predictability of the earthquake and they had misconceptions about this issue. To overcome these misconceptions, the presentation in the trip included the myths about the earthquakes. The statistical data seemed to arouse the attention of the students and they helped them to realize the significance of earthquakes and internalize this reality. The students were shown NEMC website and they were very interested in the information given through the website. It was observed that the students liked the analogy of flicking used to explain the formation of the earthquakes. The association between the sound waves and earthquake waves was very helpful.

Depending on the result of the pilot study of pre-trip activity it was observed most of the materials are useful and students could follow the activities. However it is identified that some students had problems about formation of earthquakes. In the pilot version of the pre-trip activity presentation the formation of earthquakes was explained in three steps: 1) Plates move, 2) The earth crust cracks, 3) An earthquake happens. However, the slide was changed as it could cause a misunderstanding that an earthquake happens after the crack of the earth crust. Therefore in the revised version of the presentation, the two slides regarding the formation of earthquakes included two steps: 1) Plates move according to each other, 2) While the earth crust crack, an earthquake happens (See Appendix D).

In addition to this part of the pilot study, another small group application of *Earthquake Diagnostic Test* was conducted with the participation of 17 seventh grade students from another school. Two questions were added to the *Earthquake Diagnostic Test*.

These questions were regarding the seismographs as follows:

- How is the magnitude of an earthquake calculated and expressed?
- How is the intensity of an earthquake calculated and expressed?
- What is a seismograph and what is it used for?

Similar to the first part of the pilot study, the data were analyzed to determine how earthquakes are perceived and what the misconceptions about them are. With the additional questions added, it was also analyzed what students know about seismographs and what they know about how earthquakes are measured in terms of magnitude and effect in various values.

Part 2: Earthquake Park Trip (January 19th 2011): A mixed group of 40 students from 6th, 7th and 8th grades from the sample group attended to the trip under the guidance of three teachers from school. The group visited the Earthquake Park and got training based on the draft *Rv-BDATP*. The training was given by the researcher. The training was recorded and the researcher was observed by the experts who are responsible for the program. The reactions and questions of the students were analyzed. The duration of the presentation was shortened and some of the slides were cancelled. Some suggestions were made to the DPEU mostly about the application of the program.

Part 3: Follow-Up Activities of the Earthquake Park Trip (January 26th 2011): As it was the last week of the fall term, there were some absentees therefore some students did not participate in this activity. Only 24 of 46 subjects and 11 additional subjects took part in this step so the total number of the subjects was 35. The first activity in this step was making a poster as suggested in the draft *Rv-BDATP*. The students were divided into groups of 4 or 5 and each group was assigned with a task. There were three tasks determined by three questions which were: *How does earthquakes occur?*, *How should we prepare for the earthquakes and what should we do during and after the earthquake?.*

The students were observed and photographed during the poster work to analyze their motivations and reactions. The posters were reviewed in terms of form and content and each poster was photographed. It was found that the students did not make any mistakes or did not have any misconceptions regarding these three questions (see Appendix K).

After the students finished their poster work, the draft version of *Conceptual Understanding Questionnaire-Earthquake (CUQ-Earthquake)* was administrated to the students. This test was developed to evaluate the effectiveness of draft *Rv-BDATP*. It was given in Appendix H. It consisted of three parts. The first part included ten fill in the blanks questions related to earthquake literacy. The second part included twenty multiple choice questions regarding the nature of earthquakes and measurement of them. The third part included eighteen questions on what the difference between the danger and precaution before, during and after the earthquake.

Various statistical tests were conducted to analyze the draft version of *CUQ-Earthquake* scores in order to prepare the final version of *CUQ-Earthquake.* Totally 35 students answered the test. The table includes some test results regarding the draft version of *CUQ-Earthquake*. The test was composed of three parts therefore analysis results were given for each part separately in the following table.

Table 4.3 indicates that students could answer at least more than half of the questions in a proper way. Students answered about 74% of Part 1 questions correctly; it was the highest average among the three parts of the instrument. On the other hand among three parts, Part 3 had the highest standard deviations which show that there might be different groups as high and low scorers in the sample. Students took the draft version of *CUQ-Earthquake* after trip; therefore it was a kind of post-test in the pilot study. They learned about the concepts which were measured before the test application, they had high average which might cause high variance in values. At that point, skew and kurtosis values gave clear information about distribution of scores of the sample. The frequency distribution of the test scores of the students was negatively skewed. As it was given in the table for Part 1 and Part 3 skew values were -0.987 and -0.469. On the other hand, Part 2 had a skew value -0.054 which was close to the zero value as normal distribution and the Kurtosis value for this part was 0.195 which was the closest value to normal distribution among three parts.

Table 4.3. Analysis test results of the draft version of *CUQ-Earthquake* - pilot study.

(N=35)	Part 1	Part 2	Part3
Number of Items	10	20	16
Mean	7.429	10.600	10.857
Variance	3.445	6.411	20.008
Std. Dev.	1.856	2.532	4.473
Skew	-0.987	-0.054	-0.469
Kurtosis	0.523	0.195	0.904
Minimum	2.000	5.000	0.000
Maximum	10.000	17.000	16.000
Median	8.000	11.000	11.000
Alpha	0.592	0.409	0.892
Mean Proportional	0.743	0.530	0.679
Mean Item-Total	0.480	0.280	0.612
Mean Biserial	0.704	0.382	0.803

Table 4.3 showed the Alpha; mean proportional correct; mean item-total correlation; mean biserial correlational coefficients for each part of the draft version of *CUQ-Earthquake*. These analysis tests were useful to have idea about internal consistency, difficulty level, and discriminating power of the instrument. Mean proportional correct values can be interpreted as difficulty level. Mean proportional correct of the second part of the test was 0.530 which is the lowest score among the three parts of the test. It seems that this part was more difficult than the others. Alpha value of the third part of the scale was 0.892 that was the highest Alpha value among the three parts. Besides, third part had the highest mean item-total correlation value which was

0.612. The data shows that the third part had the highest internal consistency among the three parts. Although the mean score regarding this part was high, it had the highest variance which increased the discriminating power of it. Mean biserial correlational coefficient of part 3 was 0.803, it showed that the items of this part generally had high discriminating power although most of the students could give proper answers in this part.

Various reliability analysis tests were conducted on the draft version of *CUQ-Earthquake*. Item analysis was carried out in order to make comments about difficulty level, discriminating power and internal consistency of the each item. For this purposes, proportional correct, biserial and point biserial values were computed for each item. Besides proportional endorsing, biserial and point biserial values were calculated for alternatives of each item in order to explore usefulness of alternatives for each item. According to the analysis results, each item was evaluated depending on their discriminating power, simplicity and proportional endorsing of alternatives. In conclusion, some of the questions in the draft version of *CUQ-Earthquake* were decided to be eliminated as they had low discriminating power. In addition, some other questions were omitted because DPEU experts suggested that they could cause misconceptions.

Apart from the test which was useful to measure the reliability of the draft version of *CUQ-Earthquake*, inter-correlations were calculated in order to examine correlations between the three parts of the draft version of *CUQ-Earthquake*. According to the results, the correlation value between Part 1 and Part 2 was 0.328; Part 1 and Part 3 was 0.479; Part 2 and Part 3 was 0.381. These data showed that the parts of the test were not highly correlated to each other. It supported the idea that each part of the draft version of *CUQ-Earthquake* examines different abilities or background of the students. These values supported the validity of the instrument.

In addition to these evaluations, a comparative analysis between the Earthquake Diagnostic Test (pre-test) and the draft version of *CUQ-Earthquake* (post-test) was made in order to identify the learning outcomes of the program for the sample students. A group of 24 students in total was identified as a group who took both of the tests and the comparative analysis was conducted using the data from this group.

Table 4.4. Results of first comparison test of pre and post test data of the pilot study.

Wilcoxon Signed Ranks Test		**n (24)**	**Mean Rank**	**Sum of Ranks**
Pretest Part 1 - Posttest Part 1	Negative Ranks	23(a)	13.00	299.00
	Positive Ranks	1(b)	1.00	1.00
	Ties	0(c)		
Pretest Part 2 - Posttest Part 2	Negative Ranks	18(d)	13.78	248.00
	Positive Ranks	6(e)	8.67	52.00
	Ties	0(f)		
Pretest Total - Posttest Total	Negative Ranks	22(g)	13.36	294.00
	Positive Ranks	2(h)	3.00	6.00
	Ties	0(i)		
a Pretest Part 1 < Posttest Part 1	b Pretest Part 1 > Posttest Part 1		c Pretest Part 1 = Posttest Part 1	
d Pretest Part 2 < Posttest Part 2	e Pretest Part 2 > Posttest Part 2		f Pretest Part 2 = Posttest Part 2	
h Pretest Total > Part Total	i Pretest Total = Part Total		g Pretest Total < Part Total	

In both tests, the common parts asking for similar information were identified. The scores of the students from these common questions were compared and the comparisons are given below. As the score ranges of these two tests were different, these comparisons were made on a percentage basis. Comparisons were made with Wilcoxon Signed Ranks test because the sample group consisted of 24 students which is less than 30, the minimum number. Table 4.4 shows the results regarding comparisons of Pretest Science 1 - Posttest Science 1; Pretest Science 2 - Posttest Science 2; Pretest Total - Posttest Total. In Part 1, the test results showed that 23 out of 24 students increased their scores after participating in the program. In Part 2, the test results indicated that 18 out of 24 students increased their scores after participating in the program. In total, it was founded that 22 students out of 24 increased their scores after the program.

Additional test was done to determine whether the increase in the scores is significant or not. Table 4.5 indicated that there was significant difference between pre and posttest scores of the sample group because the significance values for Part 1 and Part 2 were respectively .000 and .005 which were smaller than .05. The increase in post test scores was significant. Therefore, it can be said that the draft *Rv-BDATP* had statistically significant effect on students' learning outcomes.

Table 4.5. Results of second comparison test of pre and post test data of the pilot study.

N (24)	Part 1	Part 2	Total
Z	-4.257(a)	-2.800(a)	-4.114(a)
Asymp. Sig. (2-tailed)	.000	.005	.000

a Based on positive ranks. b Wilcoxon Signed Ranks Test

According to the results of correlation analysis which are given in Table 4.6, the scores of the pre-tests and post-tests were not significantly correlated to each other. The value of correlation coefficient between pretest Part 1 and posttest Part 1 was .207 which was very low. Similarly, the correlation coefficient between pretest Part 2 and posttest Part 2 was .142 which was less then correlation of first part of the test. Besides, the correlation coefficient between the total scores of the test was .044. The significance values for these correlations were respectively .332, .507, and .838 which were greater than the significance level 0.1. According to this data, it can be concluded that the improvement of the students in posttest scores cannot be a coincidence. It might support the argument that the draft *Rv-BDATP* has a positive effect on the learning process of the students. All of these results support the idea that the draft of *Rv-BDATP* had many useful points which could be regarded as the indicator of the effectiveness of *Rv-BDATP* to facilitate students' learning outcomes.

Table 4.6. Results regarding correlation of pretest and posttest of the pilot study.

Spearman Correlations		Posttest Part 1	Posttest Part 2	Posttest Total
Pretest Part 1	Correlation Coefficient	.207	-.027	.095
	Sig. (2-tailed)	.332	.899	.659
Pretest Part 2	Correlation Coefficient	-.067	.142	.108
	Sig. (2-tailed)	.754	.507	.614
Pretest Total	Correlation Coefficient	.042	-.008	.044
	Sig. (2-tailed)	.846	.972	.838

** Correlation is significant at the 0.01 level (2-tailed).

In the first phase of this thesis, the *Rv-BDATP* and the instruments which would be used to measure the effectiveness of the *Rv-BDATP* were developed. In the second phase, the experimental research which was conducted to explore effectiveness of the *Rv-BDATP* is mentioned.

4.2. Second Phase: Exploring the Effectiveness of the Revised Version of Basic Disaster Awareness Training Program

4.2.1. Sample

8th grade students were especially chosen as the sample group. One of the reasons is that the content of the existing Basic Training Awareness Program completely fit to the 8th grade curriculum and the program would provide the opportunity for the students to experience formal and informal learning environments in order to improve their awareness and foundation on earthquakes. Moreover, 8th grade is the last grade of the compulsory education in Turkey so it is significant to ensure as many students as possible to get earthquake education in an earthquake prone country. The program for 8th grade can also be adapted to both lower grades and upper grades.

The sample group was chosen through convenience sampling method from the school where the researcher was working as a teacher. There were 4 eight grade classes depending on the weekly schedule of the researcher, two classes were assigned as the experimental group and the other two were assigned as the control group. The following table includes the number of students in both control and experimental groups.

Table 4.7. Characteristics of the sample.

Control vs Experimental	**Number of Students**		
	Female	Male	Total
Experimental 1	8	8	16
Experimental 2	12	8	20
Control 1	9	9	18
Control 2	7	9	16

4.2.2. Design

The learning outcomes of the students who participated in the *Rv-BDATP* or *BDATP* were evaluated by using the data gathered from the pre and post measurements.

The learning outcomes of the students who attended the former Basic Disaster Awareness Training Program and students who attended the revised version of the program were examined in order to evaluate the effectiveness of the new version of the program.

The study was performed in an experimental research design which is derived from Solomon four group experimental research design. This design consists of two control and two experimental groups to allow the researcher to test whether the pretest itself has an effect on the learning process and posttest results of the subjects. By means of this design, the researcher tries to control the variables and check the effect of pretest on the results. The various combinations of tested and untested groups with experimental and control groups provides the researcher with the opportunity to make sure that extraneous factors have not influenced the results.

Table 4.8. Design of the research.

Date	**Groups**	**Pretest**	**Treatment**			**Posttest**	**Retention Test**
March 2011	Experimental Groups 1,2 convenience sampling- 8th grade students	E 1 Pretest	Preparation for the visit as suggested in the *Rv-BDATP*	Visit to Earthquake Park as suggested in the *Rv-BDATP*	Follow up activities as suggested in the *Rv-BDATP*	Post tests	Retention test
		E 2 No pretest					
March 2011	Control Groups 1,2 convenience sampling- 8th grade students	C 1 Pretest	Notices about trip and posttests	Visit to Earthquake Park as suggested in former version of the Program		Post tests	Retention test
		C 2 No pretest					

4.2.3. Procedure

The study was conducted in a private school with 8th grade students. Four 8th grade classes grouped into two as two control groups and two experimental groups.

Pre-trip activities (March 1st 2011): Control 1 group was given information about the trip and earthquake week. Then they took a pretest in the science and technology lesson (n=21). The Control 2 group was informed about the trip and the earthquake week without taking a pretest. Similarly the Experimental 1 was given information about the trip and earthquake week. Then Experimental 1 took a pretest (n=20) and the researcher made a presentation and distributed a handout to the students. The Experimental 2 group was informed about the trip and the same presentation was made by the researcher but they did not take a pretest. All groups were informed about the fact that they would take a post-test.

Trip Activities (March 2nd 2011): The control groups attended the Earthquake Park trip according to the former program. On the same day, the experimental groups visited the park according to the revised program.

Follow-up Activities (March 2nd 2011): The students in the control group continued with their regular science and technology schedule. The students in the experimental group made a class discussion and a poster after the trip. Students were divided into groups and each group made a poster on one of the themes which were categorized by the following questions: *How does earthquakes occur, How should we prepare for the earthquakes and What should we do during and after the earthquake?* Informative notes and pictures about the posters were given to the students (See Appendix I and J). Each group wrote the question they prepared before the trip on their posters along with the answers to them. Some of the groups presented their posters to the researcher.

Post-Measurements: On March 25th, all groups took a post-test. Totally 36 control group students and 34 experimental group students took the *CUQ-Earthquake.* The test was administrated by science and technology course teachers. On March 29th - 30th, 33 students in experimental groups and 30 students in control groups filled the program evaluation questionnaire. The test was given by classroom teachers. Between days May 2nd -13rd, the *CUQ-Earthquake* was administrated as retention test to all groups. The sample group was 8th grade students who were about to graduate from the middle school at the end of the semester. These students study for a high school entrance exam, therefore many of them did not come to school after April. Totally 33 experimental group and 34 control group students took the test. The tests were given by science and technology course teachers and researcher.

4.2.4. Instruments

As it was mentioned before two different instruments were used in this study in order to evaluate students' learning outcomes related to the revised and former version of the Basic Disaster Awareness Training Program in terms of their conceptual understanding levels and to evaluate their personal declarations and ideas about their own learning experiences.

4.2.4.1. Conceptual Understanding Questionnaire- Earthquake (CUQ-Earthquake). The CUQ-Earthquake was improved by the researcher in collaboration with DPEU experts. It was developed depending on the results of the surveys about the conceptualizations, beliefs and ideas about nature of earthquakes placed in the literature and founded by the researcher along with a pilot study conducted by the researcher.

It was used to assess 8th grade students' conceptual understanding levels related to the selected concepts such as plate tectonics, fault line, earthquake map, nature of earthquakes, seismograph, magnitude of earthquake and actions to be taken before, during and after the earthquakes in order to minimize their hazards which are found in natural process unit of the 8th grade science and technology curriculum. The basic objectives were given in Appendix C.

The instrument which is given in Appendix A consisted of two parts. The first part included eighteen multiple choice questions regarding the nature of earthquakes and measurement of them. The aim of this part is to discover the students' learning outcomes regarding concepts identified in the program. Each of the eighteen items included two statements regarding the concepts and the test takers were asked to decide whether the statements were true or false by choosing from 4 options: A) Both True, B) Only First One True, C) Only Second One is True, D) Both False.

The second part included fifteen questions which asked the students to differentiate between danger and precaution through two statements for each item. There were no wrong statements in any questions. The aim of this part was to reveal the capabilities of the students to create a logical association between the danger-precaution difference and the concepts of danger and precaution regarding the actions to be taken before, during and after the earthquake. Each of the fifteen items included two statements referring to a danger or a precaution and the test takers were asked to decide whether the statements were true of false by choosing from 4 options: A) I. is danger, II is precaution, B) I. is precaution, II is danger, C) Both are danger, D) Both are precaution.

The *CUQ-Earthquake* was administrated to Experimental 1 and Control 1 groups as a pretest before the treatment, and to all sample as a posttest and retention test after the treatments.

Validity and Reliability of the CUQ-Earthquake: The questions in the *CUQ-Earthquake* were prepared according to objectives identified in the natural process unit of the 8th grade science and technology curriculum and also these objectives were considered while developing the revised version of Basic Disaster Awareness Program. The objectives of the program were matched with the test questions. This contributed to the content validity of the *CUQ-Earthquake*. Additional supports were taken from experts teachers of 8th grade science and technology course, educators, academicians, and DPEU experts to ensure the validity of the instrument.

There was a pilot practice of the draft version of *CUQ-Earthquake* and the result of this application was used to check the reliability and validity of *CUQ-Earthquake*. As it is mentioned before according the results of the pilot study some items were eliminated to prepare more valid and reliable instrument (See page 74). As it was mentioned before the *CUQ-Earthquake* consists of two parts and it is assumed that items of the two parts examine different background and abilities of the students. Scale inter-correlation is calculated depending on the post-test application of *CUQ-Earthquake*. It is found that the correlation between first and second part of the scale is 0.242. It can be interpreted that each part of the scale measures different abilities or knowledge so it support the validity of the *CUQ-Earthquake.*

Table 4.9. Item analysis of posttest application of the *CUQ-Earthquake.*

N(70)	Part 1	Part 2
Number of items	18	15
Mean	10.557	12.614
Variance	8.475	11.037
Std. Dev.	2.911	3.322
Skew	-0.420	-1.549
Kurtosis	-0.358	1.457
Minimum	3.000	2.000
Maximum	16.000	15.000
Median	11.000	14.000
Alpha	0.640	0.883
Mean Proportional	0.587	0.841
Mean Item-Total	0.361	0.615
Mean Biserial	0.489	0.932

An additional reliability analysis of the *CUQ-Earthquake* was conducted by using the data gathered from the original study. Table 4.9 shows the analysis results which were calculated depending on the post-test application of *CUQ-Earthquake.* In the study, while only Experimental 1 and Control 1 students took the pre-test, all groups took the posttest. Therefore post-test data used for the analysis because a greater number of the sample could give more useful data regarding the analysis.

Table 4.9 indicates that both first and second parts of the scale have high alpha values. The alpha value of the second part of the scale is 0.883 which is the highest value among the two parts of the scale. Besides the mean item-total correlation score of the second part is 0.615. It seems that the second part has higher internal consistency compare to first part. The values support the reliability of the scale. Mean proportional correct values indicates that more than half of the students could find the correct answers. Part 1 has the lowest mean proportional correct value, it can be interpreted that first part of the scale is more difficult than second part. Both two parts of the instrument have high variance values although they have high means. It means that there are high and low achievers in the sample group. These values also parallel with the mean biserial scores.

The second part has very high mean biserial correlational score which is 0.921. Both variance and mean biserial correlational scores can be interpreted as discriminating power of the scale so it means that the instrument has high discriminating power.

4.2.4.2. Program Evaluation Questionnaire (PEQ). An instrument which was developed by the researcher was used in order to get information regarding the students' personal declarations and thoughts about their own learning experiences related to the programs. It was applied to all the 8^{th} grade students both control and experimental groups. These instruments included two types of questions, Likert type and open-ended questions (See Appendix B).

Validity and Reliability of the PEQ-control and PEQ-control: Useful scales were searched in the literature and their reliabilities and validities were examined. For Likert part, Modes of Learning Inventory (MOLI) was chosen to be used as one of the instruments while developing the program evaluating instrument. MOLI constitutes a part of the Questionnaire for Exit Interviews. It is used to evaluate the personal declarations of visitor's own learning process. Questionnaire for Exit Interviews is developed by Museums Actively Researching Visitors Experiences and learning (MARVEL) Project as a part of a kit, which aims to develop a set of tools for measuring aspects of learning. The kit has three tools which are Observation Study, Listening Study and Exit Interviews (Griffin et *al.*, 2005). Tekkumru Kısa (2008) translated the scale into Turkish and she conducted a reliability test on the Turkish version of the MOLI in 2008. The reliability analysis results showed a reasonable internal consistency for the scale. The alpha coefficient was found to be 0.887. Although the original English version of the MOLI consists of interview questions, for this study some of these questions were reorganized as written questions. Some of the items included in MOLI were eliminated and new items were added to identify the ideas and comments specific to the programs. This part of the instrument was arranged in two versions. The first version namely *PEQ-control* included seventeen items related to the Earthquake Park trip and the second version namely *PEQ-experimental* consisted of twenty one items with four items added. These additional items were related to the activities before and after the trip. That is why the first version was given to the control groups and the second versions were given to the experimental groups.

In addition to these, item analysis was conducted on the data gathered from both control and experimental groups in order to check the reliability of the *PEQ*. The analysis was computed on the first seventeen item of the scale which was answered by both control and experimental group. By this way item analysis could be done on higher numbers of data which increases the validity of it. The results of the item analysis can be seen in Table 4.10.

Table 4.10. Item analysis of program evaluation questionnaire (for common 17 items).

N (63)	Total
Number of Items	17
Mean	3.675
Variance	0.374
Std. Dev.	0.612
Skew	-1.326
Kurtosis	2.969
Minimum	1.176
Maximum	4.647
Median	3.765
Alpha	0.873
Mean Item-Total	0.591

There were five alternatives for each item therefore five point was the maximum score that could be gathered. Totally 63 students answered the program evaluation questionnaire. The mean score was about 3.68 out of 5 points which is a high average. The maximum answer is 4.65 which is very close to 5. In order to have an idea about distribution of the answers, Skew and Kurtosis values can be examined. The skew value is -1.326 which means that the frequency distribution of the students' answers was negatively skewed. On the other hand, the Kurtosis value is 2.969 which shows that there is no normal distribution among students' responses. The Alpha value was computed as 0.873 which indicated a reasonable internal consistency of the scale. Moreover mean item-total correlation value was 0.591 which showed high internal consistency of the instrument. All these data support the reliability of the scale.

The second part of the PEQ includes open ended questions. The open-ended questions were:

- What are your suggestions to make the Earthquake Park Trip more informative and entertaining?
- Which places would you like to go in a school trip other than the Earthquake Park? Explain why.

With these questions, it was aimed to understand the suggestions of the students to improve the program and identify their expectations from school trips (See Appendix B).

5. DATA ANALYSIS AND RESULTS

The design of the study is derived from the Solomon Four Group Design. Two control and two experimental groups participated in the study. Before the treatments only control 1 and experimental 1 groups took the *CUQ-Earthquake* as a pre-test. Afterwards, all groups took the *CUQ-Earthquake* as a post and retention test. The instrument provided quantitative data in *order to evaluate the Revised Version of Basic Disaster Awareness Training Program (Rv-BDATP).* Besides, control groups answered the *PEQ-control* and similarly experimental groups took *PEQ-experimental* which provided both qualitative and quantitative data. The data gathered from these instruments were analyzed on the base of the research questions which were mentioned before. Various statistical tests such as independent sample t-test, ANCOVA, ANOVA were used to test the hypothesis of this study.

5.1. Analysis of the Research Questions and Hypothesis

As it was mentioned before convenient sample selection technique was used. The participating groups were determined as control and experimental from the pre-existed groups so there might be initial differences between them. Therefore, firstly independent sample t-tests were conducted in order to test whether the groups were different or not from each other in terms of their conceptual understanding levels regarding the selected concepts in the natural processes unit as well as their capabilities to differentiate the concepts of danger and precaution regarding the actions to be taken before, during and after the earthquake.

Table 5.1 shows descriptive statics regarding pre-test scores of Control 1 and Experimental 1 groups. According to these results, the mean of the total score of the Experimental 1 group is 19.94 while the mean of the total score of the Control 1 group is 21.61.

Table 5.1. Descriptive statistics about the pre-test application of *CUQ-Earthquake.*

Pre-test	Group	n	Mean	Std. Deviation	Std. Error Mean
Part 1	Experimental 1	16	7.69	3.400	0.850
	Control 1	18	9.78	1.987	0.468
Part 2	Experimental 1	16	12.25	3.235	0.809
	Control 1	18	11.83	3.930	0.926
Total Score	Experimental 1	16	19.94	5.105	1.276
	Control 1	18	21.61	4.434	1.045

In addition to this, Table 5.2 includes the results of the independent sample t-tests which were carried out depending on the pretest results of *CUQ-Earthquake*. It shows results of Levene's test for equality of variances. According to these results, significant value for the total test is 0.262 which is greater than 0.05 therefore it has homogeneity of variances. Also, it is founded that both Part 1 and Part 2 have homogeneous variances.

Table 5.2. Levene's test for equality of variances for pre-test application of *CUQ-Earthquake.*

Pre-test (N=34)	Levene's Test for Equality of Variances	
	F	Sig.
Part 1	3.460	0.072
Part 2	0.243	0.626
Total Score	1.302	0.262

Table 5.3 includes the results regarding t-test for equality of means. The results show that there is no significant difference between the two control groups in terms of means of total scores. This result supports the appropriateness of the sample groups for the experimental research design because the Experimental 1 and Control 1 groups show similarity in terms of pre-knowledge about the topic. For experimental studies in order to check the effect of the treatment in a better way, control and experimental groups should be similar at the beginning of the study.

Table 5.3. Independent sample t-test on pre-test application of *CUQ-Earthquake.*

Pre-test (n=34)		t-test for Equality of Means				
		T	df	Sig. (2-tailed)	Mean Difference	Std.Error Difference
Part 1	Equal variances not assumed	-2.154	23.571	0.042	-2.090	0.971
Part 2	Equal variances assumed	0.335	32	0.740	0.417	1.244
Total Score	Equal variances assumed	-1.023	32	0.314	-1.674	1.636

The *CUQ-Earthquake* consists of two parts which supposed to measure different background and abilities. Therefore the data gathered from these two parts have been compared. The mean scores of experimental 1 group from the second part of the test is 12.25 while the mean score of control 1 group from the same part is 11.83. Statistically, there is no significant difference between the groups in terms of danger and precaution differentiation abilities. On the other hand, the mean score of experimental 1 group from the first part of the test is 7.69 while the score of control 1 group from this part is 9.78. Statistically p value is 0.042 which is slightly smaller than 0.05 so it means there is a significant difference between the mean scores of the two groups. This difference is in favor of the control group. In the research design, it is aimed to provide the experimental group with a better program than control group and to increase their success significantly. The fact that control group is more successful in one aspect than the experimental group. After this test, in order to test the first and second hypothesis the following analyses were conducted.

Research question 1: Is there any statistically significant difference between the conceptual understanding levels of the 8th grade students who received the *Rv-BDATP* and those who received the *BDATP* regarding the selected concepts in the natural processes unit?

As it is mentioned before only Control 1 and Experimental 1 groups received the *CUQ-Earthquake* test as a pretest. According to the results of the independent sample t-test, mean scores of the two groups are significantly different in terms of conceptual part of the scale. Therefore analysis of covariance (ANCOVA) which adjusts posttest scores for initial differences on the variable and compares the adjusted scores was used. It was useful to test the first hypothesis. The following tables include results of the ANCOVA.

Table 5.4. Descriptive statistics about the Part II scores of the post-test application of *CUQ-Earthquake.*

Group	Mean	Std. Deviation	N
Control 1	10.0556	3.40367	18
Experimental 1	10.3750	2.89540	16
Total	10.2059	3.13126	34

Table 5.4 shows the post-test scores of the Experimental 1 and Control 1 groups regarding conceptual knowledge part of the test. According to these results, the means are close to each other. The Levene's test was conducted when scores of conceptual knowledge part of the pre-test is included in the model as a covariate. Levene's test is significant ($F_{(1,32)}$= 4.823, p=0.035 < 0.05) indicating that the group variances are not equal.

Table 5.5. The results of the test of between-subjects effects (ANCOVA).

Dependent Variable: the Part II scores of the post-test application of *CUQ-Earthquake.*				
Source	Type III Sum of Squares	df	F	Sig.
Corrected model	36.125[a]	2	1.948	0.160
Intercept	136.271	1	14.697	0.001
Pre-test scores	35.261	1	3.803	0.060
Type of program	9.204	1	0.993	0.327
Error	287.434	31		
Total	3865.000	34		
Corrected total	323.559	33		
a. R Squared = 0.112 (Adjusted R Squared = 0.054)				

The significance values placed in the Table 5.5 show that the covariate does not significantly predict the dependent variable, because the significance value is 0.060, higher than 0.05. Therefore students' post test scores regarding the conceptual part were not influenced by the difference in their pretest scores. Besides, no significant effect of types of programs was found on students' conceptual understanding levels after controlling the effect of differences in their prior knowledge ($F_{(1,31)}$= 0.993, p= 0.327 > 0.05). The first hypothesis of the research was: 8th grade students who received the *Rv-BDATP* would have significantly higher scores in their conceptual understanding levels regarding the selected concepts in the natural processes unit than the students who attended *BDATP* as measured by the *CUQ-Earthquake*. These results did not support the first hypothesis. However, there was an increase in students' scores after they attended the *Rv-BDATP* and *BDATP*.

In addition to the Control 1 and Experimental 1 groups, the sample included Control 2 and Experimental 2 groups. All these groups took the *CUQ-Earthquake* test as post and retention test. Some of the students in both experimental and control groups could not take the *CUQ-Earthquake*. The number of students in each sample groups was low therefore Control 1 and Control 2 groups were combined and named control group. Similarly, Experimental 1 and Experimental 2 groups were combined and called experimental groups. The number of sample students who took both post and retention test was above 30 which meets statistical requirements. Therefore, instead of repeated measures of ANOVA, independent sample t-tests depending on posttest and retention test data were conducted to test whether there was any statistically significant difference between the groups in terms of their conceptual understanding levels regarding the selected concepts in the natural processes unit and their capabilities to differentiate the concepts of danger and precaution regarding the actions to be taken before, during and after the earthquake. These statistical analyses were useful to test the first, second and third hypotheses of the research.

Table 5.6. Descriptive statistics of the post-test application of *CUQ-Earthquake.*

Post-test	Group	n	Mean	Std. Deviation	Std. Error Mean
Part 1	E	36	10.7222	2.63613	043936
	C	34	10.3824	3.24751	0.55694
Part 2	E	36	13.1111	2.98355	0.49726
	C	34	12.0882	3.66282	0.62817
Total	E	36	24.1389	4.42817	0.73803
	C	34	22.1765	5.59475	0.95949

As it is seen in Table 5.6, there were two groups which were control and experimental groups and their means about the first part and second part of the post and retention test application of *CUQ-Earthquake* is given. It shows that 36 experimental group and 34 control group students took the posttest. The means of the experimental group regarding the first and second parts of the post application of *CUQ-Earthquake* were M= 10.72 and M= 13.11 respectively which were slightly higher than the means of control groups.

Table 5.7. Levene's test for equality of variances for post-test application of *CUQ-Earthquake.*

Post-test (N=70)	Levene's Test for Equality of Variances F	Sig.
Part 1	3.507	0.065
Part 2	1.697	0.197
Total Score	4.783	0.032

The Results of the independent sample t-test which was carried out depending on the post *CUQ-Earthquake* data are given in the following tables. Table 5.7 includes the results of Levene’s test for equality of variances. The significant values for the Part 1 and Part 2 are respectively 0.065 and 0.197 which are greater than 0.05, therefore both parts have homogeneity of variances.

Table 5.8. Independent sample t-test on post-test application of *CUQ-Earthquake.*

Post-test (N=70)		t-test for Equality of Means				
		t	Df	Sig. (2-tailed)	Mean Difference	Std.Error Difference
Part 1	Equal variances assumed	0.482	68	0.631	0.33987	0.70516
Part 2	Equal variances assumed	1.284	68	0.203	1.02288	0.79648
Total score	Equal variances not assumed	1.621	62.855	0.110	1.96242	1.21050

The Table 5.8 includes the results of the t-test for equality of means. The results show that there is no statistical significant difference between the mean score of experimental group (M=10.72) and control group (M=10.38) regarding the first part of the *CUQ-Earthquake*, t(68)=0.482, p=0.631 > 0.05. These results did not support the first hypothesis of the study.

Table 5.9. Descriptive statistics on the retention test application of *CUQ-Earthquake.*

Retention test	Group	n	Mean	Std. Deviation	Std. Error Mean
Part 1	E	33	9.9394	3.05102	0.53111
	C	34	10.4412	2.98675	0.51222
Part 2	E	33	11.9394	3.42727	0.59661
	C	34	12.4412	2.69895	0.46287
Total	E	33	21.5758	5.58475	0.97218
	C	34	22.8824	4.36768	0.74905

In addition to the post test scores, the retention test data were examined in order to find the answer of the first question. Table 5.9 shows the descriptive statistics of retention test application of *CUQ-Earthquake.* Totally 67 students took the retention test, 33 of the students were in experimental group and the others in control group. The means of control and experimental groups regarding part 2 were similar to each other. Control group (M= 10.44) had slightly higher means than experimental group (M=9.94) in the retention test application of *CUQ-Earthquake*. According to results of Levene's test, Table 5.10 indicates that there is homogeneity of variances in terms of both the first and second part of the test. Significance values for part 1 and part 2 are respectively 0.960 and 0.241 which are greater than 0.05.

Table 5.10. Levene's test for equality of variances for the retention test application of *CUQ-Earthquake.*

Retention (N=67)	Levene's Test for Equality of Variances	
	F	Sig.
Part 1	0.003	0.960
Part 2	1.401	0.241
Total Score	3.305	0.074

The results of the independent sample t-test can be seen in table 5.11. It was found that the significance value for Part 1 is higher than .05 so there is no significant difference between mean scores of control and experimental groups in terms of conceptual knowledge levels about earthquakes, (t(65)= - 0.680, p=0.499 > 0.05).

Table 5.11. Independent sample t-test on retention application of *CUQ-Earthquake.*

Retention test (N=67)		t-test for Equality of Means				
		t	df	Sig. (2-tailed)	Mean Difference	Std.Error Difference
Part 1	Equal variances assumed	-0.680	65	0.499	-0.50178	0.73763
Part 2	Equal variances assumed	-0.667	65	0.507	-0.50178	0.75243
Total Score	Equal variances assumed	-1.069	65	0.289	-1.30660	1.22280

Results of the test of ANCOVA and independent sample t-tests of both post and retention tests were examined to find an answer to the first question. As a conclusion, it was found that there is no statistically significant difference between mean scores of control and experimental groups in terms of the first part the *CUQ-Earthquake* which measures conceptual knowledge of the students regarding earthquakes. The first hypothesis of the research was not supported by these results.

Research question 2: Is there any statistically significant difference between the 8th grade students who received the *Rv-BDATP* and those who received the *BDATP* in terms of their capabilities to differentiate the concepts of danger and precaution regarding the actions to be taken before, during and after the earthquake?

The results of the independent sample t-tests which were applied to both post and retention test data were used to test the second hypothesis of this study. Table 5.6 shows the mean scores of experimental (M=13.11) and control (M=12.08) groups regarding the second part of the post-test application of *CUQ-Earthquake*. Although experimental group has higher mean score than control groups, statistically there is no significant difference between two groups, t(68)= 1.284, p= 0.203 (see Table 5.8). In addition, the retention test mean scores of experimental and control groups were respectively M=11.94 and M= 12.44 which are given in Table 5.9. According to these results, the control group had slightly higher mean score than the experimental group. On the other hand similar to the post test results, the second row of the Table 5.11 shows that the significance value of Part 2 which is higher than 0.05, $t(65)= -0.667$, $p= 0.507$. It was concluded that there was no significant difference between scores of the students regarding their abilities to differentiate the concepts of danger and precaution about earthquakes. According to this result, the second hypothesis of the research was not supported.

Research question 3: Is there any effect of pre-testing on the post measurements of the 8^{th} grade students for both who received the *Rv-BDATP* and those who received *the BDATP* in terms of their conceptual understanding levels regarding the selected concepts in the natural processes unit?

In order to test the related hypotheses several comparisons of the mean scores can be conducted according to the research design. In this research design, only Control 1 and Experimental 1 groups took *CUQ-Earthquake* as a pre-test. On the other hand, all four groups took the *CUQ-Earthquake* as a post and retention test. As it was discussed while searching for the first and second hypothesis, there was not any significant difference between means of experimental and control groups which was given in Table 5.8 and 5.11. These comparisons were made on the basis of control group which includes Control 1 and Control 2 and experimental group which consists of Experimental 1 and Experimental 2 groups.

In order to find the possible effect of pre-testing one-way ANOVA was calculated depending on the post-test results. Table 5.12 includes descriptive statistics regarding the each sample group. Experimental 2 group had the highest mean score (M= 11.00) from the first part of the *CUQ-Earthquake* among the four sample groups. Control 1 group had the lowest mean that is 10.06. On the other hand, Experimental 1 group had the greatest mean score (M=13.19) regarding the second part of the *CUQ-Earthquake.*

Table 5.12. Descriptive statistics of the post-test application of *CUQ-Earthquake* (ANOVA).

Post-test	Group	N	Mean	Std. Deviation	Std. Error Mean
Part 1	E1	16	10.3750	2.89540	0.72385
	E2	20	11.0000	2.44949	0.54772
	C1	18	10.0556	3.40367	0.80225
	C2	16	10.7500	3.13050	0.78262
	Total	70	10.5571	2.93226	0.35047
Part 2	E1	16	13.1875	3.33104	0.83276
	E2	20	13.0500	2.76205	0.61761
	C1	18	11.9444	3.73335	0.87996
	C2	16	12.2500	3.69685	0.92421
	Total	70	12.6143	3.34618	0.39994
Total	E1	16	23.5625	4.95269	1.23817
	E2	20	24.6000	4.03146	0.90146
	C1	18	21.4444	5.31615	1.25303
	C2	16	23.0000	5.95539	1.48885
	Total	70	23.1857	5.08847	0.60819

The results of the Levene's test indicate that there is homogeneity of variances in terms of all parts of the CUQ- Earthquake because the significance values were computed as 0.248 and 0.648 which were greater than 0.05 (see Table 5.13).

Table 5.13. Levene's Test for equality of variances for post-test application of *CUQ-Earthquake* (ANOVA).

	Levene Statistic	df1	df2	Sig.
Part 1: Conceptual	1.408	3	66	0.248
Part 2: Discriminating	0.553	3	66	0.648
Total	1.387	3	66	0.254

Table 5.14 shows the results of one-way ANOVA. According to these results there is no statistically significant difference between four sample groups in terms of Part 1 ($F_{(3,66)}$= 0.361, p=0.781 > 0.05). Besides there is no significant difference among the four sample groups regarding the mean scores of the Part 2, ($F_{(3,66)}$ = 0.592, p= 0.642 > 0.05). It was founded that the comparison results of the posttest of Experimental 2 and Control 2

were not significantly different from the comparison results of the posttest scores of Experimental 1 and Control 1. Then it could be assumed that the pretest did not have any effect on the result. There was no significant difference between Experimental 1 and Control 1 groups.

Table 5.14. Results of ANOVA on the post-test application of *CUQ-Earthquake*.

Post-test (N=70)		Sum of Squares	df	Mean Square	F	Sig.
Part 1	Between Groups	9.577	3	3.192	0.361	0.781
	Within Groups	583.694	66	8.844		
	Total	593.271	69			
Part 2	Between Groups	19.254	3	6.418	0.562	0.642
	Within Groups	753.332	66	11.414		
	Total	772.586	69			
Post total	Between Groups	97.404	3	32.468	1.269	0.292
	Within Groups	1689.182	66	25.594		
	Total	1786.586	69			

In addition to this, Table 5.12 indicates that the total post-test mean score of Experimental 2 group (M=24.60) was higher than the mean score of Experimental 1 group (M= 23.56) which took pre-test. On the basis of this result, it could be concluded that there is no pretesting effect on the treatment of the revised program. The third hypothesis of the research is that there would not be any significant difference between the post measurement scores of 8th grade students who took pre-test before they attended the former and the revised versions of the Basic Disaster Awareness Training Program and those who did not take pre-test before they attended the program. On the basis of these results, the third hypothesis was supported.

Research question 4: Is there any difference between 8th grade students who attended the *BDATP* and those students who attended the *Rv-BDATP* in terms of their personal declarations and ideas about their own learning experiences regarding the program?

The last research question inquires if there is any difference between 8th grade students who attended different training programs in terms of their personal declarations and ideas about their own learning experiences regarding to their experiences. In order to test the related hypothesis the data gathered by application of program evaluation questionnaires were examined. Control groups took *PEQ-control* and similarly experimental groups answered the *PEQ-experimental*. *PEQ-control* and *PEQ-experimental* were similar scales. The first seventeen items of the scales were common in both of them. In order to answer this research question firstly descriptive statistics of scores of the program evaluation questionnaire was calculated for the common seventeen items. Among these items, 7th item is a reverse item. Each item has five options therefore 5 is the maximum score for an item.

Table 5.15. Descriptive statistics about program evaluation questionnaire (first 17 item).

	GROUP	N	Mean	Std. Deviation	Std. Error Mean
Program Evaluation Instrument	Experimental 1,2	33	3.7709	0.55018	0.09577
	Control 1,2	30	3.6003	0.70471	0.12866

Totally 33 experimental group and 30 control group students answered these common items (see Table 5.15). While calculating the mean scores for *PEQ-control and PEQ-experimental*, the means of seventeen items were computed. The mean score of experimental groups is 3.77. Similarly the mean score of control groups is 3.60. Secondly independent sample t-test was used to compare the scores of two control and two experimental groups regarding the items. The hypothesis was tested on the basis of the results.

Table 5.16. Independent sample t-test for Program Evaluation Questionnaire.

	Levene's Test for Equality of Variances		t-test for equality of means				
	F	Sig.	T	df	Sig.(2-tailed)	Mean Difference	Std. Error Difference
PEQ	0.177	0.675	1.076	61	0.286	0.17058	0.15852

The result of Levene's test for equality of variances is given in Table 5.16. The data has homogeneity of variances because significance value is 0.675 that is greater than 0.05. According to the results of t-test for equality of means, there is no statistically significant value between means of control and experimental groups, p= 0.286 > 0.05. The last hypothesis of the research was not supported.

Frequency distribution was calculated for the last four items of the *PEQ-experimental* which were only applied to experimental groups (n=33) in order to have an idea about students' evaluations regarding some properties of the *Rv-BDATP*. Results of the additional four items of *PEQ-experimental* were summarized in the following paragraphs and tables.

Item – 18: "It was useful to be informed about the earthquakes in the class before the trip."

Table 5.17. Frequency distribution for item-18.

Item 18	A "Yes, very true"	B "Yes, quite true"	C "I don't know for sure"	D "No, not very true"	E "No, not true at all"
Frequency	4	14	10	2	3
Percent	12%	42%	30%	6%	10%

The results of the item-18 indicates that most of the students (almost 54%), stated that getting information about earthquakes before the trip was helpful. Besides, about 30% of the students could not decide about usefulness of the informing which is given before the trip. On the other hand three students among 33 students stated that the getting information about earthquakes before the trip was not helpful.

Item – 19: "Setting objectives regarding the trip before we go increased my motivation for the trip."

Table 5.18. Frequency distribution for item-19.

Item 19	A "Yes, true"	B "Yes, quite true"	C "I don't know for sure"	D "No, not very true"	E "No, not true at all"
Frequency	5	13	8	2	5
Percent	15%	39%	24%	7%	15%

According to the answers given to the nineteenth item, most of the students (54%) stated that before the trip, identifying purposes about the trip increased their motivation for attending the trip. On the other hand, identifying aims for the trip did not affect the willingness of the 15% of the students. Similar to the seventeenth item about 24% of the students did not decide about the effect of setting aims for the trip on their motivation for the trip.

Item – 20: "The questions that I prepared before the trip increased my attention to the topic taught in the trip."

Table 5.19. Frequency distribution for item-20.

Item 20	A "Yes, very true"	B "Yes, quite true"	C "I don't know for sure"	D "No, not very true"	E "No, not true at all"
Frequency	7	9	7	2	8
Percent	21%	27%	21%	7%	24%

The frequency distribution of the answers given to the twentieth item indicates that 48% of students declared that the questions that I prepared before the trip increased my attention to topic mentioned in trip. About 21% of the students did not identify usefulness of the student prepared questions in terms of their effect on students' attention to the topic. On the other hand about 24% of the students thought that the student prepared questions had not any effect on their attention.

Item – 21: "It was useful to make posters in the class after the trip."

Table 5.20. Frequency distribution for item-21.

Item 21	A "Yes, very true"	B "Yes, quite true"	C "I don't know for sure"	D "No, not very true"	E "No, not true at all"
Frequency	9	11	5	3	5
Percent	27%	33%	15%	10%	15%

Table 5.20 includes the results regarding the last item of the *PEQ-experimental*. It was founded that about 60% of the students thought that making posters in the classroom after the trip was useful. This item had the highest favored item among the four items while about 15% of the students declared that the poster work had no usefulness. Besides, 15% of the students were unsettled about the usefulness of the poster work.

In conclusion, frequencies of the answers given to each four item of the *PEQ-experimental* indicated that large proportions of the experimental group students had favorable opinions about their own learning related to the revised version of the Basic Disaster Awareness Training Program. The percentages of the answers marked as “Evet, çok uygun” (Yes, very true) and “Evet, oldukça uygun” (Yes, quite true) are more than the percentages of answers marked as “Hayır, pek uygun değil” (No, not very true) and “Hayır, hiç uygun değil” (No, not true at all) in these four items.

5.2. Analysis of Open-ended Questions

The both *PEQ-experimental* and *PEQ-control* consisted of two parts. Part 2 includes two open ended questions. All students’ responses to the questions were evaluated and categorized in order to understand their ideas regarding improvement of both former and revised versions of the program and school trips.

The first question is: What are your suggestions to make the Earthquake Park Trip more informative and entertaining? The following paragraphs include students’ common answers regarding the question. First of all, all common answers to the questions were listed. Similar answers were classified twice by researcher. The translation of the students’ answers used for classification was checked by a researcher doing her MA in a different field with a Translation and Interpreting Studies BA. As a result, the most frequent answers were gathered in five groups. PEQ were applied to 69 students about three weeks after the trip. 17 of the 60 students did not answer the first question. Nine of them did not attend the program therefore they did not answer the first question. On the other hand the other eight students did not respond to this question although they participated into programs. 12 of the 52 students who gave answers stated that everything was very good and that there was no need to change anything. 13 of 40 students who made various suggestions stated that there should be more practical activities. Examples for the original sentences of the students to give suggestions are “Daha çok aktivite olabilirdi (There could be more activities)”; “Daha fazla deney ya da simülasyon yapılabilir (More experiments and simulations could be conducted)”; “Depremle ilgili bazı deneyler eklenebilir (Some experiments about earthquakes could be added.)" These 13 students used the words, activity, and experiment to make these suggestions.

The part which was suggested to be changed by students was the earthquake simulation table activity. 20 students suggested that the earthquake table should be tried by either more students or everyone and this activity should be longer. Regarding the first part of the trip that is the presentation part, 11 students stated that the subject could be explained in a more detailed way or more videos could be added. Contrary to this two students suggested that the presentation and the videos should be shorter. On the other hand four students wrote that the presentation could be funnier, more interesting and more effective. In addition two students suggested that the groups should have fewer people.

The second question of the instrument was asked to understand the general attitudes of students towards school trips and what kinds of places they were curious about. The question is: Which places would you like to go in a school trip other than the Earthquake Park? Explain why. The answers to this question can give information about what kind of a learning environment the students see their out of school experiences.

Nine of the students who took the questionnaire left the questions empty. The rest 60 students suggested various trip destinations. These suggestions include important cities in Turkey and abroad, museums, science centers, zoos and so on. In making their suggestion, most of the students mentioned places of science, history, culture and art. Funfairs were suggested only by four students and shopping centers by two as they are entertaining and good for stress. In addition, three different students stated that school trips are very informative and they contribute the school content. They suggested that school trips should be organized to many more places regarding different topics. The majority of the suggestions were about various museums and science centers.

25 of 60 students suggested that trips to various museums and science centers. Three students suggested archeology museums while one student suggested going to a museum about fossils. Besides, one student suggested a trip about Genom project and another one to biology labs. In addition seven students, suggested going to science

museums, centers and places where they can make experiments without giving a specific name. Moreover 5 students especially suggested TUBITAK (The Scientific and Technological Research Council of Turkey) as a trip destination. Some of them suggested visiting the center of TUBITAK in Gebze. Two students suggested having trips to museums about electronics. Similarly two students suggested science-fiction museums. One of them, suggested Seattle Science-Fiction Museum. Apart from these, Şişli Science Center, İTÜ Science Fair, Body Worlds, Santralistanbul, Pelit Chocolate Factory were mentioned by students as a potential trip destination.

14 of the students who took the questionnaire suggested going to the zoos as a school trip. The reason for this suggestion is that they are curious about various animals, they want to understand their lives and also zoos are fun. In addition, a student suggested having school trips to explore the lives of polar bears in the North Pole and to see wild animals in Africa. Similarly, two students wanted to go to forest and one of them especially suggested rain forest to explore the wild life. In parallel with forest trips, two students suggested to go to botanic gardens. One of them suggested botanic gardens by giving the reason that they are relevant to many topics that they learn this year. Six students suggested aquariums to visit generally to get informed about the lives of the fish.

Apart from the suggestions about science learning environments, the students suggested to visit many places in Turkey or abroad to see historical and cultural places. One of the most frequently mentioned places was Çanakkale. Seven students suggested to visit Çanakkale for the reasons to see historical places and war remnants. One of the students made a general suggestion to visit historical places in other cities. Hatay-Antakya, Kapadokya were also suggested by two students. One of them explained the reasons for this suggestion as to know the customs and traditions of different regions in our country. Four students suggested an İstanbul tour and another student especially wanted to visit Minia Turk. Six students, on the other hand, suggested trips to abroad. The places mentioned were Australia, Las Vegas, Siberia, London, Paris and Seattle. These places were suggested mostly because of they were beautiful places. However three students gave the reasons of the cultural development and knowing different cultures.

Art and sports centers were also suggested as trip destinations in Turkey. Four students suggested visiting current exhibitions and art galleries. İstanbul Museum of Modern Art was mentioned as one of those places. Three students suggested to go to stadiums, football trips, and matches for the reason that they are fun an useful as a sportive activity. Besides, three students wanted to visit Boğaziçi University and some popular high schools to learn about them.

In conclusion, it has been understood that students regard school trips as informative activities rather than seeing them only as an opportunity to have fun. These suggestions and their implications shall be discussed in the following parts.

6. DISCUSSION AND CONCLUSION

This study had two main objectives. The first one was to develop *the Revised Version of Basic Disaster Awareness Training Program (Rv-BDATP)* in order to increase students' learning outcomes related to nature of earthquakes and actions to be taken before, during and after the earthquake to minimize its possible damage. The *Rv-BDATP* was developed by taking into consideration the opinions of the DPEU experts and the suggestions/ warnings in the literature. In addition, carrying out a pilot study contributed to the development of the program and instruments to be used in this study.

The second objective of this study was to evaluate the effectiveness of the *Rv-BDATP*. The effects of the program were explored by comparing the learning outcomes of the 8^{th} grade students who attended the *Rv-BDATP* with the ones who participated in the former version of the program. Learning outcomes of the students were measured by three instruments *CUQ-Earthquake*, *PEQ-control and PEQ-experimental*. The instruments deals with students' conceptual understandings of identified concepts related to the "natural processes" unit of 8^{th} grade science and technology curriculum and their abilities to differentiate between dangers and precautions related to earthquake. They are also concerned with students' personal declarations and ideas about their learning experiences regarding the programs. During the research both quantitative and qualitative data obtained from 8^{th} grade students of a private school were analyzed. The effectiveness of the *Rv-BDATP* was tested by an experimental research design which is derived from the Solomon four group research design with pre-test, post-test, retention test applications. There were two experimental and two control groups. Before attending the program Experimental 1 and Control 1 groups took the *CUQ-Earthquake* test as a pretest. Then, experimental groups attended Earthquake Park trip with the activities included in *Rv-BDATP* and similarly control groups attended the trip. Three weeks later, all groups took the *CUQ-Earthquake* test a posttest. After taking this test, they answered the questions in program evaluation questionnaires (PEQ-control and PEQ-experimental). Approximately 5 weeks after the post-test application, the groups retook the *CUQ-Earthquake* test as a retention test.

This study aimed to examine whether there was any statistically significant difference between the learning outcomes of the students who took the *Rv-BDATP* and the ones who took *BDATP*. The data gathered from the pre, post, and retention test application of *CUQ-Earthquake* test were used to learn if there were any significant differences between the conceptual understanding levels of the students about earthquakes. In addition, *PEQ-control* and *PEQ-experimental* test results were analyzed to see if there was any difference among the students in terms of their personal declaration and ideas about their learning experiences regarding the programs.

According to the analysis of *CUQ-Earthquake* results, there was no significant difference between the students in the control group who took *BDATP* and the students who took *Rv-BDATP* in terms of conceptual understanding levels and abilities to differentiate danger and precaution about earthquakes. These results did not support the first, second and fourth hypotheses of the study.

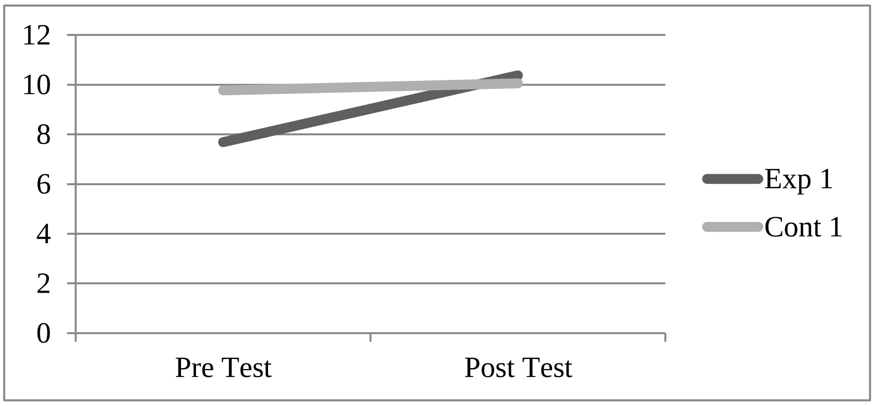


Figure 6.1. The Comparison of pre-test and post-test scores of the Control 1 and Experimental 1 regarding first part of the *CUQ-Earthquake.*

Although there was no significant difference between scores of the experimental and control groups after the treatments, Figure 6.1 shows that both Experimental 1 and Control 1 groups made improvement after the treatments. According to independent sample t-test results of pre-test scores which were mentioned before, in the beginning of this study, there was a significant difference between the conceptual knowledge levels of the groups measured by the first part of the *CUQ-Earthquake.* The Experimental 1 was the disadvantaged group. However, the Experimental 1 which was disadvantaged in terms of pre knowledge kept up with the Control 1 after attending the program. Paired sample t-test was used to test the differences between pretest and post test scores of both the Control 1 and Experimental 1 groups. The mean score of Experimental 1 taken from the first part of the pretest was (M=7.69) after the treatment, in the post test the mean score increased to (M=10.38) which can be followed in the first row of the Table 6.1.

Table 6.1. Descriptive statistics of Control 1 and Experimental 1 groups' scores regarding the Part 1 of *CUQ-Earthquake* taken from pre and post applications.

Part 1		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	E1Pretest	7.6875	16	3.40037	0.85009
	E1 Posttest	10.3750	16	2.89540	0.72385
Pair 2	C1 Pretest	9.7778	18	1.98689	0.46831
	C1 Posttest	10.0556	18	3.40367	0.80225

Results of the paired sample t-test were given in Table 6.2. showed that the increase in students' achievement is significant ($t(15)=-4.354$, $p=0.001 < 0.05$). This clearly indicates the positive effect of the *Rv-BDATP*. Attending the *Rv-BDATP* contributed significantly to the learning outcomes of the students in the disadvantaged group. This result obviously indicates that the *Rv-BDATP* facilitated students' learning outcomes from a non-formal science learning setting (Earthquake Park Trip).

Table 6.2. Results of paired sample t-test (Part 1 of *CUQ-earthquake*).

Part 1		Paired Differences					
		Mean	Std. Deviation	Std. Error Mean	t	df	Sig. (2-tailed)
Pair 1	E1 Pre – Post test	-2.68750	2.46897	0.61724	-4.354	15	0.001
Pair 2	C1 Pre – Post test	-0.27778	4.11319	0.96949	-0.287	17	0.778

On the other hand although there was increase in post test scores of the Control 1 group, paired sample t-test results in Table 6.2 showed that statistically there was no significant difference between pretest scores (M=9.78) and posttest scores (M=10.06) of the students in Control 1 group ($t(17)= -0.287$, $p= 0.778 > 0.05$).

Table 6.3. Descriptive statistics of Control 1 and Experimental 1 groups' scores regarding the Part 2 of *CUQ-Earthquake* taken from pre and post applications.

Part 2		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	E1 Pretest	12.2500	16	3.23522	0.80881
	E1 Posttest	13.1875	16	3.33104	0.83276
Pair 2	C1 Pretest	11.8333	18	3.92953	0.92620
	C1 Posttest	11.9444	18	3.73335	0.87996

In addition to the increase in post test scores which were taken from the first part of the *CUQ-Earthquake*, both Control 1 and Experimental 1 groups had higher scores compared to their pretest scores regarding the second part of the *CUQ-Earthquake*. The pretest mean score of Experimental 1 group was (M=12.25), while its post-test mean score after taking the program was (M=13.19). Similarly, the mean score of Control 1 group in the second part of the pretest was (M=11.83). The mean score of Control 1 group made a little shift in the posttest, it was calculated to be (M=11.94). It was observed that Experimental 1 groups had higher number of increase compared to Control 1 group (see Table 6.3).

Table 6.4.Results of paired sample t-test (the Part 2 of *CUQ-earthquake*).

Part 2		Paired Differences					
		Mean	Std. Deviation	Std. Error Mean	t	df	Sig. (2-tailed)
Pair 1	E1 Pre – Post-test	-0.93750	2.64496	0.66124	-1.418	15	0.177
Pair 2	C1 Pre – Post-test	-0.11111	5.41120	1.27543	-0.087	17	0.932

For both Experimental 1 and Control 1 groups, paired sample t-test was done to determine whether the difference between the means of pretest and posttest scores was significant or not. Table 6.4 shows that there was no significant difference between pretest and posttest scores of the students who attended the *Rv-BDAP* t(15)= -1.418, p=0.177 > 0.05). Similarly, there was also no significant difference between pretest and post test scores of the students who attended the *BDATP* (t(17)= -0.087, p= 0.932 > 0.05).

There were increases in the mean scores of both groups but the increases in their scores were not statistically significant. These results were not surprising when we looked at the literature. In the literature it is stated that the pre-knowledge level of students is a significant factor which affects the learning process of the students in non-formal or informal settings and how they benefit from these settings. The groups which have higher levels of pre-knowledge benefit less from these setting than the groups with low pre-knowledge levels (Falk and Adelman, 2003). The sample group in this study had a high pre-test mean score. The students answered most of the questions correctly. Considering this, it could be hard to significantly increase the mean score of a group which had above average knowledge about the subject with a one hour trip and an activity of two class hours. Apart from these, these results goes parallel with the results of Tekkumru Kısa's study (2008), there was no significant differences between pretest and posttest scores of the students who conducted a visit to science center in Istanbul with a science learning kit which was designed to facilitate learning outcomes from the center. The researcher mentioned about the factors which affect the students' performances such as the motivation and attention of students, teachers; problems regarding practice of the science learning kit. Similar factors might affect the result of this research.

It is highly recommended in the *Rv-BDATP* that the trip should be made in accordance with the school curriculum. However, during the research, the trip could not be done in the week when natural process unit was covered at the school because of time limitations. The trip was carried out in association with the earthquake week which was the first week in March. By doing this, the content of the science and technology lesson was integrated with the trip and earthquake week. The students were reminded that the trip was significant because the last unit of the curricula would be related to the content of the trip. This highlighted the importance of the trip in terms of the school curriculum. However, this association might have been weak to create the recommended association in a detailed way.

The 8th grade students of the sample group were from four different classes of the same school. Control 1 and Experimental 2 were taught by the same teacher and Control 2 and Experimental 1 had another science teacher. The announcement about the trip was made to all the classes by the researcher in order to control the difference which could be caused by these teachers. In addition, the pre-trip and follow-up activities in the revised program were also carried out by the researcher. Science and technology course teachers took part in these activities but they did not actively participate. Due to the conflicts in the weekly programs, the students attended the trip for the science and technology course under the guidance of mathematics, English and social science teachers. The researcher accompanied the groups as a school teacher throughout the trip. However, the fact that the main teachers of science and technology lesson did not attend the trip might have affected the motivation of the students. The students might have been deprived of the instruction and guidance of their main teachers. Besides, the absence of science teachers might have caused the students to see the content of the trip as unimportant.

In addition to these factors, as the students were preparing for high school entrance exams, they were either taking private lessons or attending private courses. Therefore, they might have obtained information about earthquakes from different sources before post and retention tests. This situation might have affected the result of the study. In the demographical information part of *CUQ-Earthquake* test, the students were asked to give detailed information about these sources regarding earthquakes. Especially in the post test and retention test applications, the students were reminded to mention if they had covered the earthquake science topic in private courses or lessons. Only three students mentioned that they had covered this topic in the private courses. The papers of these students were not included in the study. Some student might have not mentioned about their private courses although they have learned about earthquakes. There were limited number of students therefore the post and retention test scores of the students who took private course might affect the results of this study. In this respect, the effect of extraneous variables in the experimental work on the study should be taken into account.

Apart from all the other factors, before the students took the post-test after the trip, the Tohoku earthquake happened in Japan which affected the entire world. For days media channels talked about the earthquake, tsunamis, and effects of them and also formation of earthquakes. This study focused on the effects of non-formal settings which are out-of school environments on the learning process of an individual. At this point, it can be said that everything the students heard, read and saw about the earthquake in Japan affected their ideas and knowledge about the earthquakes. At this point, all talks among friends, family members and printed and visual news about earthquake might have affected the learning process of the students. It was assumed that each student in this study was affected equally by the media but the ways of this influence can vary. The effect of media on learning is stated in the literature. For instance, UNESCO included mass-media in their definitions of informal setting. As Chen (1994), suggests that media can help viewers have broader visions about science and it can arise the interest of people in science. That is why the knowledge and motivation of the students in the sample group could have been shaped by the media coverage about the Tohoku earthquake in Japan.

Additional Analysis and Discussion about the results of Program Evaluation Questionnaire: In addition to testing conceptual understanding levels of the students', the study also aimed to examine the personal declaration of the 8th grade students who attended the former and revised version of the programs. The results gathered from the *PEQ-control and PEQ-expe*rimental were examined. This instrument consisted of two parts. The first part included Likert type items which were asked to gain information about the ideas and impressions of the students regarding the Earthquake Park trip.

This part of the instrument was arranged in two versions. The first version called as *PEQ-control* included seventeen items related to the Earthquake Park trip and the second version named as *PEQ-expe*rimental consisted of twenty one items with four items added. These additional items were related to the activities before and after the trip. That is why the first version was given to the control groups and the second versions were given to the experimental groups. Both control and experimental group students answered the first 17 Likert items in the first part of the scale. The results of this part of the questionnaire were analyzed to answer the 4th question of this study. The 4th question was: "Is there any difference between 8th grade students who attended revised version of Basic Disaster Awareness Training Program and those students who attended the Basic Disaster Awareness Training Program in terms of their personal declarations and ideas about their own learning experiences regarding the program?" According to independent sample t-test results, there was no significant difference between the *PEQ-control* and *PEQ-experimental* scores of the groups who attended the revised version and former version of the program. The mean score of the experimental group was 3.77 out of 5 while the mean score of the control group was 3.60. Both groups made positive comments about the programs shown by high main scores. The groups went through a similar experience in the during-trip activities, therefore there is no significant difference between groups both control and experimental groups got high scores from the program evaluation questionnaires. Another point that can be concluded from these results is that the students thought the content of during trip activities was helpful and they liked it in many aspects.

The second part of the both *PEQ-control* and *PEQ-experimental* included two open-ended questions. The first one was: “What are your suggestions to make the Earthquake Park Trip more informative and entertaining?” When the students’ suggestions about improvement of Earthquake Part Trip were analyzed, it was seen that the results complied with the literature. In the literature one of the most significant features of the out-of school settings as informal and non-formal is to provide people with experiences which they cannot have in their daily lives or at schools (Griffin, 1998; Falk and Adleman, 2003). At this point the curiosity and enthusiasm of the students about the earthquake simulation table and also their suggestions for more activities, experiments and simulations go parallel with the literature. Moreover the demands of the students for more practical activities come from their demand to gain firsthand experience as active learners. This parallel with many works in the literature (Hein 1991; Griffin, 1998; Falk, 2001; Rennie *et al*., 2003; 2008). One of the most highlighted points during the development of the revised program was to make students more active. During the work of program development, it was suggested that the simulation table should be used by more students. However, this suggestion could not followed by DPEU due to the ergonomic structure of the simulation table, time limitations and the risk of damage of the table. In order to make the presentation more attractive and entertaining, it will be suggested that two very short videos with celebrities should be added to the presentation. In addition, instead of the images from 2005 Kobe earthquake images from 2011 Tohoku earthquake in Japan earthquake which is more recent and popular are planned to be added. This can make the presentation more attractive. The results showed that the activities of the program are as important as the informative content of the program. To give importance to both activities and the content was one of the priorities of the researcher and DPEU experts, as well.

The second open-ended question was: Which places would you like to go in a school trip other than the Earthquake Park? Explain why. When students' answers about school trips were analyzed, it became obvious that students not only saw school trips as fun but also as an opportunity to learn about many subjects that they are curious about. Many students made suggestions depending on their interests and curiosity. The fact that students made so many and diverse suggestions about school trips can be resulting from that the sample school organizes school trips very often. The sample school was a private school and the students were taken to school trips to many places within many lessons at K-12 level. Among these places, there were factories, museums, centers, camps, cultural and natural places. It was recognized that these trips have created a positive image in the minds of students about school trips as non-formal or informal learning environments. The suggestions of the students were parallel with the literature. The biggest motivation for the students about school trips was that they could see, do and touch things which were not possible at school and they could have fun doing these (Griffin 1998; Hein 1991; Bell et all, 2009). It is clear that they thought visiting places relevant to school subjects was useful. Students offered trip places regarding the topic that they learnt about in the school such as science centers, botanic gardens, places of technology, biology and Çanakkale. Most of these places were related to the content of 8th grade social sciences and science and technology courses. At this point, it can be said that the results supported the argument that the combination of formal, non-formal or informal settings contribute to the learning process of students (Hofstein and Rosenfeld, 1996; Bell *et al*., 2009; Condon, 2010).

Independent sample t-test, one-way ANOVA and ANCOVA analysis were made on the data gathered from *CUQ-Earthquake* test carried out as pre, post and retention test to find answers to the main research questions. In addition, item analyses were conducted according to the pre, post and retention test data. Item analyses were useful in examining the answers to each question and analyzing the learning process in a detailed way. For each question, proportional correct, biserial and pointbiserial correlational values were calculated depending on the item analysis results. The questions which had proportional correct value below 0.500 according to the data from analysis results were examined. The questions number 4, 6, 8, 9, 12 and 14 in the first part of the *CUQ-Earthquake* were the questions which got the lowest rate of correct answer by students (See Appendix A). More than 50% of the sample students gave wrong answers to these questions.

The question which had the lowest rate of correct answer among these questions was Question 8. The items of the question 8 were:

I: The intensity of an Earthquake is calculated by a seismograph

II: Bigger earthquakes have higher intensity.

In fact only the second item of this question is correct which is represented by option B. However, according to the pretest and post test results, it is seen that more than 90% of the students thought both items were correct and they chose option A.

Correspondingly Questions 9 and 12 are about the magnitude and intensity of an earthquake. More than 60% of the students interestingly thought that these statements were wrong. The items in which students made mistakes are:

Question 9

I: The intensity of an earthquake is expressed by Roman numerals.

II: The intensity of an earthquake is determined depending on its effects on surroundings.

Question 12

I: The intensity of an earthquake is determined depends on the nature of the region.

The concepts of earthquake magnitude and earthquake intensity are confused by students. This fact is stated by DPEU sources, experts, pilot study results and literature. Throughout the work of program development, the characteristics of these concepts and the differences between them were tired to be identified and expressed in the shortest and clearest way possible. However it is observed that most of the students still have these misconceptions even after attend the former or revised versions of the program. This can be associated with two reasons. First of all, these concepts are used interchangeable in everyday life by many people and the mass media. Besides, the concepts of magnitude and intensity have many other connotations in Turkish. The students could have had difficulty in differentiating between the “magnitude” in its everyday life meaning and its terminological usage in earthquake science.

One of the striking results of the studies about misconceptions in the literature is that similar concepts used in both everyday life and terminology can be more confusing. In this respect, this result of the study supports the results in the literature. It takes time to correct these misconceptions. It is very difficult for the students to get rid of well-established misconceptions with a short trip program.

Apart from the misconceptions about the magnitude and intensity of earthquakes, students are also mistaken in some basic concepts about earthquake formation. According to the post test results, about 72% of 70 students thought that the item “Plate tectonics occurs after earthquakes” was correct. Besides about 46% of them chose the option “Distribution of the balance on earth is the cause of earthquakes” as correct. About 30% of them said that the statement “Fault lines are in line with meridians” was correct. In addition according to the pre-test results, these items were the ones in which many students were mistaken.

In the review of literature section, there are some studies about similar misconceptions regarding earthquake formation and fault lines. Some of these researches were mentioned in this study (Demirkaya, 2007; Şimşek, 2007; Oğuz, 2005; Ross and Shunell, 1900, 1993). While preparing the *CUQ-Earthquake,* the above mentioned items were written to question the misconceptions standing out in literature and pilot study results. The most striking results of the answers to these items were that earthquake formation and plate tectonics were wrongly associated. Most of the students knew that earthquake formation and plate tectonics were related. However, they evaluated this association incorrectly within a cause and effect relation. One of the main purposes of this study was to raise the scientific literacy level of students. For this purpose, the process of earthquake formation was explained briefly in two basic steps. In the revised program it was suggested that a special emphasis should be put on the cause and effect relations while covering the topic of trip. In this respect, this study has a significant role both in earthquake science education and general science education.

For scientific literacy and effective science education, it is very important that students can build correct connections between concepts. For example, it is a crucial ability to differentiate cause and effect, danger and precaution, means and ends. With respect to this, in the process of program application it was stressed that such associations should be focused on very carefully.

On the other hand, according to the pre-test results only 36% of the students answered the question 3 correctly. The items of Question 3 were:

I: Japanese scientists know where an earthquake will happen a week in advance.

II: Abnormal animal behaviors are one of the reasons for an earthquake.

In addition to abnormal animal behavior there are many misconceptions about the earthquake predictability in the literature (Whitney et *al*., Turner, Nigg and Paz, 1986). One of the common misconceptions is that scientists can predict earthquakes. As Japan and earthquake terms are frequently used together in mass media and daily life, Japanese scientists are associated with earthquakes. Item I was generated with respect to this misconception. According to the pretest results, nearly 37% of the students took the statement that “Japanese scientists know where and earthquake will happen a week in advance” as correct. However; according to the post test results, it was observed that this misconception was corrected in high percentage. During this study, the myth and fact part was re-added in to the Basic Disaster Awareness Training Program. At this point, it was seen that the myth and fact section in the programs was useful for the students. In both pre-trip and during trip activities and presentations, it was stressed that an earthquake is a natural process. Correspondingly, it explained some misconceptions about predictability of earthquakes. As a conclusion it can be said that the program might contribute to the scientific literacy of individuals.

In addition to these results, the posters made as a part of the follow-up activities were examined to understand the learning outcomes of the experimental group students. The posters were not graded however they were analyzed in terms of content (See Appendix K). This analysis showed that the students expressed the actions to be taken before, during and after an earthquake and formation of an earthquake with appropriate terms. The questions asked by the students included:

- What is the average number of earthquakes that happens in our country in a day and in a year?
- What is the biggest earthquake that happened in our country?
- What is the most frequent type of earthquakes?
- Can we know the location and magnitude of the earthquakes in advance?
- How long does it take for the rescue teams to arrive at the earthquake scene for the first intervention?
- Does an earthquake happen out of a fault line?
- What should I do during an earthquake if I am in a car?

These questions showed that the students are generally curious about statistical facts about earthquakes. In addition, the predictability of an earthquake draws the attention of the students. In the literature, there are some misconceptions about that predictability issue however the students were able to answer the question about predictability in a correct way with suitable terms. They also gave correct answers to the other questions. This shows that students could find the answers to various questions in the program. The topics that the students were curious about can be included in the program for future applications.

6.1. Limitations

Earthquake Park trip can be regarded as a field trip organized to a non-formal learning environment. When factors that affect the learning process of the students in non-formal, informal settings and school trips were analyzed, it was seen that the study had limitations in some aspects. On the other hand, the study was conducted in accordance with the Solomon Four Group design but the sample group could not be selected randomly. In this part the limitations of this study will be discussed in different aspects.

First of all, the sample group consisted of 8th grade students from a private school. The sample was chosen with the convenience sampling method. The numbers of sample students was not high moreover the sample school had special applications regarding the earthquakes and disaster preparation process, therefore the sample of this study is limited and its generalizability is low. Apart from this, 4 groups chosen as the sample were grouped as into Experimental 1, 2 and Control 1, 2 conveniently according to the lesson program of the researcher and the science and technology teachers of the sample group. Normally it is suggested that sampling and grouping should be done randomly and higher number of sample should attend the research in Solomon four group design. Solomon four group design provides advantages to explore the effects of pretest and treatments clearly on the other hand it might cause some limitations. At the beginning of the study the sample groups were chosen from the same school and science and technology course teachers said that the four classes were similar to each other in terms of their background and achievement in science. Therefore it was assumed that there were no significant differences between the classes of sample groups in terms of their prior knowledge. According to this research design only Control 1 and Experimental 1 groups took the pre-test among four sample groups therefore only the pretest means of these groups were compared statistically to examine their similarity in terms of prior knowledge about earthquakes. It was found that the two groups was significantly different from each other in terms of their scores taken from first part of the *CUQ-Earthquake* which measures conceptual knowledge about earthquakes although there was no significant difference between the two groups in terms of the second part and total scores of the test. These results showed that sample groups might be different before the treatments. In this study we could not check prior knowledge levels of Experimental 2 and Control 2 groups, and examine pretest mean scores of the four sample groups. This application limits the study in terms of checking similarity of sample groups before the treatment. However for statistical analysis it was assumed that the groups were similar before the treatments and the scores of all groups regarding the post measurements were compared. There might be significant differences among sample groups in terms of their prior knowledge and these differences might affect students' learning outcomes and their scores on post measurements.

Generally, unlike the other schools in Turkey, in the sample school, students get extra information about earthquakes and actions should be taken before during and after an earthquake which were the research topics of this study. In addition to K-12 curriculum, in the sample school the actions that should be taken during an earthquake are practiced with class teachers at the beginning of every academic year and at least two earthquake practices are made at school every year. Moreover, the school pays attention to preparations for possible earthquakes. Many closets and panels are fixed. Chemical material is kept in special cupboards under suitable conditions. The pre-test results of children also showed that they had good knowledge about earthquakes. This fact limits the study in terms of the pre-knowledge levels of the sample group and lowers the generalizability of the results.

In the literature the following points are highlighted. The content of the trip should be associated with the content of the curriculum taught at school (Orion, 1993; Anderson *et al.,* 2000; Anderson and Zhang, 2003; Bozdoğan, 2008). Due to the time limitations, the study was conducted when students in the sample group were learning another topic in science and technology lesson. The earthquake park trip was organized in association with earthquake week to be related with the curriculum. The association between trip and the natural process unit in later weeks was especially emphasized. However, this association does not fully comply with the association mentioned in the literature and suggested in the revised program. In this way, this study is limited.

In addition to these, the fact that all the activities before, during and after the trip were carried out by the researcher instead of the science and technology teachers limited the study. To generate equality between groups, both groups were taken care of by the researcher. However in the revised program it is recommended that the activities should be carried out by the teachers who organize them. In this respect, the study is limited. In the literature it is stressed that the opinions of the teachers about school trips and their background about how to use informal science learning settings to improve the learning process of the students affect the learning process of the students (Tran, 2004; Bozdoğan and Yalçın, 2009; Kisiel, 2005). In addition, teachers should see the informal science setting before the trip and learn details about the program to benefit from all services (Jarvis and Pell, 2005; Bozdoğan, 2008). However, science and technology teachers could not attend the trip due to the conflict in their schedule. The students were accompanied by the researcher, math teacher, social sciences teachers and English teachers. Apart from the researcher, none of these teachers had detailed information about the program. The researcher attended the Earthquake Park trip of both control and experimental groups as an observer and as a teacher who helped to maintain the order of the trip. She did not intervene the trip in any way. All the teachers who attended the trip guided the students about the order of the trip. None of the teachers guided the students to associate the content of the trip with the topic of science and technology lesson. In addition, the students were not reminded about the questions that they had prepared to ask the experts by the guiding teachers. Therefore, the students were deprived of the association, motivation, attention that their science and technology teachers would have provided. This situation might have negative effects on the learning process of the students considering the literature. The study has limitations in this aspect. *The Revised Version of the Basic Disaster Awareness Training Program* could not be realized as suggested.

The retention test was conducted approximately 5 weeks after the posttest while this period should normally be longer and this may be accepted as a limitation. The reason why this period got shorter was that the sample group students were 8th grade students and they usually did not attend classes in the last weeks of the school year due to their preparation for high school entrance exams. Besides many students were attending private courses and these courses covered the natural processes unit earlier than school. To avoid the possible effect of private courses and lessons, the retention test was given to the students a short time after the post test. In addition to these, the retention application was made after all science and technology course exams were over. Although the retention test was applied at the beginning of May, most of the students were absent due to their preparation for high school entrance exams. It took about 2 weeks to reach most of the students in the sample group. In addition, some of the students were unwilling to answer the questions once more as a retention test as they had already answered them as a post-test before. As they immediately recognize the questions of the test, their motivation was low. In this respect, the study results might be affected.

6.2. Recommendations for Further Research and Implications

The results of this study show that the revised version of the program was more effective than the former version of it. However, the validity of these results would increase if the program was conducted on diverse and more crowded sample groups in a more proper way and therefore, more comprehensive feedbacks could be obtained regarding the development of the program. Moreover, the program developed in this study can be applied by many institutions to different groups as it is not costly or time-consuming. Therefore, data on this field can grow cumulatively by yielding more precise results. In addition to its practicality and accessibility, the program provides students with information and awareness about such a crucial concept as earthquake. It also enables students to make connections between school content and real life which leads to scientific literacy.

Furthermore, when the idea of this research first came up, it was suggested that 3 different program contents could be developed for the sample groups. However, in time the program was developed only for 8th grade students for various reasons. The 7th grade science and technology curriculum is the same as the curriculum of the 8th grade science and technology lesson except for the natural processes unit. In the course of program development, the necessary pre-information was given to the students through pre-trip activities. The objectives of the trip program were related to the natural processes unit however the program can be applied independently of this unit. In this respect, the program can be used for both 7th and 8th grade students in the lessons which concern with science, technology and earthquakes. In addition earthquakes are covered in geography and physics lessons in the 9th grade. Although it is suggested that students should learn about earthquakes within the natural processes unit in the science and technology curriculum of the 8th grade, due to time limitations and students' preparation for high school entrance exams this unit is mostly skipped. In this respect, the 9th grade students can take the revised version of the program within the geography and physics lessons. Apart from this, the revised version of the program can inspire the development of different programs for younger and older student groups.

In the literature it is highlighted that both institutions and teachers have an important role in the recognition of the importance of the out-of-school learning settings and in using them effectively. In this respect, the teachers guiding booklets developed in the study and the findings of it will set an example for other formal, non-formal and informal institutions and teachers in different fields. With this study, teachers and institutions can get information about the significant points and possible work to enrich the learning settings.

Turkey is an earthquake prone country. Therefore it is very essential that every individual in this country be informed about the nature of the earthquakes and the steps that should be taken before, during and after the earthquakes. At this point, the *CUQ-Earthquake* test developed in this study can be used to measure the conceptual understanding levels of individuals about earthquakes in different studies. In addition, the *PEQ-control* and *PEQ-experimental* developed in this study can be employed for the measurement of different trips with some adjustments.

The teacher guide booklet developed in this study will be submitted to DPEU as a whole. If they find it appropriate, DPEU can present the program on its website regarding Earthquake Park Trip for the access of institutions and teachers. Teachers can carry out different activities benefiting from these guide booklets before and after the trips. These activities can contribute to the effectiveness of Earthquake Park Trip.

Moreover, *PEQ-control*, *PEQ-experimental* and *CUQ-Earthquake* instruments can be accessed online by the students. The students can answer the questions in *CUQ-Earthquake* test before and after the trip. In time, the answers from various schools and different age groups will create a rich database. When these data are analyzed, many results will be reached regarding the effectiveness of the program, what students learn from it, the concepts they have difficulty and misconceptions. In addition, the *PEQ-control* and *PEQ-experimental* filled out after the trip will contribute greatly to the evaluation and improvement of the program.

DPEU is a source in our country for curriculum studies regarding earthquakes. In this respect, the results of this study and results from a larger sample group will contribute to curriculum studies.

The perspectives of teachers, school executives and institution managers about out-of-school learning settings affect the effective usage of these settings. Therefore, various studies can be carried out to reveal the opinions of teachers and teacher candidates about out-of-school learning settings. Besides, a new study can be conducted regarding Earthquake Park Trip to learn the evaluations of the teachers about the program and their suggestions about the trip. A competition can be organized on DPEU website regarding activity and project suggestions and the results of this competition can be shared on the site to set an example.

APPENDIX A: CONCEPTUAL UNDERSTANDING QUESTIONAIRE-EARTHQUAKE (CUQ-Earthquake)

Deprempark Gezisi Değerlendirme Çalışması

A) Kişisel Bilgi Formu: Aşağıdaki sorularda istenen bilgileri yazarak ya da verilen seçeneklerin sağındaki noktalı boşluğa "X" işareti koyarak yanıtlayınız.

Adınız:	Soyadınız:	
Sınıfınız: 6 ……… 7 ………	8 ………	
Bu yıl deprem konusunu hangi derste işlediniz?	Hiç bir derste işlemedik …… Hayat Bilgisi ……… Fen ve Teknoloji ……… Sosyal Bilgiler ……. Diğer (Belirtiniz)…………………………………………	
Daha önce deprem konusunu işlediğiniz sınıflar: *(Birden fazla işaretleyebilirsiniz)*	1 ….. 2 ….. 3 ….. 4 …. 5 ….. 6 ….. 7…..	
Depremler hakkında hangi kaynaklardan bilgi edindiniz? *(Birden fazla işaretleyebilirsiniz)*	Öğretmen ……… Aile ……… Arkadaşlar ……… Kitap …………..... Televizyon….. İnternet ……… Gazete ……… Dergi ……… Diğer (Belirtiniz) ……………………………………..	
Daha önce deprem yaşadınız mı?	Evet	Hayır...........
Önceki yıllarda Deprempark gezisine katıldınız mı?	Evet	Hayır...........
2 Mart Çarşamba günü yapılan Deprem Park gezisine katıldınız mı?	Evet	Hayır...........

B) Deprem Testi

Bu test 2 farklı kısımdan oluşmaktadır. Lütfen tüm soruları dikkatle cevaplayınız.

1. Kısım

Aşağıda yer alan 1-18 nolu maddelerde bazı bilgi, yorum ya da yargı cümleleri verilmiştir. Her madde I. ve II. olarak işaretlenen iki cümle içermektedir. Her maddedeki cümlelerin doğru olup olmadığını ayrı ayrı değerlendiriniz. Değerlendirmenizin sonuçlarını aşağıdaki seçeneklere göre belirtiniz. Cevabınızı gösteren seçeneği her maddenin yanındaki cevap kısmına yazınız.

A) Her ikisi de doğru B) Sadece I.'si doğru C) Sadece II.'si doğru D) Her ikisi de yanlış

Cevap	No	Bilgi, yorum ya da yargı cümleleri
.....*A*...	*Örnek*	***I. Her yıl ülkemizde çok sayıda deprem olur.*** ***II. Ülkemiz bir deprem ülkesidir.***
....	**1.**	I. Depremin nedenlerinden biri evlerin sağlam yapılmamasıdır. II. Gecekonduların çok olduğu bölge deprem bölgesidir.
....	**2.**	I. Tank, tren gibi ağır taşıtlar geçerken yol kenarlarında deprem oluşur. II. Şiddeti az olan depremleri hissetmeyiz.
....	**3.**	I. Japon bilim adamları depremin nerede olacağını bir hafta öncesinden bilir. II. Anormal hayvan davranışları depremin sebeplerinden biridir.

1. Kısım devam ediyor...

A) Her ikisi de doğru B) Sadece I.'si doğru C) Sadece II.'si doğru D) Her ikisi de yanlış

Cevap	No	Bilgi, yorum ya da yargı cümleleri
....	4.	I. Levhalar arasında biriken enerji aniden açığa çıkar. II. Depremler sonucunda levha hareketleri oluşur.
....	5.	I. Deprem sismometre ile kaydedilir. II. Depremlerin büyüklüğü bölgedeki evlerin yapısına göre değişmez.
....	6.	I. Fay hatları depremle oluşur. II. Fay hatları meridyenler doğrultusundadır.
....	7.	I. Ormanların azalması deprem oluşumunu tetikler. II. Erozyon depremin nedenlerinden biridir.
....	8.	I. Deprem şiddeti, sismograf kayıtları kullanılarak hesaplanır. II. Büyük depremlerin şiddet değerleri daha fazladır.
....	9.	I. Deprem şiddeti romen rakamları (I,II, III,...) ile ifade edilir. II. Depremin şiddeti, çevrede oluşturduğu etkilere bakılarak belirlenir.
....	10.	I. Güneş yerkabuğundaki levhaları çatlatır. II. Deprem levha hareketleri sonucu oluşur.
....	11.	I. Fay hattı arama kurtarma ekiplerinin iletişim hattıdır. II. Deprem anında ilk önce fay hattı aranır.
....	12.	I. Bir depremin şiddet değeri bölgenin yapısına göre değişir. II. Depremin büyüklüğü sismografla ölçülür.
....	13.	I. Yer kabuğu zayıf bölgelerinden aniden kırılır. II. Deprem olurken faylar arasındaki gaz patlar.
....	14.	I. Fay hattı olmayan yerde de deprem hissedilir. II. Ülkemizde aktif fay hatları vardır.
....	15.	I. Dünyanın dengesinin bozulması depremin sebeplerindedir. II. Deprem çoğunlukla geceleri olur.
....	16.	I. Sismometre depremin olacağı yeri gösterir. II. Deprem dalgalar halinde yayılır.
....	17.	I. Levha hareketlerinin çok olduğu bölge deprem bölgesidir. II. Deprem bir çeşit heyelandır.
....	18.	I. Güneşten gelen yüksek ısı depreme sebep olur. II. Dünyamızda sürekli deprem olmaktadır.

<u>2.Kısım:</u> Aşağıda yer alan 19-33 nolu maddelerde bazı bilgi, yorum, yargı ya da davranış cümleleri verilmiştir. Her maddede verilen cümleleri tehlike ya da önlem olarak sınıflandırınız. Cevabınızı gösteren seçeneği her maddenin yanındaki cevap kısmına yazınız.

A) I.'si tehlike, II.'si önlemdir
B) I.'si önlem, II.'si tehlikedir
C) Her ikisi de tehlikedir
D) Her ikisi de önlemdir

Cevap	No	Bilgi, yorum, yargı ya da davranış cümleleri
...*A*..	*Örnek*	***I. Yapısında sorun olan binalar depremde kolaylıkla yıkılır.*** ***II. Depreme dayanıklı binalar inşa edilir.***
....	**19.**	I. Depremden sonra binanın düzenli olarak boşaltılması can ve mal kaybını azaltır. II. Bina çıkış planı ve uygulaması yapılır.
....	**20.**	I. Depremde telefon hatlarının meşgul olması can ve mal kayıplarını arttırabilir. II. Deprem sonrasında telefonlar acil durumlarda kullanılır.
....	**21.**	I. Depremden hemen sonra binada çakmak kullanılmaz. II. Depremde binada doğal gaz kaçakları oluşabilir.
....	**22.**	I. Depremde binada elektrik kaçakları oluşabilir. II. Depremde duvardaki çerçeveler düşebilir.
....	**23.**	I. Deprem çantası sık sık kontrol edilir. II. Depolanan içecek ve yiyecekler zamanla bozulur.
....	**24.**	I. Evden çıkarken telefonlar kontrol edilir. II. Evden çıkarken gaz vanaları kapatılır.
....	**25.**	I. Sarsıntı yüzünden asansör bina duvarları arasına sıkışabilir, bozulabilir. II.Deprem sonrası binadan çıkarken merdivenler kullanılır.
....	**26.**	I. Depremde pencerelerden uzak durulur. II. Depremde çök, kapan, tutun pozisyonu alınır.
....	**27.**	I. Depremde yangın çıkma ihtimali vardır. II. Depremde panik yapma olasılığı yüksektir.
....	**28.**	I. Depremden hemen sonra elektrik düğmelerinden, prizlerden uzak durulur. II. Çerçeveler duvara kancalı vidalar ile asılır.
....	**29.**	I. Depremde kimlik kartı, tapu, banka cüzdan gibi önemli evraklar zarar görebilir. II. Kimlik kartı gibi önemli evrakların bir kopyası deprem çantasına konur.
....	**30.**	I. Eşyalar uygun şekilde sabitlenir. II. Sarsıntı yüzünden eşyalar düşebilir.
....	**31.**	I. Şiddetli deprem sarsıntısı pencere camlarını kırar. II. Depremde telaş ve panik hataya yol açar.
....	**32.**	I. Deprem sırasında balkonlardan uzak durulur. II. Depremde balkonlar kolaylıkla hasar görür.
....	**33.**	I. Sarsıntı yüzünden düşebilir kendimize ve çevremizdekilere zarar verebiliriz. II. Depremde sabitlenmeyen eşyalar bir çok kişiyi yaralayabilir.

Tüm soruları cevaplandırdığınız için teşekkür ederiz ☺
Lütfen cevapsız soru bırakmayınız!

APPENDIX B: PROGRAM EVALUATION QUESTIONNAIRE(PEQ)

Gezi Değerlendirme Çalışması

Sevgili Öğrenciler!
Okul gezilerinizi değerlendirmek ve geliştirmek için bir araştırma yapıyoruz. Bu çalışmada sizlerden "Boğaziçi Üniversitesi Kandillli Rasathanesi ve Deprem Araştırma Enstitüsü'ndeki Deprempark'a yaptığımız geziyi değerlendirmenizi istiyoruz. **Aşağıdaki tüm soruları içtenlikle cevaplandıracağınızı umuyoruz.**

Adınız:................................ Soyadınız: .... Sınıfınız: ....

1.Kısım:

1-21. nolu maddelerde Deprempark gezisiyle ilgili bazı bildirimler vardır. Bu bildirimler sizin izlenimlerinize ne derece uygundur? Aşağıdaki seneçeklere göre her bildirim için ayrı ayrı decelendirme yapınız. Yanıtınızı maddenin en solunda bulunan YANIT kutusuna yazınız.

Derecelendirme:

A) Evet, çok uygun
B) Evet, oldukça uygun
C) Tam olarak karar veremiyorum
D) Hayır, pek uygun değil
E) Hayır, hiç uygun değil

YANIT	No	Bildirim
	1.	Bilmediğim şeyleri keşfettim.
	2.	Bildiklerimle ilgili daha çok şey öğrendim.
	3.	Bir süredir düşünmediğim şeyleri hatırladım.
	4.	Bildiklerimi diğer insanlarla paylaştım.
	5.	Bazı konulara karşı merakım arttı.
	6.	Bazı konuların önemini hatırlamış oldum.
	7.	Hepsi bildiğim şeylerdi.
	8.	Öğrendiğim bazı şeyler benim için çok yararlı olacak.
	9.	Öğrendiklerim ilgi çekiciydi.
	10.	Gezide çeşitli videolar izlemek hoşuma gitti.
	11.	Gezide çeşitli modeller ve deprem simulasyon masasını görmek hoşuma gitti.
	12.	Uzmanların bize çeşitli konularda bilgi vermesi yararlı oldu.
	13.	Gezimiz, okulda işlediğimiz, işleyeceğimiz konuları öğrenmeme yardımcı oldu.
	14.	Gezide kafamdaki soruların cevaplarını buldum.
	15.	Gezideki bazı deneyleri kendim yapmak isterdim.
	16.	Gezide öğrendiklerimi geziden sonra ailemle paylaştım.
	17.	Geziden sonra evde depreme karşı bazı hazırlıklar yaptık.
	18.	Geziden önce sınıfımızda deprem konusunda bilgi edinmek yararlı oldu.
	19.	Geziden önce, geziye yönelik amaçlar belirlemek geziye gitme isteğimi arttırdı.
	20.	Geziden önce hazırladığım sorular gezide anlatılanlara ilgimi arttırdı.
	21.	Geziden sonra sınıfta poster çalışması yapmak yararlı oldu.

2.Kısım: Okul gezilerimizin verimli ve eğlenceli olabilmesi için sizin vereceğiniz öneriler çok değerlidir. Aşağıdaki soruları dikkatle cevaplandırınız.

1. Deprempark gezisinin daha öğretici ve daha eğlenceli olabilmesi için önerileriniz nelerdir?

a) ....

....

b) ....

....

c) ....

....

2. Deprempark dışında nerelere okul gezisi düzenlenmesini istersiniz? Nedenini açıklayınız.

a) ……………………………………………………………………………………………….

……………………………………………………………………………………………..

b) ……………………………………………………………………………………………..

……………………………………………………………………………………………..

c) ……………………………………………………………………………………………….

……………………………………………………………………………………………..

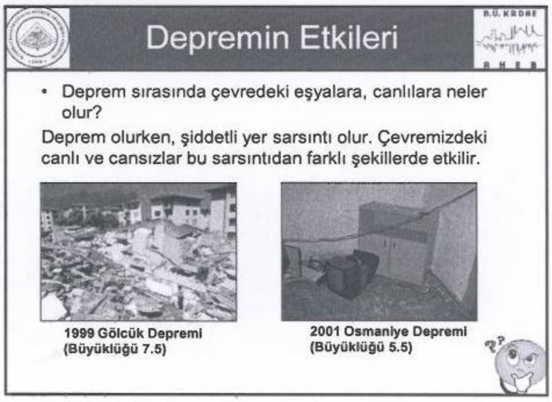
Çalışmamıza katıldığınız için teşekkür ederiz ☺

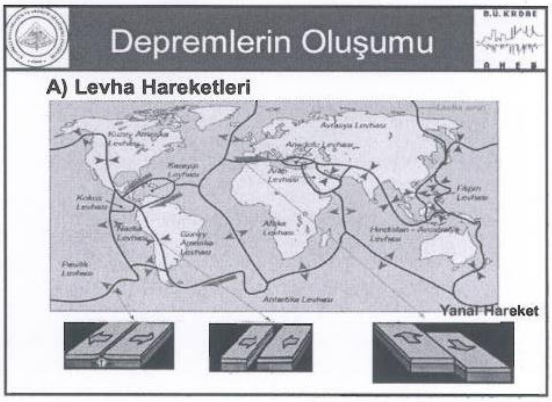
APPENDIX C: THE OBJECTIVES OF THE REVISED VERSION OF THE PROGRAM

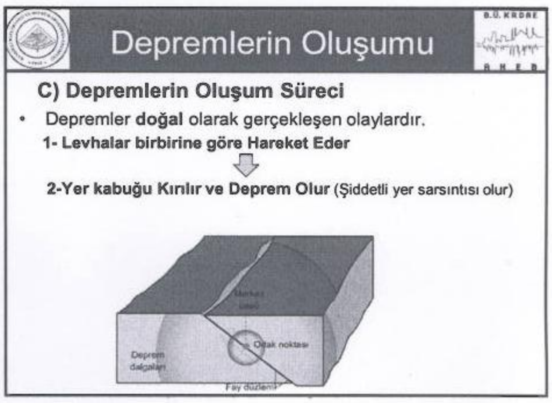
Yeniden Düzenlenmiş Temel Afet Bilinci Eğitimi Programı Kazanımları

Öğrenciler **deprem gerçekliğiyle** ilgili olarak; 1- Dünyadaki ve ülkemizdeki deprem gerçekliğini fark eder.
Öğrenciler **depremlerin oluşum nedenleriyle** ilgili olarak; 2. Depremlerin oluşum sürecini, lehva hareketleriyle ilişkilendir. 3.Ülkemizin üzerinde yer aldığı levhaları, fayları harita üzerinde inceler, fay hattaları ile deprem bölgeleri arasında ilişki kurar.
Öğrenciler **depremle ilgili çalışmalara** ilişkin olarak; 4. B.U. Kandilli Rasathanesi ve Deprem Araştırma Enstitüsü'nün depremle ilgili çalışmaları hakkında fikir sahibi olur. 5. Sismografın çalışma prensibini fark eder ve gerçek bir sismografın nasıl çalıştığını gözlemler. 6. Depremin büyüklüğü ve şiddeti arasındaki farkı ifade eder. 7. Depremlerin nerede ve ne zaman olacağının kesin olarak tahmin edilemeyeceğini belirtir.
Öğrenciler **depreme hazırlık süreci** ile ilgili olarak; 8. Deprem tehlikesine karşı alınabilecek çeşitli önlemleri ve bu önemlerin sağlayacağı yararları fark eder. 9. Yapısal unsurların depreme göre düzenlenmesinin sağlayacağı yararları fark eder. 10. Bireysel olarak yapısal olmayan tehditlerin azaltılması konusunda ev, okul gibi mekanlarda neler yapabileceğini fark eder. 11. Deprem sırasında alacağı en güvenli duruş pozisyonu bilir ve uygular. 12. Deprem sonrasında kendisinin ve çevresindekilerin güvenliği için yapması gereken davranışları bilir.

APPENDIX D: EARTHQUAKE PARK TRIP PREPERATION ACTIVITY- PRESENTATION







Depremlerin Oluşumu

C) Depremlerin Oluşum Süreci

1-Levhalar bir birlerine göre hareket ettikçe aralarında sürtünme olur ve çok miktarda enerji birikir.

2- Biriken bu enerji yer kabuğunun zayıf bölgelerini kırar. Yer kabuğu kırılırken aniden şiddetli bir yer sarsıntısı oluşur. Bu sarsıntıya **deprem denir ve dalgalar halinde çevreye yayılır.**

Sonuç: Depremler doğal olaylardır.

Depremle İlgili Çalışmalar

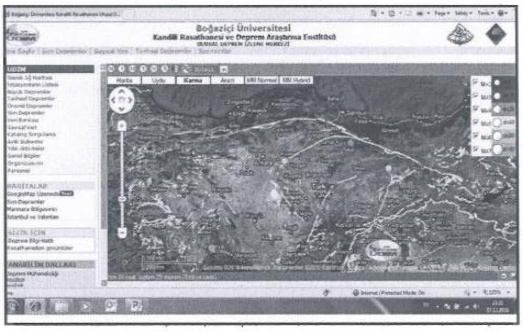
- Ülkemizde depremle ilgili araştırmalar yapan bir üniversite biliyor musunuz?

Boğaziçi Üniversitesi

Kandilli Rasathanesi ve Deprem Araştırma Enstitüsü

Depremle İlgili Çalışmalar

- Sizce bu hafta ülkemizde deprem olmuş mudur?
- Ülkemizdeki son depremleri keşfedelim.



Deprempark Gezisi

- **Gezi Tarihi: 2 Mart Çarşamba**
- **Gezimizin Amaçları:**
- Sizce yapacağımız gezi neden önemlidir?
  - Deprem bilimi ile ilgili yeni bilgiler edinmek
  - Depremler üzerine çalışmalar yapan bilim insanları ile tanışmak
  - Depreme hazırlık süreci hakkında bilgi edinmek
  - ....

Deprempark Gezisi

- **Gezi Çalışmalarımız**

A) Geziden önce yapmamız gerekenler

1- Bu ders yaptığımız çalışmaları tekrar etmek

2- Deprempark'taki uzmanlara sormak üzere bir soru hazırlamak

B) Gezi sırasında yapacaklarımız

Uzmanları çok dikkatli dinlemek, sorularımıza cevap bulmak

C) Gezi sonrasında yapacaklarımız

1- Poster hazırlamak

2- Depremler ilgili bir testi cevaplandırmak

Deprempark Gezisi

Yeni bilgiler ve deneyimler edineceğimiz eğlenceli bir gezi yapacağız ☺

APPENDIX E: EARTHQUAKE PARK TRIP PREPARATION ACTIVITY–STUDENT HANDOUT

Deprempark Gezisi Hazırlık Çalışması

isim: **Sınıf:** **Tarih:**

DEPREMLER

- Depremler ………… olaylardır. Dünyanın bir çok yerinde deprem olur.
- Dünyamızda her yıl ortalama 3.5 milyon deprem olur, ancak insanlar bunların sadece 34 bin tanesini hisseder.
- Çünkü depremler farklı büyüklüklerde olur ve çevreyi farklı etkiler.

DEPREMLERİN OLUŞUMU

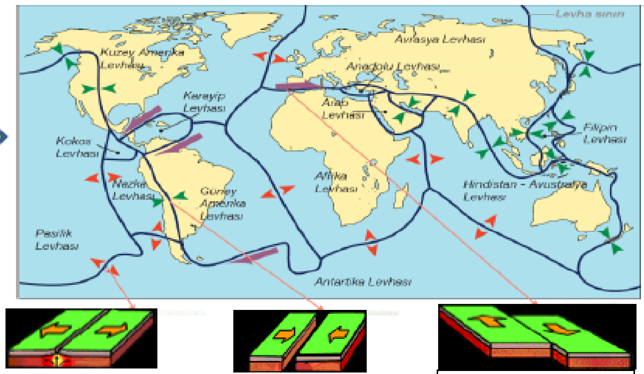
A) Levha Hareketleri ve Deprem

- Yer kabuğu sürekli hareket eden çok büyük ....(parçalardan) oluşur.
- Dünyada en sık olan ve en çok hasar veren depremler ....sonucu oluşur. Bu çeşit depremlere .... depremler denir.

Yer kabuğu yapboz gibidir.

Levhalar ateş küre üzerinde sürekli ve çok yavaş hareket eder.

Yer Kabuğunu Oluşturan Levhalar ve Haketleri



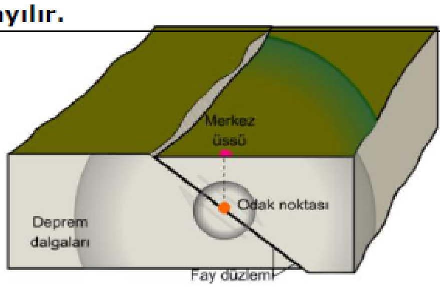
Yanal Hareket

B) Faylar ve Deprem

Fay hatları yerkabuğunun zayıf bölgelerinde deprem sonucu oluşan kırıklardır.

➢ **Depremlerin Oluşum Süreci**

1- Levha Hareket Eder	**2- Yer kabuğu kırılır ve Deprem olur**
1-Levhalar bir birlerine göre hareket ettikçe aralarında .... olur ve çok miktarda .... birikir.	2-Biriken bu enerji yer kabuğunun .... bölgelerini kırar. Yer kabuğu kırılırken .... şiddetli bir yer sarsıntısı oluşur. Bu sarsıntıya **deprem denir ve .... halinde çevreye yayılır.**



➤ **Ülkemizdeki Faylar ve Depremler**

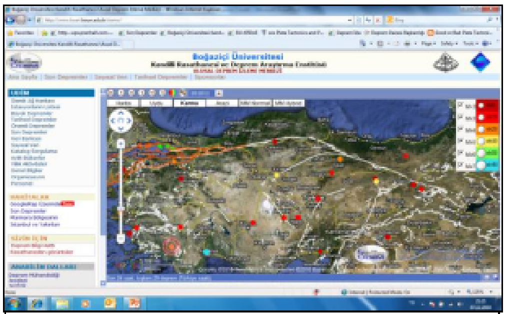
Ülkemizde üç büyük fay hattı vardır:

1- .... Fay Hattı 2- Doğu Anadolu Fay Hattı 3- Batı Anadolu Fay Hatları

- Ülkemiz bir deprem ülkesidir, ülkemizde sık sık deprem olur.
- Örneğin 2009 yılında ülkemizde toplam 9196 tane deprem oldu.
- İnsanlar bu depremlerin büyük kısmını hissetmemiştir çünkü küçük depremlerdir.

DEPREM ÇALIŞMALARI

- Ülkemizde deprem bilimi ile ilgili bir çok çalışma yapılmaktadır.
- Boğaziçi Üniversitesi Kandilli Rasathanesi ve Deprem Araştırma Enstitüsü'nde deprem bilimiyle ilgili bir çok çalışma yürütülmektedir.
- Aşağıda verilen internet adresini kullanarak ülkemizde olan depremler ve yapılan çeşitli çalışmalar hakkında bilgi edinebilirsiniz.



Internet adresi:
http://www.koeri.boun.edu.tr/sismo/

Deprempark Gezisi: 2 Mart 2010 Çarşamba Günü

Gezimizin Amaçları:

- Yapacağımız gezi neden önemlidir? Bu gezideki amaçlarınızı yazınız.

....

....

....

Geziden önce yapacaklarımız:

1- Bu ders yaptığımız çalışmaları tekrar etmek.

2- Deprempark'daki uzmanlara sormak üzere depremle ilgili en az bir soru hazırlamak.

Sorunuz:
....

....

Gezi sırasında ve sonrasında yapacaklarımız:

1- Geziyi dikkatli dinlemek, hazırladığımız sorulara cevap bulmak

2- Gezi sonrasında poster çalışması yapmak ve depremle ilgili bir test cevaplandırmak.

Bu çalışma kağıdını kaybetmeyiniz, Cuma günü teslim edeceksiniz!

Yeni bilgiler ve deneyimler edineceğimiz eğlenceli bir gezi yapacağız ☺

APPENDIX E: EARTHQUAKE PARK TRIP PREPARATION ACTIVITY–STUDENT HANDOUT – PILOT STUDY

Deprempark Gezisi Hazırlık Çalışması

İsim: **Sınıf:** **Tarih:**

DEPREMLER

- Depremler doğal olaylardır. Dünyanın bir çok yerinde deprem olur.
- Dünyamızda her yıl ortalama 3.5 milyon deprem olur, insanlar bunların sadece 34 bin tanesini hisseder.
- Çünkü depremler farklı büyüklüklerde olur ve çevreyi farklı etkiler.

DEPREMLERİN OLUŞUMU

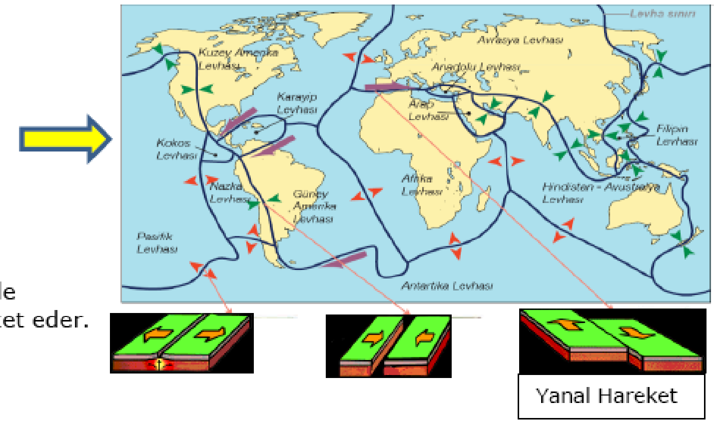
A) Levha Hareketleri ve Deprem

- Yer kabuğu sürekli hareket eden çok büyük **levhalardan** (parçalardan) oluşur.
- Dünyada en sık olan ve en çok hasar veren depremler levha hareketleri sonucu oluşur.

Yer kabuğu yapboz gibidir.

Levhalar ateş küre üzerinde sürekli ve çok yavaş hareket eder.

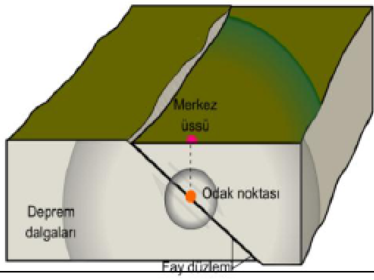
Yer Kabuğunu Oluşuran Levhalar ve Haketleri



B) Faylar ve Deprem

Fay hatları yerkabuğunun zayıf bölgelerinde deprem sonucu oluşan kırıklardır.

➢ **Depremlerin Oluşum Süreci**

1- Levha Hareket Eder ➡	2- Yer kabuğu kırılır ➡	3- Deprem olur
1-Levhalar hareket ettikçe aralarında sürtünme olur ve çok miktarda enerji birikir.	2-Biriken bu enerji yer kabuğunun zayıf bölgelerini kırar. Fay oluşur.	3-Kırılma sonucu aniden şiddetli bir yer sarsıntısı oluşur. Bu sarsıntıya **deprem denir ve dalgalar halinde çevreye yayılır.** 

➢ Ülkemizdeki Faylar ve Depremler

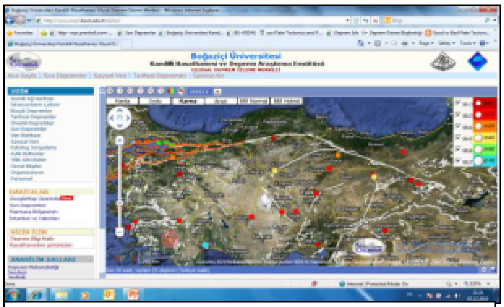
Ülkemizde üç büyük fay hattı vardır:

1- Kuzey Anadolu Fay Hattı   2- Doğu Anadolu Fay Hattı 3- Batı Anadolu Fay Hattı

- Ülkemiz bir deprem ülkesidir, ülkemizde sık sık deprem olur.
- Örneğin 2009 yılında ülkemizde toplam 9196 tane deprem oldu.
- İnsanlar bu depremlerin büyük kısmını hissetmemiştir çünkü küçük depremlerdir.

DEPREM ÇALIŞMALARI

- Ülkemizde deprem bilimi ile ilgili bir çok çalışma yapılmaktadır.
- Boğaziçi Üniversitesi Kandilli Rasathanesi ve Deprem Araştırma Enstitüsü'nde deprem bilimiyle ilgili bir çok çalışma yürütülmektedir.
- Aşağıda verilen internet adresini kullanarak ülkemizde olan depremler ve yapılan çeşitli çalışmalar hakkında bilgi edinebilirsiniz.



Internet adresi:
http://www.koeri.boun.edu.tr/sismo/

Deprempark Gezisi: 19 Ocak 2010 Çarşamba Günü

Gezimizin Amaçları:

- Sizce yapacağımız gezi neden önemlidir? Bu gezideki amaçlarını yazınız.

....

....

....

Geziden Önce yapacaklarımız:

1- Bu ders yaptığımız çalışmaları tekrar etmek.

2- Depremparktaki uzmanlara sormak için depremle ilgili bir soru yazmak.

Sorunuz:
....

....

Geziden sonra yapacaklarımız:

- Geziden sonra depremle ilgili bir test cevaplandıracaksınız. Geziyi dikkatli dinlemeniz çok önemlidir.

Yeni bilgiler ve deneyimler edineceğimiz eğlenceli bir gezi yapacağız ☺

APPENDIX F: TEACHER GUIDE BOOKLET

Deprempark Eğitimleri Rehber Kitapçığı

Giriş

Bu kitapçık Deprempark eğitiminin verimliliğini arttırmak amacıyla hazırlanmıştır. Yapacağınız etkili bir gezi planı sayesinde Deprempark eğitim programından en iyi şekilde yararlanabilirsiniz. Uzmanlar okuldışı öğrenme ortamlarında yapılan çalışmaların üç aşamada düzenlenmesini önermektedir. Bu aşamalar gezi öncesi hazırlık çalışmaları, gezi sırasındaki etkinlikler ve gezi sonrasını değerlendirme çalışmalarından oluşmaktadır. Buna uygun olarak kitapçık üç bölümden oluşmaktadır. İlk bölüm Deprempark eğitimi öncesinde yapılması önerilen hazırlık çalışmalarını, ikinci bölüm Demrempark eğitimi sırasında dikkat edilmesi gereken noktaları içermektedir. Son bölümde ise Deprempark eğitimi sonrasında yapılması önerilen etkinlikler hakkında bilgi verilmektedir.

Hedef Grup

Hazırlanan ders planları özellikle ilköğretim 8.sınıf öğrencilerinin deprem konusundaki çeşitli bilgi ve becerilerine katkı sağlamayı hedeflemektedir. Ancak 8. sınıflara ek olarak ilköğretim ve lise öğrencileri bu programdan çeşitli derslerinin kapsamında yararlanabilirler:

1-5 Sınıflar	Hayat Bilgisi Dersi
6. ve 7.Sınıflar	Sosyal Bilgiler Dersi
8. Sınıflar	Fen ve Teknoloji Dersi
9. ve 10. Sınıflar	Fizik ve Coğrafya Dersleri

A) Gezi öncesi Hazırlık Çalışmaları (Lütfen yazı üzerine tıklayınız)

Gezi öncesi hazırlık çalışmalarını temel olarak üç aşamadan oluşmaktadır.
1- Amaç belirleme – konu ilişkilendirme
2- Gezi için randevu alınması- resmi izinler,
3- Öğrencilerin deprem ve depremlerin oluşum süreci konusunda bilgilendirilmesi

1- Amaç belirleme – konu ilişkilendirme

Öğretmen Bilgi Notu: Okulda işlediğiniz konular ile deprempark eğitimlerinin ilişkilendirilmesi öğrencilerinizin deprem ve depreme ilişkin temel afet bilinci hakkındaki bilgi birikimlerinin artmasına yardımcı olacaktır. Bu nedenle öncelikli olarak sınıfta işlediğiniz konular ile Deprempark eğitimlerini ilişkilendiriniz. Deprempark eğitimlerine yönelik amaçlar belirleyiniz.

Temel olarak şu soruların cevaplarını arayabilirsiniz:

- Deprempark eğitimlerini okuldaki konular ile nasıl ilişkilendirebilirim?
- Deprempark eğitimleri sayesinde çocukların hangi konular hakkında bilgi ve deneyim edinmelerini amaçlıyorum?

Aşağıda Milli Eğitim Bakanlığı müfredatında deprem konusunun yer aldığı çeşitli dersler ve kazanımlarla ilgili bilgi verilmektedir. Bu bölüm size gezinize yönelik amaç belirlemekte yardımcı olacaktır.

MEB müfredatında Doğal Afetler ve Deprem Konusu

Deprem konusu ilköğretim ve ortaöğretim programlarında çeşitli derslerin kapsamında detaylı olarak yer alamaktadır. Farklı derslerin kapsamında sözü edilen deprem konusuna genel olarak iki farklı açıdan değinilmiştir. İlk olarak ilköğretim birinci kademede deprem, doğal afetler konusu içerisinde işlenmiştir. Hayat Bilgisi ve Sosyal Bilgiler dersleri kapsamında doğal afetler ve depremle ilgili çeşitli kazanımlar yer almaktadır. İkinci olarak ise ilköğretim ikinci kademe ve lise programındaki çeşitli derslerde depremler doğal süreçler, iç kuvvetler olarak incelenmiştir. Örneğin Fen ve Teknoloji, Coğrafya, Fizik gibi derslerde depremlerin oluşumu doğal bir süreç olarak değerlendirilmiş, levha hareketleri, iç kuvvetler ve deprem biliminden söz edilmiştir.

i) Doğal Afetler ve Deprem

"Güvenlik ve Korunmayı Sağlama" ilköğretim programında geliştirilmesi hedeflenen temel becerilerden biridir. "Doğal Afetlerden Korunma" da bu becerinin alt başlıkları arasında yer almaktadır. Bu kapsamda öğrenciler ilköğretim birinci kademede depremleri bir çeşit doğal afet olarak tanıyıp, öğrenmektedir. Öğrencilerin depremlerin çevremize etkileri, depremlerden korunma yöntemleri ve deprem hazırlık süreci hakkında çeşiti bilgi ve deneyim edinmeleri hedeflenmektedir.

Hayat Bilgisi Dersi

İlköğretim 1., 2. ve 3. sınıf Hayat Bilgisi dersi kapsamında "Doğal Afetlerden Korunma" konusunda hedeflenen beceriler aşağıda yer almakdatır.

- Doğal Afetlerden Korunma
  - Doğal afetlerin verebileceği zararları fark etme
  - Doğal afetlere hazırlıklı olma
  - Doğal afetlerden korunmak için yetişkinler eşliğinde uygulama yapma
  - Ülkemizde ve farklı ülkelerde meydana gelen doğal afetlerin farkında olma
  - Doğal afetlerin yaratabileceği maddî ve manevi etkileri bilme

Tablo 1.1. Hayat Bilgisi Dersi "Doğal Afetlerden Korunma" konusundaki Kazanımlar

Sınıf	**Ders**	**Ünite Adı**	**Kazımlar**
1.	Hayat Bilgisi	OKUL HEYECANIM DÜN BUGÜN YARIN BENİM EŞSİZ YUVAM	• Görsel, işitsel ve hem görsel hem işitsel iletişim araçlarından yararlanarak doğal afetlerin zararlarını fark eder. • Doğal afetlerin etkilerinden korunmak için okuldaki güvenlik önlemlerinin gereğini yerine getirir. • Doğal afetler karşısında yapması gerekenleri belirleyerek ailesi birlikte hazırlık yapar.
2.	Hayat Bilgisi	DÜN BUGÜN YARIN	• Farklı ülkelerde, doğal afetlere karşı alınan önlemlerle ülkemizde alınan önlemleri karşılaştırır.
3.	Hayat Bilgisi	BENİM EŞSİZ YUVAM	• Evde meydana gelebilecek tehlikeli ya da acil durumlarda ne yapması gerektiğini uygulayarak gösterir. • Doğal afetler sırasında evinde yapılması gerekenleri, yetişkinler eşliğinde uygulayarak gösterir.
Konuyla ilgili Afetten Korunma ve Güvenli Yaşam Kazanımları			• Bir deprem sırasında neler hissedebileceğini fark eder. • Bir deprem sırasında alınaması gereken pozisyonu bilir. • Deprem sırasında yapılması gerekenleri deprem sırasında uygular. • Bir deprem sonrasında binadan tahliye yollarını bilir. • Depremden sonra olabilecek ve karşılaşılabilecek olumsuz durumlar hakkında fikir edinir. • Deprem srasında karşılaşılabilecek tehlikeleri araştırır. • Belirlenen mekanda Deprem Tehlike Avı yapar ve bulduğu tehlikeleri listeler. • Tehlikelerin azaltılması konusunda alınabilecek önlemleri araştırır ve uygun çözümler sunar. • Depreme karşı sınıf içinde alınabilecek basit önlemleri uygular.

<u>Sosyal Bilgiler Dersi</u>

İlköğretim programlarında 1, 2 ve 3. sınıf Hayat Bilgisi dersi kapsamındaki konulara ek olarak ilerleyen sınıflarda Sosyal Bilgiler dersinin içeriğinde doğal afetler, deprem tatbikatı, hazırlık sürecinde yapılması gereken hazırlıklar gibi çeşitli konularda kazanımlar yer almaktadır.

Tablo 1.2. Sosyal Bilgiler Dersi "Doğal Afetlerden Korunma" konusundaki Kazanımlar

Sınıf	**Ders**	**Ünite Adı**	**Kazımlar**
4.	Sosyal Bilgiler	YAŞADIĞIMIZ YER	• Doğal afetler karşısında hazırlıklı olur.
5.	Sosyal Bilgiler	BÖLGEMİZİ TANIYALIM	• Yaşadığı bölgede görülen bir afet ile bölgenin coğrafî özelliklerini ilişkilendirir. • Kültürümüzün sözlü ve yazılı ögelerinden yola çıkarak, doğal afetlerin toplum hayatı üzerine etkilerini örneklendirir. • Yaşadığı bölgede görülen doğal afetlerin zararlarını artıran insan faaliyetlerini fark eder.
Konuyla ilgili Afetten Korunma ve Güvenli Yaşam Kazanımları			• Sınıf tahliye çantası oluşturulması ve malzemelerin sağlanması konusunda aktif görev alır. • Posterler hazırlayarak toplumun bu konuda bilgilenmesine destek verir. • Farklı mekânlarda bir deprem sırasında yapılması gerekenleri tartışır. • Deprem sırasında yapılması gerekenleri, deprem tatbikatında uygular.

ii) Doğal Süreçler ve Deprem

Depremlerin oluşum süreçleriyle ilgili ilk bilimsel alt yapı 4. sınıf Fen ve Teknoloji dersi kapsamında işlenen Dünya'nın katmanları ve özellikleri adlı alt konu başlığında verilmektedir. Daha sonra ilerleyen seviyelerde 8. sınıf Fen ve Teknoloji dersi, Lise Coğrafya ve Fizik dersleri kapsamında depremlerin oluşumu doğal bir süreç olarak anlatılmaktadır. Bu derslerin içeriğinde levha hareketleri, levha hareketlerinin etkileri, deprem bilimi, deprem dalgaları, depremden korunma yöntemleri gibi konularda çeşitli kazanımlar yer almaktadır. Aşağıdaki tabloda kazanımlarla ilgili detaylı bilgi yer almaktadır.

Fen ve Teknoloji Dersi

Tablo 1.3. 4.Sınıf Fen ve Teknoloji Dersinin Dünya'nın yapısı konusundaki kazanımları

Sınıf	Ders	Ünite Adı	Kazımlar
4.	Fen ve Teknoloji	GEZEGENİMİZ DÜNYA	• Dünya'daki karaların taş küre (yer kabuğu), suların su küre ve bunları çevreleyen havanın hava küre adı verilen bilimsel bir modelle temsil edildiğini ifade eder. • Dünya yüzeyinin derinliklerindeki katmanları temsil eden ateş küre ve ağır kürenin (çekirdek) belirgin özelliklerini ifade eder. • Dünya'nın yapısındaki katmanları genel özelliklerine göre karşılaştırır. • Dünya'nın katmanlarını gösteren kendine özgü bir model oluşturur ve sunar.

Tablo 1.4. 8.Sınıf Fen ve Teknoloji Dersi Kapsamında Deprem Konusundaki Kazanımlar

Sınıf	Ders	Ünite Adı	Kazımlar
8.	Fen ve Teknoloji	DOĞAL SÜREÇLER	Bir doğal süreç olan levha hareketleri ile ilgili olarak öğrenciler; • Yer kabuğunun, sıcak ve akışkan olan magma üzerinde hareket eden levhalardan oluştuğunu gösteren bir model tasarlar ve yapar. • Okyanusların ve dağların oluşumunu levha hareketleriyle açıklar. • Artçı deprem, öncü deprem, şiddet, büyüklük, fay kırılması, fay hattı ve deprem bölgesi kavramlarını tanımlar. • Depremle ilgili çalışmalar yapan bilim dalına "sismoloji", bu alanda çalışan bilim insanlarına ise "sismolog" adı verildiğini belirtir. • Türkiye'nin deprem bölgeleriyle fay hatları arasında ilişki kurar. • Depremlere, fayların yanında, volkanik faaliyetlerin ve arazi çöküntülerinin de sebep olabileceğini açıklar. • Volkanların oluşumunu ve bunun sonucunda oluşan yeryüzü şekillerini levha hareketleriyle açıklar. • Volkanların ve depremlerin insan hayatındaki etkileri ve sebep olabileceği olumsuz sonuçları ifade eder. • Deprem tehlikesine karşı alınabilecek önlemleri ve deprem anında yapılması gerekenleri açıklar.

Lise programında deprem konusuna detaylı olarak Coğrafya dersi kapsamında değinilmiştir. Bununla birlikte fizik dersinde dalgalar konusunda, deprem dalgaları konusuna yerverilmektedir. ve konu günlük hayatta deprem dalgaları örneği üzerinden işlenmektedir.

Coğrafya Dersi

Tablo 1.5. Coğrafya Dersi Kapsamında Deprem Konusundaki Kazanımlar

Sınıf	**Ders**	**Ünite Adı**	**Kazımlar**
9	Coğrafya	DOĞAL SİSTEMLER	• Dünyanın tektonik oluşumundaki değişim ve sürekliliğe kanıtlar gösterir. • Jeolojik zamanların özelliklerini tektonikle ilişkilendirerek açıklar. • İç ve dış kuvvetlerin oluşum süreçlerini açıklar. • İç ve dış kuvvetleri, farklı yer şekillerinin oluşumuna etkileri açısından sınıflandırır.
10	Coğrafya	DOĞAL SİSTEMLER	• Levha tektoniği kuramı ile deprem kuşaklarını ve volkanların dağılışını ilişkilendirir. • Dağılış haritaları kullanarak sıcak su kaynaklarını fay hatlarıyla ilişkilendirir.
		ÇEVRE VE TOPLUM	• Yaşadığı alan ile başka alanlardaki doğal afetleri oluşum nedenleri, şiddetleri, sıklıkları ve insanlara olan etkileri bakımından karşılaştırır. • Dünyanın farklı bölgelerinde oluşan benzer doğal afetlerin etkilerini, korunma yöntemleri ve planlama açısından karşılaştırır. • Doğal afetlere neden olan uygulamalarla korunma yollarını ilişkilendirir.
11	Coğrafya	MEKÂNSAL BİR SENTEZ: TÜRKİYE	• Verilerden ve haritalardan yararlanarak Türkiye'deki doğal afetlerin dağılışıyla oluşum şekillerini ilişkilendirir.
12	Coğrafya	ÇEVRE VE TOPLUM	• Doğal afetlere ilişkin farklı uygulamaların yeterliliğini değerlendirir. • Doğal çevreyi korumaya yönelik alınan önlemlerin ve projelerin mekâna etkilerini değerlendirir.

Tablo 1.6. Fizik Dersi Kapsamında Deprem Konusundaki Kazanımlar

Sınıf	Ders	Ünite Adı	Kazımlar
9.	Fizik	**DALGALAR**	**Dalgalara ait temel büyüklüklerle ilgili olarak öğrenciler;** • Titreşim ve dalga kavramlarını örneklerle açıklar. • Periyot ve frekans arasındaki ilişkiyi belirler . • Dalgaların enerji taşıdığını örnekler vererek açıklar. • Dalgaları titreşim doğrultusuna ve taşıdığı enerjiye göre sınıflandırır. • Dalganın ilerleme hızı, dalga boyu ve frekansı arasındaki ilişkiyi belirler. • Ortamın özelliklerinin dalgaların ilerleme hızını nasıl etkilediğini fark eder. • **Deprem kaynaklı can ve mal kaybını önleyecek bir yapı modeli oluşturur**.
10.	Fizik	**DALGALAR**	**Su dalgalarıyla ilgili olarak öğrenciler;** • Oluşturduğu doğrusal ve dairesel su dalgaları üzerinde; dalgaların ilerleme yönü, dalga tepesi, dalga çukuru, dalga boyu, genlik, periyot ve frekansını belirler. • Doğrusal ve dairesel su dalgalarının düzlem ve parabolik engelde nasıl yansıdığını keşfeder.
(MEB)Etkinlik Önerileri:			9.Sınıf: İstanbul'da beklenen olası bir depreme yönelik bir önceki depremlerden yola çıkarak yapılacak bir etkinlik önerisi bulunmaktadır. Bu etkinlik öncesi öğrenciler yakın çevrelerinde varsa deprem müzelerine yönlendirilir. 10.Sınıf: Su dalgaları işlenirken, tusunami oluşumu-tusunami deprem ilişkini anlatan deyalı bir etkinlik önerilmektedir.

2- Gezi için randevu alınması ve resmi izinler

Her yıl binlerce öğrenci Deprempark eğitimlerine katılmaktadır bu nedenle yoğunluk yaşanmaktadır. Gezi yapmaya karar verirvermez dönemin başında mümkün olan en kısa sürede Deprempark eğitimleri için randevu alınız. Deprempark eğitimleri okul gezisi şeklinde düzenlenmektedir bu sebeple bulunduğunuz okulun ve MEB gezi kurallarına uygun olarak gerekli tüm resmi izinleri alınız.

3- Öğrencilerin deprem ve depremlerin oluşum süreci konusunda bilgilendirilmesi

Öğrencileriniz Deprempark ziyaretinden önce depremlerle ilgili bazı önbilgilere sahip olurlarsa verdiğimiz eğitimden daha çok yararlanabilirler. Geziye yönelik belirlediğiniz amaçlara ek olarak öğrencilerinizin Deprempark eğitimlerine katılmadan önce kendi bireysel amaçlarını, merak ettikleri konu ve soruları belirlemeleri çok önemlidir. Aşağıda gezi öncesi yapabileceğiniz çalışmaya yönelik olarak hazırlanmış bir ders planı yer almaktadır.

- Gezi Öncesi Hazırlık Ders Planı (lütfen isim üzerindeki linke tıklayınız)

Deprem konusu farklı derslerle ilişkilendirebilir bu sebeple öğrencilerinize ve dersin içeriğine göre hazırlık çalışmasının detaylarını şekillendiriniz. Farklı kaynaklar ve çalışmalar yaparak öğrencilerinizi Deprempark gezisine hazırlayabilirsiniz. Aşağıdaki ders planı sadece bir örnektir sizler farklı çalışmalar yapabilirsiniz.

- Seviye: 8.Sınıf
- Ders: Fen ve Teknoloji
- Ünite: Doğal Süreçler ya da (Deprem Haftası)
- Süre: 1 Ders (40dk)
- Materyaller: Powerpoint Sunum, ders notu (linklere tıklayınız)
- Kaynak Kitap: Ders kitabı, (AHEB kitaplarının linkleri verilebilir)

Dersin İşlenişi:

Powerpoint sunum dosyası üzerine tıklayarak sunum dosyasını indirebilirsiniz. Sunum dosyasında anlatıcı notlarını okuyunuz. Bu dersin genel amacı öğrencilerin depremlerin oluşumunu doğal bir süreç olarak algılamalarına yardımcı olmak ve onları Deprempark gezisi hakkında kısaca bilgilendirmektir. Dersinizi temel olarak aşağıdaki aşamalarda işleyebilirsiniz.

- *Öğrencilerin depremler hakkındaki bilgilerini paylaşması*
- *Ülkemizde ve dünyada çok sık deprem olduğunun hatırlatılması (Ders notu kullanılabilir, Japonya'daki deprem hatırlatılabilir.)*
- *Öğrencilerin deprem olurken meydana gelen temel değişikliği fark etmesi - Yer sarsıntısı- (ppt sunum üzerindeki resimler ile deprem sırasındaki sarsıntı sebebiyle meydana gelen değişiklikleri gösteriniz, büyüklüğü fazla olan depremin daha fazla etki oluşturduğuna vurgu yapınız)*

- *Deprem oluşum sürecinin anlatılması (Öncelikle levha kavramı, temel levha hareketleri, ülkemizdeki fay hatlarından bahsediniz. Daha sonra animasyonu kullanarak depremin oluşumunu levha hareketleri ile ilişkilendirerek anlatınız. Sonuç olarak depremlerin Doğal bir oluşum süreci olduğuna vurgu yapınız. Öğrenciler ders notunun ilgili kısımlarını dolduracaklar.)*
- *Ülkemizdeki deprem gerçekliğinin fark edilmesi (Ülkemizde depremle ilgili çalışma yapan bir kaç üniversite sorun, cevaplarını aldıktan sonra, B.U Kandilli Rasathanesi ve Deprem Araştırma Enstitüsü'nden kısaca bahsediniz. UDİM sayfası linkine tıklayarak, açılan googleearth haritası üzerindeki güncel depremleri kontrol ediniz. Bu sayfa üzerinde yer alan çeşitli linklerden ödev ve araştırma yaparken yararlanılabileceklerini söyleyiniz. Ayrıca ülkemizdeki depremlerle ilgili en güvenilir bilgileri bu sayfadan takip edebilirler.)*
- *Deprempark gezisi hakkında bilgi veriniz (Öğrencilerinizi gezi tarihi, konusunda bilgilendiriniz. Öğrenciler gezi için kendi amaçlarını ve uzmanlara sormak istedikleri bir kaç soru belirleyip ders notuna yazabilirler.)*
- *Gezi sırasında ve sonrasında yapacağınız çalışmalar hakkında öğrencilerinizi bilgilendiriniz.(Gezi düzeni, kurallar ve gezi sonrasında yapacağınız poster çalışması ve test hakkında öğrencilerinizi kısaca bilgilendirebilirsiniz.)*

Bilgi Notu: Depremi tanımlarken ve depremlerin çevreye olan etkilerinden bahsederken kullanılan tüm ifadeler öğrencilerin deprem ve depreme hazırlık sürecine ilişkin olan algılarını, tutum ve davranışlarını etkilemektedir. Bu sebeple deprem ve depreme ilişkin afet bilinci eğitiminden bahsederken kullanılan tanımlar, örnekler özenli bir şekilde seçilmelidir. Depremler Dünyayı etkileyen iç kuvvetlerden biridir. Depremin doğal bir süreç olduğuna vurgu yapılması çok önemlidir. Dünyamızın yapısından dolayı milyarlarca yıldır deprem olmaktadır ve olmaya devam edecektir. Depremler yeryüzündeki şekillerin, canlıların ve yaşam biçimlerinin çeşitliliğine çok önemli katkılar sağlamıştır.

Kaynak Kitap: Ders kitaplarına ek olarak AHEB sayfasında yer alan kitapları inceleyerek konu hakkında detaylı bilgi edinebilirsiniz. Ayrıca öğrencilerinizi bu kitapları okumaları konusunda yönlendirebilirsiniz.

B) Gezi Sırasında Dikkat Edilmesi Gerekenler (Lütfen yazı üzerine tıklayınız)

Deprempark eğitimleri iki kısımdan oluşmaktadır:

1.kısım: Uzmanlar tarafından yapılan sunum (Depremlerin oluşumu, ölçülmesi, ölçüm birimleri, depreme yönelik temel afet bilinci eğitim)

2.kısım: Deprempark salonunda uygulamalı çalışmalar (sismograf, deprem sallantı masası, fay hattı maketleri, deprem öncesi, sırası ve sonrasında yapılması gereken)

Öğrencilerinizin dikkatli bir şekilde verilen bilgileri dinlemelerini sağlayınız. Gezi öncesinde hazırladıkları soruları uygun zaman diliminde uzmanlara sormaları konusunda onları cesaretlendiriniz. Deprempark'ı gün boyunca bir çok öğrenci grubu ziyaret etmektedir. Bu sebeple öğrencileriniz yönergelere uyması, düzenin koruması gibi konularda görevlilere yardımcı olunuz. Deprempark salonundaki uygulamalı çalışmalar sırasında öğrencileriniz, heyecanlandıkları ya da şaşırdıkları durumlarda tepkilerini içtenlikle ifade etmelerini hoşgörünüz. Etkinliklere katılımları konusunda onları cesaretlendiriniz. Eğitimlerimizde öğrencilerin eğlenerek öğrenmelerini hedeflemekteyiz.

C) Gezi Sonrası Değerlendirme Çalışmaları (Lütfen yazı üzerine tıklayınız)

Gezi sonrası sınıfta yapacağınız bazı etkinlikler ile öğrencilerin kazanımlarını destekleyebilirsiniz. Gezi değerlendirme çalışmalarının temel amacı öğrencilerin gezide neler öğrendiğini kısaca kontrol etmek, geziyle ilgili fikirlerini almak, gezide öğrendiklerinden yola çıkarak yeni fikirler ortaya çıkarmalarını sağlamak ve öğrendiklerini tüm arkadaşları ve aileleri ile paylaşmalarını sağlamaktır.

Aşağıda bu amaçla hazırlanmış ders planı ve etkinlik kâğıtları yer almaktadır. Ders içeriğiniz ve öğrenci gruplarınıza göre farklı çalışmalar yapabilirsiniz.

- Seviye: 8. sınıf
- Ders: Fen ve Teknoloji
- Ünite: Doğal Süreçler ya da (Deprem Haftası)
- Süre: 2 Ders (80dk)
- Materyaller: Powerpoint Sunum, poster için resim, poster görev kağıtları, poster için kırtasiye malzemeleri
- Ölçme değerlendirme: Deprempark eğitim bilgi testi, gezi değerlendirme anketi
- Kaynak Kitap: Ders kitabı, AHEB kitaplarının linkleri verilebilir

Ders 1 İşleniş

İlk ders iki temel kısımdan oluşmaktadır. Öncelikli olarak kısaca öğrencilerin gezi hakkındaki yorumları alınır. Sonrasında çeşitli sorularla öğrencilerin Deprempark eğitimlerinde bahsedilen kavramlarla ilgili bilgileri sorgulanır. Bu kısımda geziden önce yaptığınız powerpoint sunum dosyasından faydalanabilirsiniz.

Dersin ikinci kısmında poster çalışması yapılır.

Poster Görev Kağıtları:

Posterler aşağıda verilen üç temel soruya ilişkin görevler hakkında yapılacaktır. Görev kâğıtlarında posterin içeriğine ilişkin detaylı bilgi yer almaktadır. Öğrencileri 3-4 kişilik gruplara ayrılabilirsiniz. Her bir grup aşağıdaki poster görevlerinden birini yapacaktır. Poster görev kağıtlarını aşağıdaki sorular üzerine tıklayarak indirebilirsiniz.

- Depremler nasıl oluşur?
- Depreme nasıl hazırlanmalıyız?
- Deprem olursa ne yaparım?

Poster Resimleri

Poster çalışması için kullanılacak resimler iki farklı şekilde temin edilebilir.

1-Bu dersten önce öğrencilere depremlerin oluşumu, deprem öncesi, sırası ve sonrasında depremin zararlarını en aza indirmek için yapılması gerekenlerle ilgili çeşitli resimler getirmeleri istenebilir. Öğrenciler kendi getirdikleri resimleri kullanabilir. Bu resimler bir çok farklı kaynaktan getirileceği için çok renkli ve çeşitli olabilir. Poster çalışmasına zenginlik katabilir. Ayrıca öğrenciler konu hakkında araştırma yapmaya yönlendirilebilir.

2- AHEB tarafından hazırlanan resimler uygun sayıda çoğaltılarak öğrencilere dağıtılabilir. Aşağıda poster yönergelerine uygun olarak hazırlanan resim dosyaları bulunmaktadır. Dosya üzerine tıklayarak resimleri indirebilirsiniz.

- Depremler nasıl oluşur? (resim)
- Depreme nasıl hazırlanmalıyız? (resim)
- Deprem olursa ne yaparım? (resim)

Kırtasiye malzemeleri: Gerekli malzemeleri öğrenciler önceden getirebilir ya da siz sınıfta dağıtabilirsiniz.

Posterlerin Değerlendirilmesi

Gruplar hazırladıkları posteri bu dersin içinde kalan sürede ya da bir sonraki ders sunabilir. Posterler için bir değerlendirme çizelgesi hazırlayarak notlandırma yapabilirsiniz. Bu poster çalışmasını bir performans görevi olarak kullanabilirsiniz. Posterleri okulun farklı yerlerini asarak geziye gelmeyen öğrencilerin konu hakkında bilgi sahibi olmalarına yardımcı olabilirsiniz. Buna ek olarak başarılı sunum yapan öğrencileriniz geziye gelmeyen farklı sınıflara giderek ilgili konularda 5 dakikalık kısa poster sunumları yapabilir.

Seçtiğiniz en iyi 3 poster çalışmasının fotoğrafını çekerek aşağıdaki e-mail adresine gönderiniz. Bu şekilde ayın Deprempark posteri yarışmasına katılabilirsiniz. Birinci seçilen poster bir ay boyunca Deprempark salonunda sergilenecektir. Yarışma başvuru formuna aşağıdaki linkten ulaşabilirsiniz.

Başvuru formu:

Öğrencilerin Adı, soyadı:	
Okulu:	
Sınıfı:	
Geziye katıldığı tarih:	
Poster başlığı(slogan)	
Posterin net bir fotoğrafı	Net, anlaşılır bir fotoğraf çekerek bu kısma ekleyiniz.

Her bir poster için yeni bir form doldurunuz.

Ders 2 İşleniş

Öncelikli olarak öğrenci poster sunumları tamamlanır. Daha sonra öğrencilerin geziye ilişkin yorumlarını almak için Program Değerlendirme Anketi uygulanır. Anketi tamamlayan öğrenciler depreme ilişkin Kavramsal Anlama Anketini cevaplandırırlar. Öğrencilerinizin özelliklerine göre anketler için vereceğiniz süre değişebilir. Anketlere aşağıdaki linklerden ulaşabilirsiniz.

- Program Değerlendirme Anketi
- Kavramsal Anlama Anketi

Anketlerin Değerlendirilmesi:

Program Değerlendirme Anketi öğrencilerin gezi hakkındaki yorumlarını görmenizi sağlar. Bu anketten alacakları puanlara göre öğrencilere not verilmeyeceğini öğrencilerinize söyleyiniz ve anketi içtenlikle doldurmaları gerektiği belirtiniz.

Kavramsal Anlama Anketini notlandırabilirsiniz. Öğrencilerin temel olarak hangi kavramları iyi anladıkları, hangi kavramlara ilişkin sorun yaşadıklarını test sonuçlarından görebilirsiniz.
Anket kağıtlarını değerlendirdikten sonra aşağıdaki adrese göndermeniz çok önemlidir. Öğrencilerin hangi kavramları iyi bildiklerini, hangi kavramlara ilişkin çeşitli yanılgıları olduğunu tespit etmemiz çok önemlidir. Sizden gelecek anket sonuçlarına göre eğitim programımızı geliştirip çeşitlendirebiliriz. Desteğiniz bu noktada çok önemli bir katkı sağlayacaktır.
Adres:
(Testler online olarak verilebilir)
Alternatif Etkinlikler: AHEB Sayfasında yer alan "Deprem Ustası" oyununu sınıfta öğrencileriniz ile oynayabilirsiniz. Bu oyunu evde de oynamaları konusunda onları yönlendiriniz. Bu oyun sayesinde öğrenciler deprem öncesinde ve sırasında ne yapmaları gerektiğini uygulamalı olarak görebilir. Oyuna AHEB'in ana sayfasından ulaşabilirsiniz. Bu oyunu oynadıktan sonra "Deprem Tehlike Avı" kağıdını öğrencilerinize dağıtarak sınıfta, okulda tehlike avı yapabilirsiniz. Ayrıca "Deprem Tehlike Avı" çalışmasını performans görevi olarak yaptırabilirsiniz. Öğrencilerinizi kendi evlerinde aile üyeleri ile birlikte "Deprem Tehlike Avı" çalışması yapabilirler. Bu çalışma sırasında tespit edilen tehlikeler giderildikten sonra sabitlenen eşyalar ve depreme yönelik hazırlık çalışması öğrenci tarafından fotoğraflanarak poster ya da powerpoint sunum haline getirilebilir. Sunumlar sınıfta paylaşılabilir. Buna ek olarak okulda deprem tatbikatı yapılabilir.

Afete Hazırlık Eğitim Biriminin temel amacı çocuklardan yola çıkarak aileye ve toplumun geneline temel afet bilinci kazandırmaktır. Bu çalışmalarla birlikte Deprempark eğitimleri gerçek amaçlarına daha çok hizmet edecektir.

Deprem Tehlike Avı dosyasını indirmek için tıklayınız.
Kaynak Kitap: Ders kitaplarına ek olarak AHEB sayfasında yer alan kitapları inceleyerek konu hakkında detaylı bilgi edinebilirsiniz. Ayrıca öğrencilerinizi bu kitapları okumaları konusunda yönlendirebilirsiniz.
Not: Hazırlanan örnek ders planları hakkındaki görüşlerinizi AHEB adresine gönderiniz. Ayrıca deprem ve deprem öncesi, sırası ve sonrasında yapılması gerekenler ile ilgili sınıfta yaptığınız değişik çalışmaları AHEB .... adresine elektronik posta yolu ile

gönderebilirsiniz. Bu şekilde deprem gibi önemli bir konuda birçok kişinin bilgi edinmesine katkı sağlayabilirsiniz. Deprem ve depreme yönelik afet bilinci konusundaki bilgi ve beceriler deprem sonrasında oluşabilecek olası birçok maddi ve manevi hasarın önlenmesinde çok önemli rol oynamaktadır.

Deprempark Gezi Çalışması Kontrol Çizelgesi

Temel olarak Deprempark eğitimleri çalışması üç aşamadan oluşmaktadır. Bu aşamalarla ilgili detaylı bilgi önceki sayfalarda verilmiştir. Aşağıda yer alan kontrol çizelgesini kullanarak çalışmalarınızı takip edebilirsiniz.

Deprempark Gezi Çalışması Kontrol Çizelgesi
1- Deprempark eğitimleri ile sınıfta işlediğim konuları ilişkilendirdim.
2- Deprempark eğitimine yönelik temel hedefler belirledim.
3- Eğitimler için randevu aldım.
4- Çalıştığım okulun gezi izin kurallarına uygun olarak çeşitli izinler aldım.
5- Velilerimizi gezi hakkında ve geziden sonra evde yapabilecekleri etkinlikler konusunda bilgilendirdim.
6- Geziden önce öğrencilerin depremle ilgili önbilgilerini destekleyen çalışmalar yaptım.
7-Öğrencilerin geziye yönelik amaçlar ve uzmanlara sorulmak üzere sorular hazırlamalarını sağladım.
8- Deprempark eğitimleri sırasında öğrencilere rehberlik ettim.
9- Eğitim sonrası sınıfta değerlendirme çalışması yaptık (sınıf tartışması, poster çalışması, deprem ustası, Deprem Tehlike Avı).
10- Öğrenciler gezi sonrasında aileleriyle çeşitli çalışmalar yaptı, bunların sonuçlarını sınıfta paylaştı (Deprem Tehlike Avı, deprem hazırlıkları).
11- Okulda deprem tatbikatı yaptık.
12- Öğrencilerimiz Program Değerlendirme Anketini ve Kavramsal Öğrenme Anketini cevaplandırdı, (online) (anketler AHEB’e iletildi).
13- En iyi 3 poster çalışması fotoğraflandı ve yarışma formlaryla beraber AHEB’e elektronik posta yoluyla iletildi.
1+4- Sınıfta yapılan alternatif etkinlikler AHEB adresine e-posta adresine gönderildi.

Not: Kitapçık tasarım aşamasındadır. Katkılarınız ve yorumlarınız ile şekillendirilecektir. Bu kitabçık AHEB saydafında yer alan Deprempark Eğitimleri linkinin altına yerleştirilebilir.

APPENDIX G: EARTHQUAKE DIAGNOSTIC TEST – PILOT STUDY

Deprempark Gezisi Hazırlık Çalışması

A) Kişisel Bilgi Formu: Aşağıdaki formdaki sorularda istenen bilgileri yazarak ya da verilen seçeneklerin sağındaki noktalı boşluğa "X" işareti koyarak yanıtlayınız.

Adınız:	**Soyadınız:**		
Bu yıl Deprem konusunu hangi derste işlediniz?	Hiçbir derste işlemedik .... Hayat Bilgisi .... Fen ve Teknoloji .... Sosyal Bilgiler .... Diğer (Belirtiniz)...		
Deprem konusunu işlediğiniz kulüp:	Sivil Savunma .... Fen ve Teknoloji .... Diğer (Belirtiniz)		
Daha önce deprem konusunu işlediğiniz sınıflar:	1 .... 2 .... 3 .... 4 .... 5 .... 6 .... 7.........		
Depremler hakkında hangi kaynaklardan bilgi edindiniz? (Birden fazla işaretleyebilirsiniz)	Öğretmen .... Aile .... Arkadaşlarım .... Kitap .... Televizyon .... İnternet .... Gazete .... Dergi ...... Diğer *(Belirtiniz)*		
Daha önce ne zaman nerede deprem yaşadınız?	Yaşamadım.....	Yıl	Yer ....

B) Deprem Bilgi Formu: Aşağıdaki soruların hepsini kısaca cevaplandırınız.
Tüm soruları cevaplandırmanız çok önemlidir!

1) Deprem nedir? (Depremi bir cümle ile nasıl tanımlarsınız?)

....

....

2) Depremler nasıl oluşur? Depremlerin nedenlerini kısaca sıralayınız.

i) .... ii) ....

iii) .... iV) ....

3) Deprem olurken yeryüzünde neler olur?

i) .... ii) ....

iii) .... iV) ....

4) Deprem olurken yerin altında neler olur?

i) .... ii) ....

iii) .... iV) ....

5) Depreme nasıl hazırlanmalıyız? Deprem öncesi yapılması gereken dört hazırlık çalışması yazınız.

i) .... ii) ....

iii) .... iv) ....

6) Deprem olurken kendimizi korumak için nasıl davranmalıyız? Dört örnek *davranış* yazınız.

i) .... ii) ....

iii) .... iv) ....

7) Deprem olurken neler yapmamalıyız? Deprem sırasında kaçınılması gereken dört *davranış* yazınız.

i) .... ii) ....

iii) .... iv) ....

8) Deprem sonrasında neler yapmalıyız? Yapılması gereken dört örnek davranış yazınız.

i) .... ii) ....

iii) .... iv) ....

9) Depremden sonra neler *yapmamalıyız*? Deprem sonrası kaçınılması gereken dört davranış yazınız.

i) .... ii) ....

iii) .... iv) ....

10) Günümüzde depremlerin nerede ve ne zaman olacağı konusunda neler biliyorsunuz? Yazınız.

I) ....

II) ....

III) ....

11) Deprem bilimi uzmanları ile bir söyleşi yapma şansınız var. Depremlerle ilgili neler öğrenmek isterdiniz? Uzmanlara sormak üzere dört soru yazınız.

I) ....

II) ....

III) ....

IV) ....

APPENDIX H: DRAFT VERSION OF CUQ-EARTHQUAKE TEST-PILOT STUDY

Deprempark Gezisi Değerlendirme Çalışması

A) Kişisel Bilgi Formu: Aşağıdaki formdaki sorularda istenen bilgileri yazarak ya da verilen seçeneklerin sağındaki noktalı boşluğa "X" işareti koyarak yanıtlayınız.

Adınız:	Soyadınız:	
Sınıfınız: 6 ……… 7 ……… 8 ………		
Depremler hakkında hangi kaynaklardan bilgi edindiniz? *(Birden fazla işaretleyebilirsiniz)*	Öğretmen ……… Aile ……… Arkadaşlarım ……… Kitap ……………. Televizyon ……İnternet ……… Gazete ……… Dergi ……… Diğer (Belirtiniz) ………………………………………	
Deprempark gezisine katıldınız mı?	Evet …………………	Hayır…………
Önceki yıllarda depremparka gittiniz mi?	Evet …………………	Hayır…………

B) Deprem Testi

Bu test 3 farklı kısımdan oluşmaktadır. Tüm soruları dikkatle cevaplandırmanız gerekmektedir.

1.Kısım: **Aşağıdaki metinde numaralı (1-11) boşluklar yer almaktadır. Her bir boşluk için o numarada yer alan seçeneklerden en uygun kelimeyi işaretleyiniz.**

Yer kabuğu__**(1)**__ denilen çok büyük parçalardan oluşur. Bunlar hareket ettikçe aralarında sürtünme olur ve enerji birikir. Bu enerji yer kabuğunun zayıf bölgelerini kırar ve __(2)__ şiddetli bir __(3)___ oluşur. Bu olaya __(4)___ denir ve çevreye __(5)___ halinde yayılır. Bu sırada oluşan arazi kırıklarına ___(6)___ denir. Ülkemizde __(7)__ deprem olmaktadır. Örneğin 25 Mart 2005 tarihinde Erzurum'da VII _________(8)___ bir deprem olmuştur ve toplam 1280 bina hasar görmüştür. __(9)____ kayıtlarına göre depremin ___(10)___ 5.6 olarak hesaplanmıştır. Deprem çevre illerde farklı ___(11)___ hissedilmiştir.

1.	**A)** tabaka	B) kütle	C) katman	**D) levha**
2.	A) yavaşça	B) sessizce	C) aniden	D) zamanla
3.	A) patlama	B) toprak kayması	C) sarsıntı	D) olay
4.	A) sarsıntı	B) heyelan	C) afet	D) deprem
5.	A) dalgalar	B) parçalar	C) yüksek sesler	D) patlamalar
6.	A) sınır hattı	B) fay hattı	C) kırık hattı	D) deprem hattı
7.	A) her an	B) bazen	C) sık sık	D) nadiren
8.	A) büyüklüğünde	B) şiddetinde	C) gücünde	D) kuvvetinde
9.	A) torkmetre	B) multimetre	C) güçmetre	D) sismometre
10.	A) büyüklüğü	B) gücü	C) şiddeti	D) etkisi
11.	A) güçte	B) büyüklükte	C) şiddette	D) kuvvette

2.kısım: **Aşağıda yer alan 1-21 nolu maddelerde bazı bilgi, yorum ya da yargı cümleleri verilmiştir. Her madde iki cümle (I,II) içermektedir. Her maddenin içerdiği cümlelerin doğruluk payını ayrı ayrı değerlendiriniz. Daha sonra değerlendirme sonuçlarınızı aşağıdaki seçeneklere göre belirtiniz. Cevabınızı gösteren seçeneği her maddenin yanındaki cevap kısmına yazınız.**

A) Her ikisi de doğru B) Sadece I doğru C) Sadece II doğru D) Her ikisi de yanlış

Cevap	no	Bilgi, yorum ya da yargı cümleleri
....A...	1.	I. Her yıl ülkemizde çok sayıda deprem olur. II.Ülkemiz bir deprem ülkesidir.
....	2.	I. Ormanların azalması deprem oluşumunu tetikler. II. Erozyon depremin nedenlerinden biridir.
....	3.	I. Tank, tren gibi ağır taşıtlar geçerken yol kenarlarında deprem oluşur. II. Şiddeti az olan depremleri hissetmeyiz.
....	4.	I. Japon bilim adamları depremin nerede olacağını bir hafta öncesinden bilir. II. Anormal hayvan davranışları depremin sebeplerinden biridir.
....	5.	I. Levhalar arasında biriken enerji aniden açığa çıkar. II. Depremler sonucunda levha hareketleri oluşur.
....	6.	I. Deprem sismometre ile kaydedilir. II. Depremlerin büyüklüğü bölgedeki evlerin yapısına göre değişmez.
....	7.	I. Depremin nedenlerinden biri evlerin sağlam yapılmamasıdır. II. Gecekonduların çok olduğu bölge deprem bölgesidir.
....	8.	I. Yer sarsılınca sismometre otomatik olarak çalışmaya başlar. II. Her depremin tek bir büyüklük değeri vardır.
....	9.	I. Fay hatları depremle oluşur. II. Fay hatları meridyenler doğrultusundadır.
....	10.	I. Deprem şiddeti romen rakamları (I,II, III,...) ile ifade edilir. II. Depremin şiddeti, çevrede oluşturduğu etkilere bakılarak belirlenir.
....	11.	I. Güneş yerkabuğundaki levhaları çatlatır. II. Deprem levha hareketleri sonucu oluşur.
....	12.	I. Fay hattı arama kurtarma ekiplerinin iletişim hattıdır. II. Deprem anında ilk önce fay hattı aranır.
....	13.	I. Büyük depremlerin şiddet değerleri daha fazladır. II. Deprem şiddeti, sismograf kayıtları kullanılarak hesaplanır.
....	14.	I. Kötü hava şartları depreme sebep olur. II. Hava şartlarına bakılarak depremin nerede olacağı 1 gün öncesinden hesaplanır.

2.kısım devam ediyor...

A) Her ikisi de doğru B) Sadece I doğru C) Sadece II doğru D) Her ikisi de yanlış

Cevap	no	Bilgi, yorum ya da yargı cümleleri
....	**15.**	I. Bir depremin şiddet değeri bölgenin yapısına göre değişir. II. Depremin büyüklüğü sismografla ölçülür.
....	**16.**	I. Yer kabuğu zayıf bölgelerinden aniden kırılır. II. Deprem olurken faylar arasındaki gaz patlar.
....	**17.**	I. Fay hattı olmayan yerde deprem hissedilir. II. Ülkemizde aktif fay hatları vardır.
....	**18.**	I. Dünyanın dengesinin bozulması depremin sebeplerindedir. II. Deprem çoğunlukla geceleri olur.
....	**19.**	I.Sismometre depremin olacağı yeri gösterir. II. Deprem dalgalar halinde yayılır.
....	**20.**	I. Levha hareketlerinin çok olduğu bölge deprem bölgesidir. II. Deprem bir çeşit heyelandır.
....	**21.**	I. Güneşten gelen yüksek ısı depreme sebep olur. II. Dünyamızda sürekli deprem olmaktadır.

3.Kısım: **Aşağıda yer alan 22-38 nolu maddelerde bazı bilgi, yorum, yargı ya da davranış cümleleri verilmiştir. Her maddede verilen cümleleri tehlike ya da önlem olarak sınıflandırınız. Cevabınızı gösteren seçeneği her maddenin yanındaki cevap kısmına yazınız.**

A) I.Tehlike, II.Önlemdir **C) İkiside tehlikedir**

B) I.Önlem. II.Tehlikedir **D) İkiside önlemdir**

Cevap	no	Bilgi, yorum, yargı ya da davranış cümleleri
.....A..	**22.**	I. Yapısında sorun olan binalar depremde kolaylıkla yıkılır. II. Depreme dayanıklı binalar inşa edilir.
....	**23.**	I. Depremden sonra binanın düzenli olarak boşaltılması can ve mal kaybını azaltır. II. Bina çıkış planı ve uygulaması yapılır.
....	**24.**	I. Depremde telefon hatlarının meşgul olması can ve mal kayıplarını arttırabilir. II. Deprem sonrasında telefonlar acil durumlarda kullanılır.
....	**25.**	I. Depremden hemen sonra binada çakmak kullanılmaz. II. Depremde binada doğal gaz kaçakları oluşabilir.

3.kısım devam ediyor.

A) I.Tehlike, II.Önlemdir **C) İkiside tehlikedir**

B) I.Önlem. II.Tehlikedir **D) İkiside önlemdir**

Cevap	no	Bilgi, yorum, yargı ya da davranış cümleleri
....	26.	I. Depremden hemen sonra temel ihtiyaçlarımızı temin etmek zor olabilir. II. Depremden önce gerekli malzemelerin olduğu bir çanta hazırlanır.
....	27.	I. Evden çıkılırken telefonlar kontrol edilir. II. Evden çıkarken gaz vanaları kapatılır.
....	28.	I. Depremde binada elektrik kaçakları oluşabilir. II. Depremde duvardaki çerçeveler düşebilir.
....	29.	I. Depremden hemen sonra elektrik düğmelerinden. pirizlerden uzak durulur. II. Çerçeveler duvara kancalı vidalar ile asılır.
....	30.	I. Depremde yangın çıkma ihtimali vardır. II. Depremde panik yapma olasılığı yüksektir.
....	31.	I. Sallantı yüzünden düşebilir kendimize ve çevremizdekilere zarar verebiliriz. II. Depremde çök. kapan. tutun posizyonu alabiliriz.
....	32.	I. Depremde pencerelerden uzak durulur. II. Depremde derin nefes alarak sakinleşir.
....	33.	I.Depremde kimlik kartı. tapu. banka cüzdan gibi önemli evraklar zarar görebilir. II. Kimlik kartı gibi önemli evrakların bir kopyası deprem çantasına konur.
....	34.	I. Deprem çantası sık sık kontrol edilir. II. Depolanan içecek ve yiyecekler zamanla bozulur.
....	35.	I. Sallantı yüzünden asansör bina duvarları arasına sıkışabilir. bozulabilir. II.Deprem sonrası binadan çıkarken mervidenler kullanılır.
....	36.	I. Eşyalar uygun şekilde sabitlenir. II. Sallantı yüzünden eşyalar düşebilir.
....	37.	I. Şiddetli deprem sarsıntısı pencere camlarını kırar. II. Depremde telaş ve panik hataya yol açar.
....	38.	I. Depremde balkonlardan uzak durulur. II. Depremde balkonlar kolaylıkla hasar görür.

Başarılar ☺

APPENDIX I: EARTHQUAKE PARK TRIP POST ACTIVITY –THE TASKS OF POSTERS

Depreme Nasıl Hazırlanmalıyız?

Sevgili çocuklar,

Ülkemiz topraklarının çoğunluğu deprem bölgesidir. Bu yüzden depremle yaşamayı öğrenmemiz çok önemlidir. Ancak ülkemizdeki bir çok kişi depreme hazırlık süreci hakkında bilgi sahibi değildir. Sizler depremle ilgili bir çok bilgi edindiniz, videolar izlediniz, geziye katıldınız. Şimdi göreviniz depreme hazırlık süreci hakkında en çok merak edilen sorulara cevap veren bir poster hazırlamaktır.

En çok merak edilen konular:

- Depremde tüm evler yıkılır mı?
- Depremde odadaki eşyalar bize zarar verebilir mi?
- Evdeki tehlikeleri azaltmak için neler yapmalıyız?
- Deprem posizyonu nedir?
- Deprem çantası nedir? Ne işe yarar?
- Bina çıkış planı neden önemlidir?

<u>Posterin İçeriği:</u>

- En çok merak edilen soruların cevapları
  (yukarıdaki en çok merak edilen konular)
- Grup olarak hazırladığınız soru ve cevabı
- Sizin depreme hazırlık süreci hakkında vermek istediğiniz ek bilgiler

<u>Gerekli malzemeler:</u> Karton, yapıştırıcı, makas, renkli kalemler, depremle ilgili resimler. (size dosya içinde verilen resimler)

<u>Süre: 30 dakika</u>

Takım arkadaşlarınızla işbirliği yaparak kısa süre içerisinde depreme hazırlık sürecini anlatan güzel bir poster hazırlamanız gerekmektedir.

Posterinize mutlaka bir başlık ve slogan yazınız.

İsimlerinizi posterin üzerine yazınız.

Başarılar☺

Depremler Nasıl Oluşur?

Sevgili çocuklar,

Bir çok insan depremle ilgili çeşitli konuları merak etmektedir. Sizler depremle ilgili bir çok bilgi edindiniz, videolar izlediniz, geziye katıldınız. Şimdi göreviniz en çok merak edilen sorulara cevap veren bir poster hazırlamaktır.

En çok merak edilen konular:

- Depremler nasıl oluşur?
- Ülkemizde deprem olur mu?
- 2009 yıl ülkemizde kaç deprem olmuştur?
- Ülkemizde fay hattı var mıdır?
- Deprem olunca çevre etkilenir mi?
- Neden ülkemizde deprem hazırlık çalışmaları yapılmalıdır?
- Deprem ne zaman, nerede olacak?

Posterin İçeriği:

- En çok merak edilen soruların cevapları
  (yukarıdaki en çok merak edilen konular)
- Grup olarak hazırladığınız soru ve cevabı
- Sizin depremle ilgili olarak vermek istediğiniz ek bilgiler

Gerekli malzemeler: Karton, yapıştırıcı, makas, renkli kalemler, depremle ilgili resimler. (size dosya içinde verilen resimler)

Süre: 20 dakika

Takım arkadaşlarınız ile işbirliği yaparak kısa süre içerisinde depremi anlatan güzel bir poster hazırlamanız gerekmektedir.

Posterinize mutlaka bir başlık ve slogan yazınız.

İsimlerinizi posterin üzerine yazınız.

Başarılar☺

Deprem Olursa Ne Yaparım?

Sevgili çocuklar,

Ülkemizde her gün çok sayıda deprem olmaktadır. Deprem sırasındaki ve sonrasındaki davranışlarımız depremin zararlarını azaltmak için çok önemlidir. Ancak ülkemizde birçok kişi deprem sırasında ve deprem sonrasında nasıl davranması gerektiğini bilmemektedir. Sizler depremle ilgili bir çok bilgi edindiniz, videolar izlediniz, geziye katıldınız. Şimdi göreviniz bu konuda en çok merak edilen sorulara cevap veren bir poster hazırlamaktır.

En çok merak edilen konular:

- Deprem olurken ne yapmalıyım?
- Depremden sonra binada nerelere dikkat etmek gerekir?
- Deprem sonrası ailemi nasıl bulurum?
- Depremden sonra binadan nasıl çıkmalıyım?
- Deprem sırasında hangi davranışlardan uzak durmalıyız?
- Depremden sonra hangi davranışlardan uzak durmalıyız?

<u>Posterin İçeriği:</u>

- En çok merak edilen soruların cevapları
  (yukarıdaki en çok merak edilen konular)
- Grup olarak hazırladığınız soru ve cevabı
- Sizin depremle ilgili olarak vermek istediğiniz ek bilgiler

<u>Gerekli malzemeler:</u> Karton, yapıştırıcı, makas, renkli kalemler, depremle ilgili resimler. (size dosya içinde verilen resimler)

<u>Süre: 20 dakika</u>

Takım arkadaşlarınızla işbirliği yaparak kısa süre içerisinde deprem sırasındaki ve sonrasındaki davranışları anlatan güzel bir poster hazırlamanız gerekmektedir.

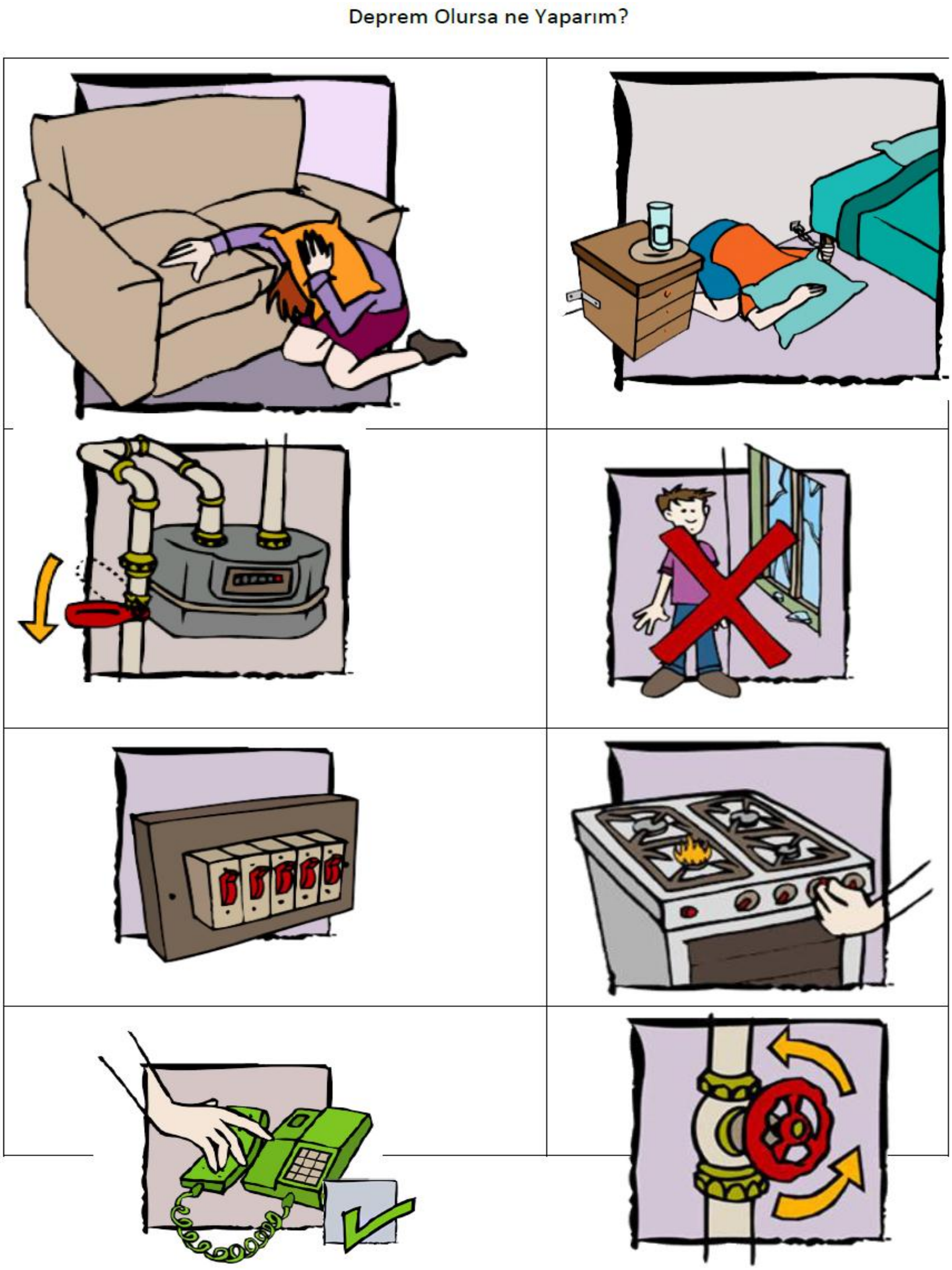
Posterinize mutlaka bir başlık ve slogan yazınız.

İsimlerinizi posterin üzerine yazınız.

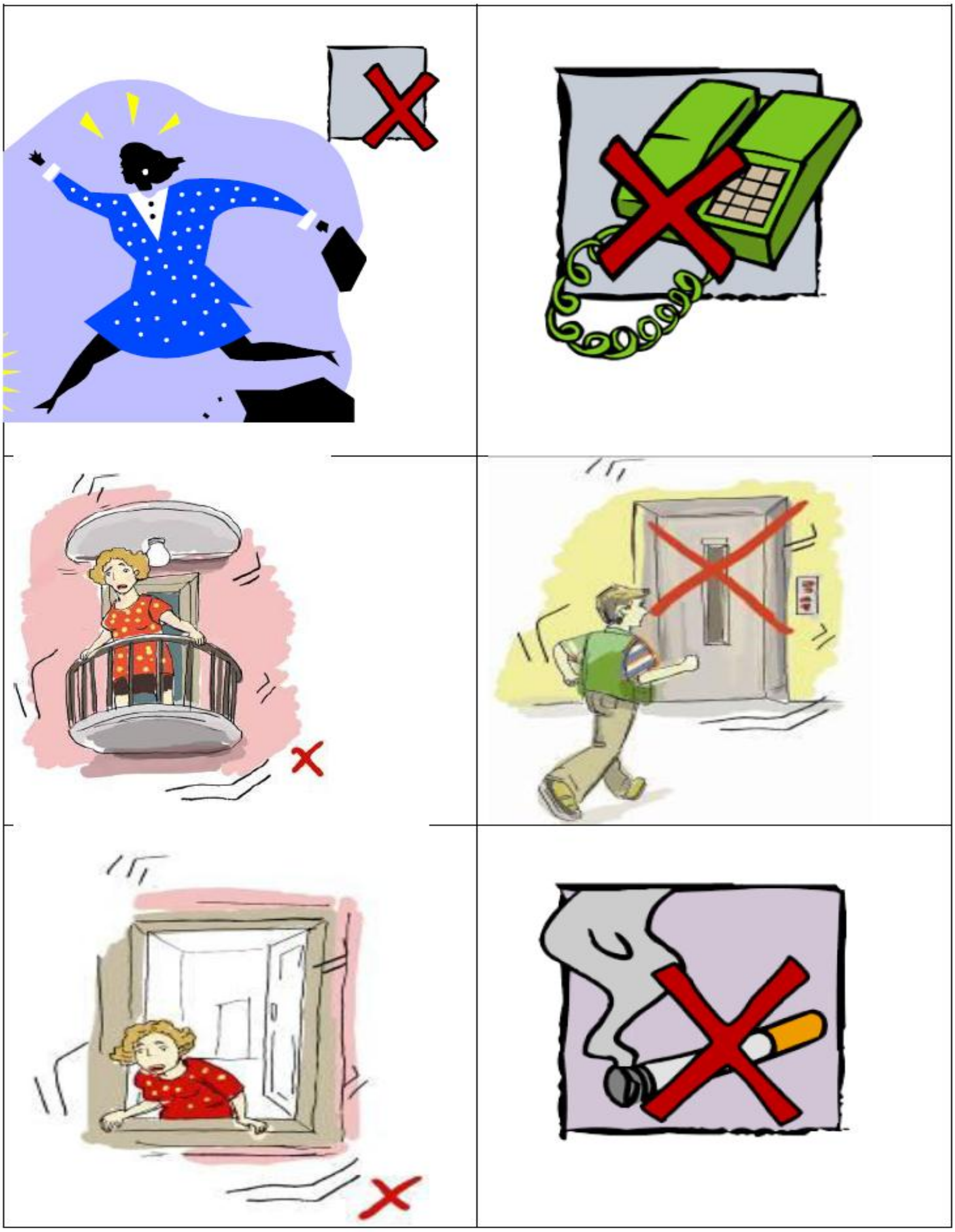
Başarılar☺

APPENDIX J: EARTHQUAKE PARK TRIP POST ACTIVITY – AN EXAMPLE OF POSTER PICTURES

The sample pictures gathered from DPEU and arranged for the poster work.



Deprem Olursa ne Yaparım?

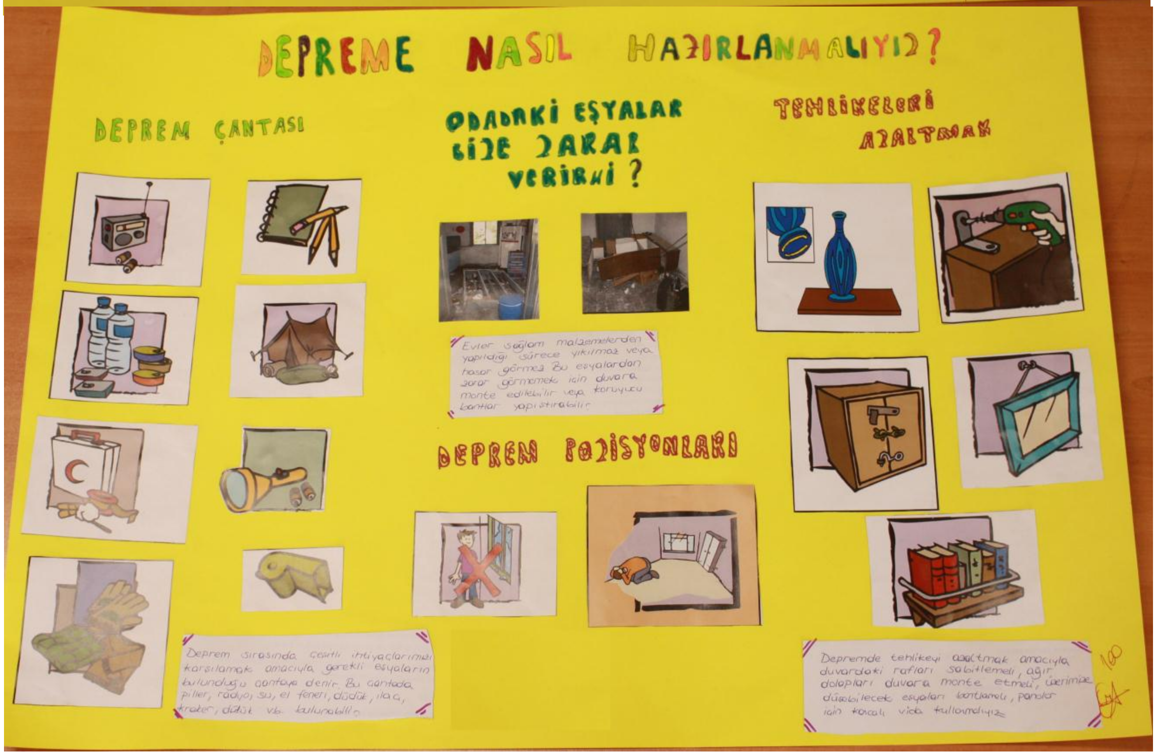


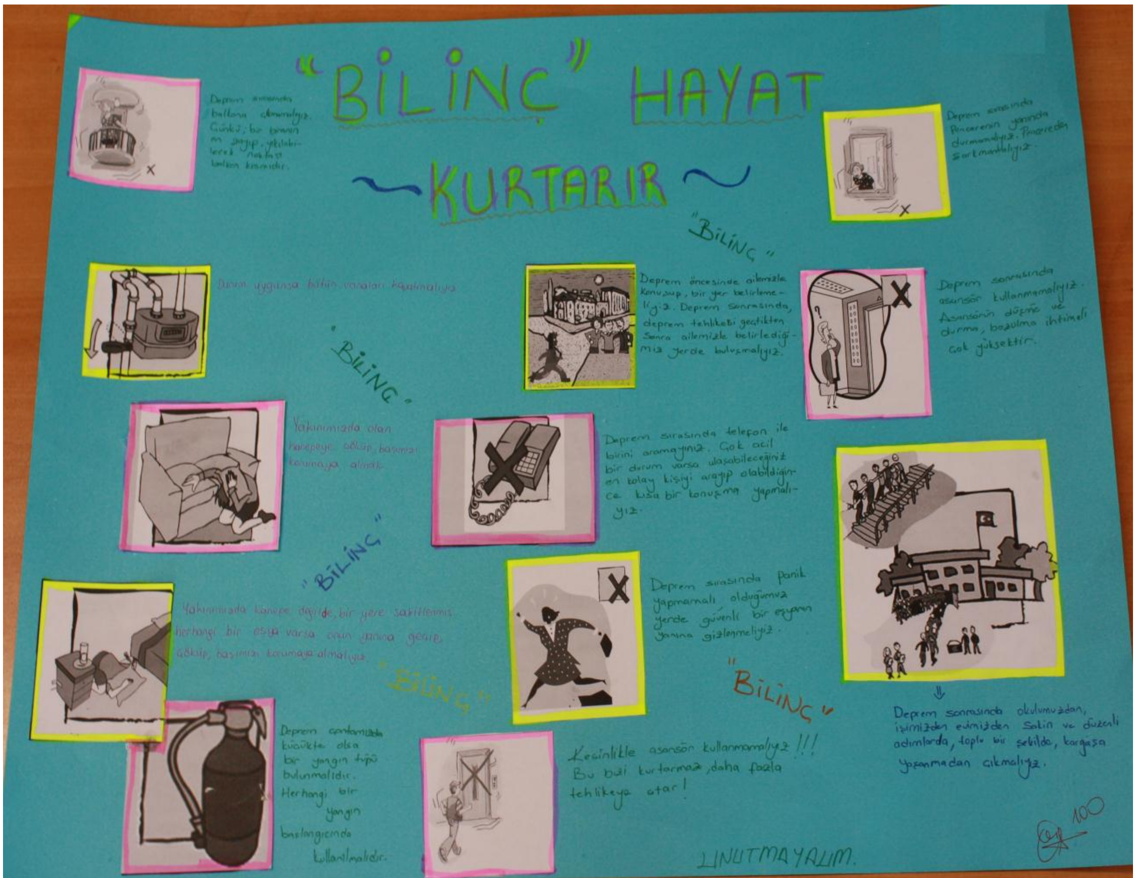
Deprem Olursa ne Yaparım?

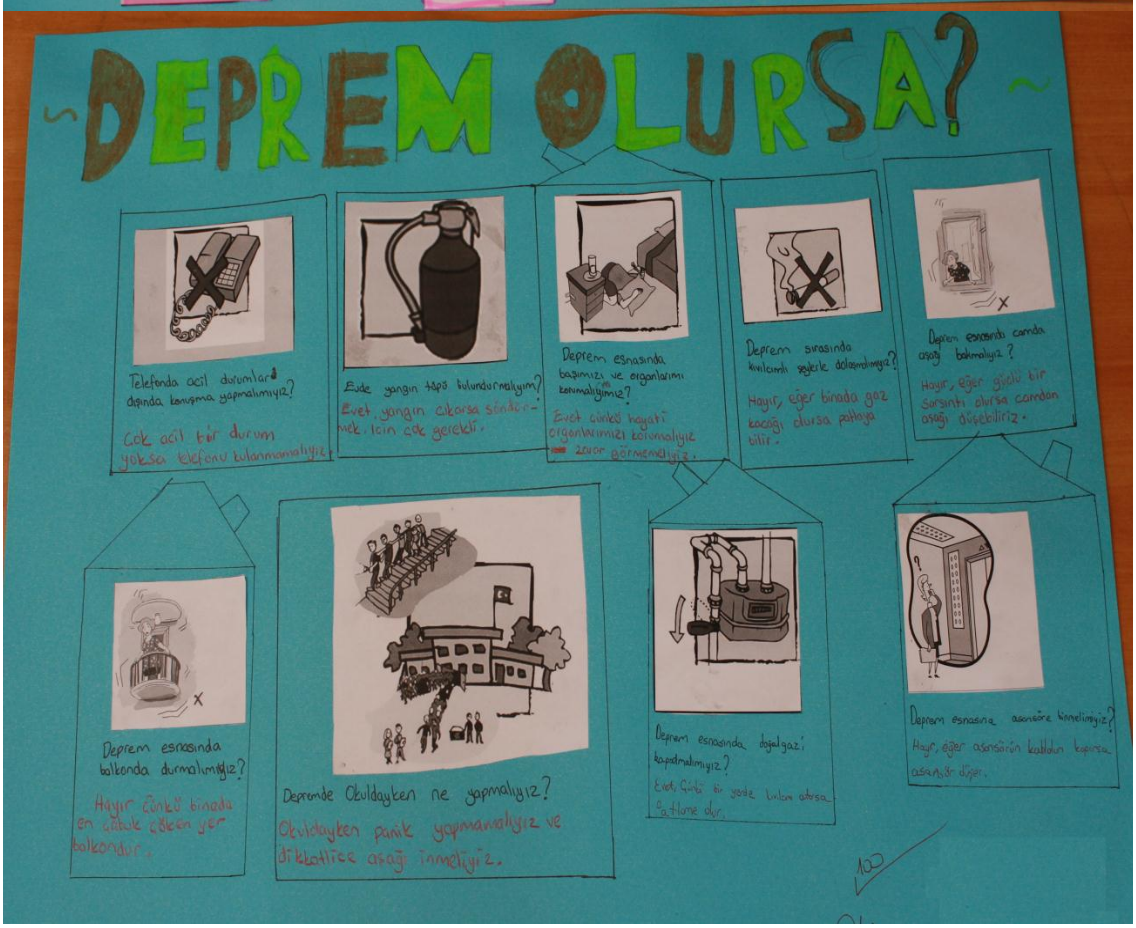
APPENDIX K: EARTHQUAKE PARK TRIP POST ACTIVITY – SOME EXAMPLES FROM STUDENT POSTERS

Some examples from the posters which were made during the pilot study and the main study were given in this appendix.

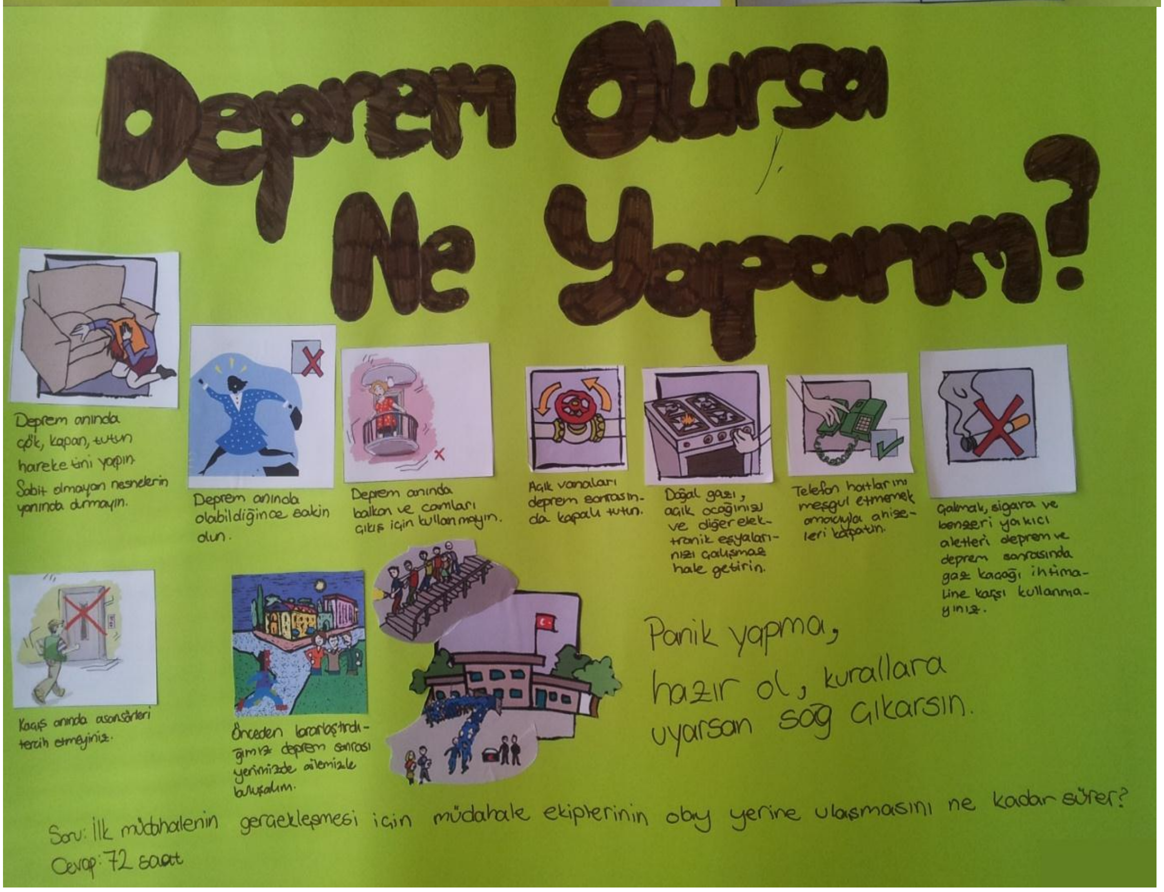
- The posters were made by students during the pilot study.



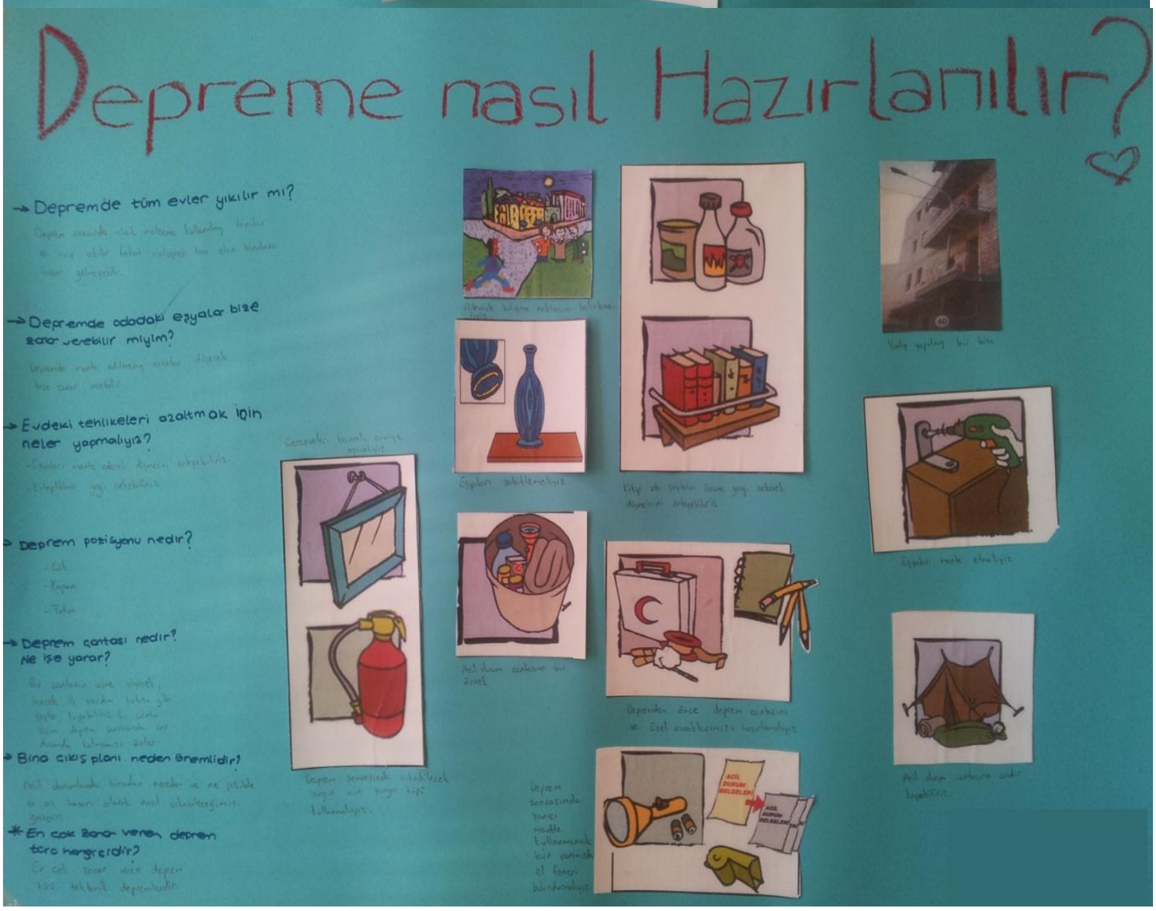

"BİLİNÇ" HAYAT
~KURTARIR~
"BİLİNÇ"
Kesinlikle asansör kullanmamalıyız!!!
UNUTMAYALIM.


~DEPREM OLURSA?~
Telefonda acil durumlar dışında konuşma yapmalımıyız?
Çok acil bir durum yoksa telefonu kullanmamalıyız.
Deprem esnasında balkonda durmalımıyız?
Deprende Okuldayken ne yapmalıyız?
Okuldayken panik yapmamalıyız ve dikkatlice aşağı inmeliyiz.

- The posters were made by students during the main study.




DEPREMLER NASIL OLUŞUR?
LEVHALAR
Depremler nasıl oluşur?
Ülkemizde deprem olur mu?
Ülkemizde fay hattı var mıdır?
1. Kuzey Anadolu Fay Hattı
2. Doğu Anadolu Fay Hattı
KARADENİZ
AKDENİZ
TÜRKİYE'DE FAY HATLARININ DAĞILIŞI
2009 YILI TÜRKİYE VE YAKIN ÇEVRESİ DEPREM ETKİNLİĞİ Toplam: 9196 Adet
Odak noktası
Deprem olunca çevre etkilenir mi?
Neden ülkemizde deprem hazırlık çalışmaları yapılmalıdır?
Sorumuz: Depremlerin yerlerini ve büyüklüklerini önceden bulunabilir mi?
Depremin Çevreye Etkileri


Depreme nasıl Hazırlanılır?
Depremde tüm evler yıkılır mı?
Depremde odadaki eşyalar bize zarar verebilir miyim?
Evdeki tehlikeleri azaltmak için neler yapmalıyız?
Deprem pozisyonu nedir?
Deprem çantası nedir? Ne işe yarar?
Bina çıkış planı neden önemlidir?
En çok zarar veren deprem türü hangisidir?

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