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Planetariums as a source of outdoor learning environment[#]

Aksu Seyma* and Umdu Topsakal, Ünsal

Yildiz Technical University, Turkey.

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The aim of this study is to study the effect of using planetariums as an outdoor learning environment regarding students' opinions. Therefore, descriptive qualitative research was used. The participants were from a school in Istanbul. Ten students, 4 male and 6 female, participated in a planetarium visit to a museum. The data of the study were obtained in 2016. A survey instrument consisting of 6 open ended questions and semi-structured interviews were used as data collecting tools. As a result of the collected data, using planetariums as outdoor activities in science education had a positive effect on students. The students found planetarium interesting and they stated that the visit was very fun.

Key words: Informal learning, outdoor activities, outdoor learning environments, astronomy education, planetariums.

INTRODUCTION

Manning (1994) stated that planetariums operate in all three realms of learning: cognitive realm, psychomotor area involving physical action; the affective realm; and the realm of feelings, as we encourage greater appreciation and enjoyment of the sky and try to cultivate a sense of the adventure of science.

The recognition of non-formal and informal learning is an important means for making lifelong learning available for all, and for reshaping learning to better match the needs of 21st century knowledge. Formal learning, in general, occurs at education centers like schools and it is defined as a learning that is scheduled, whereas informal learning is not scheduled and oriented. Informal learning is an independent learning which, like non-formal learning, may take place in various environments, but is not preplanned and premeditated, not purposeful or specially organized, and can continue for a long time (Björnavåld, 2000). To make concrete these two types of learning, formal and informal learning- an example from Jay Cross can be stated. Cross (2007) makes an analogy in his book for formal learning and informal learning as riding on a bus vs. riding a bike. What he tries to say is that with the formal learning bus, "the driver decides where the bus is going; the passengers are along for the ride". When on the informal learning bike, "the rider chooses the destination, the speed and the route."

In education, formal and informal learning can be combined because informal learning activities can

*Corresponding author. E-mail: seymaaksu000@gmail.com.

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support formal learning in education. Many studies show that outdoor activities have a positive impact on education. For example, science museums, science centers, zoos and botanic gardens are out of school environments in which science education is more attractive for students and complement school courses (Braund and Reiss, 2006). Activities that occur outside the school setting are not developed primarily for school use or to be part of an ongoing school curriculum but are characterized by voluntary as opposed to mandatory participation as part of a credited school experience (Crane et al., 1994)

Studies show that out of school learning environments (OSLE) are more effective with formal education. Luehmann (2009) argued that outdoor education is necessary for students. Braund and Reiss (2006) pointed out in their study that science education should be completed with out of school activities like science centers tour, planetarium or field trips.

The role of the OSLE in education is to make education more effective. According to the Science Education Program in Turkey, it involves environments (argumentation, problem-based ext.) in which the students are active and the teacher is a guide. To get information in these environments as permanent, in and out of learning environments should be considered (MEB, 2013). In this regard, informal environments such as science, art museums, zoos, natural environments are used. As an example of out of learning environments, there are studies that are of the opinion that planetariums are means of formal science education. Some studies suggest teachers' opinions about the role of planetariums as a medium for teaching science. Such studies opine that teachers agree that planetariums provide a lasting and meaningful learning effect on students (Bozdoğan, and Ustaoğlu, 2016). However, there are limited studies showing the effect of using planetariums as an out of learning environments on students' learning. As a result, the aim of this study is to examine the effect on students' opinions of using planetariums as outdoor activities in science education.

Astronomy education and planetariums

Astronomy is a discipline on the physical universe and the structure of the cosmos. That is astronomy, helps us to better understand the mechanism of the earth and the cosmos. In general, astronomical concepts are abstract and require 3D thinking. As a result of this requirement, astronomy education needs special interest and techniques. Many studies show that both students and teachers have misconceptions about some astronomy concepts. To correct the misconceptions of students and teachers, Emrahoğlu and Öztürk (2009) suggest that meaningful learning for conceptual change is required. Accordingly, the abstract terms should be transmitted perceptibly. The visual and auditory materials and models can be recommended while designing teaching activities in astronomy education should be taken advantage of Tay (2004).

Also, studies show that students have incorrect mental models of basic astronomy. In a Kurnaz and Değermenci (2012) study, it was found that students have mental models related with sun-earth-moon system that are not consistent with scientific explanations. Another study shows that students have misconceptions on solar system, planets' orbit, the stages of the Moon, distance of the celestial bodies from the Earth. Because of these misconceptions, students and researchers have tried to provide suggestions about teaching the concept to eliminate them (Uğurlu, 2005). Some of the suggestions that Uğurlu (2005) stated in his study are as follows:

1. Use of visual materials
2. Using only teaching materials to give the subject is not sufficient. It may be more effective to use activities in which students join personally
3. Related documentary can be watched
4. Group should work on a related subject (Uğurlu, 2005)

Regarding these kind of suggestions, it can be figure outed that learning environments have an impact on students learning. The richness of learning environments can block revealing misconceptions. Studies also show that students have misconceptions on Sun-Earth-Moon relative movements like Moon phases, Sun and Moon eclipses and others in astronomy education. In a study, Şahin et al. (2013), found that students have alternative conceptions such as:

1. The sun is not a star.
2. The planets and the stars are the same.
3. The shape of the stars is the same as in the Turkish flag.
4. The students cannot explain the difference between meteor and meteorite.
5. The students think that stars are the smallest in the solar system.

Sahin and colleagues (2013) suggest that it can be useful to use different teaching techniques and strategies to break down the misunderstandings students have in science education. In the society, there are events results in the deficiency of the astronomy education. Some of the events are in the followings: The solar eclipses leads to different beliefs, December 21st and Şirince, suicide and UFO. This is because these kind of beliefs blocks scientific beliefs system; astronomy education should be studied scientifically. Developed countries give importance to astronomy training and education to solve this problem. Additionally, they established planetariums,

observatories and science centers almost everywhere throughout the country. Several studies have been conducted on the effectiveness of planetariums on astronomy education. In one study, Plummer (2009) found that planetariums improve understanding of celestial motion because of planetariums' rich visual environment and kinesthetic learning techniques. Another study shows that planetariums are useful for teaching constellation study and also for improving students' attitudes towards astronomy (Mallon and Bruce, 1982).

Planetariums create environments that encompass the audience, bringing them into the experience in a way that classroom, book, television, or computer screen cannot. Clearly, planetariums represent one of the biggest and most visible avenues for presenting astronomy and related subjects to the public (Manning, 1994). This gives planetariums better position to support both formal and informal science education. Planetariums, as a result, effectively demonstrate astronomical principles, represent concepts and information that other media cannot. This advantage should be taken into consideration for science education goals which are meaningful and permanent learning. Since planetariums are places for both formal and informal learning, the educators should benefit from the opportunities of planetariums. Manning (1994) found that the students felt the reality of the sky and also enjoyed learning astronomy concepts.

According to Barstow et al. (2001), education should continue outside the classroom with strong support and involvement from parents and in collaboration with museums, science centers, planetariums and other center of informal science learning. Planetariums make learning more enjoyable and efficient.

Research questions

1. Are there any effects on students' perception about visiting planetarium as an outdoor learning environment?
2. Do the students find visiting planetarium interesting according to the traditional science course?

MATERIALS AND METHODS

The study aims to realize the effect of using planetarium in astronomy education as an outdoor learning environment regarding students' opinions. The study used a descriptive qualitative research approach. The reason for choosing the method is that we want to represent their use from the perspective of the recipient, that is, the students.

The study group of the research consists of 10 students from the same school in Istanbul, Turkey and the same grade, but from different science classes. The students are seventh grades and 13 years old. They took the same required course in science. Moreover, the students volunteered to join the planetarium trip. The students were selected according to a criteria that they had totally a good grade (80 to 100) in science course. Since the focus of the research is on the effectiveness of using planetariums as an outdoor learning environment regarding students' opinions, a planetarium in a museum was visited. An appointment was created by the researchers three days before the visit to the museum. Before visiting the planetarium, the students were informed about the trip rules and outdoor education. The students after the visits, knew that this was a study. One visit was designed because of the course schedule and time restriction. The visit took 2 h and during the visit, the students said that they came here for the first time and therefore, they heard the word 'planetarium' for the first time.

Data collecting tools

In this study, to get an idea about the effectiveness of using planetariums as an outdoor learning environment regarding students' opinions, a survey instrument consisting of 6 open ended questions was used. During the preparation of these questions, relevant literature was surveyed and after scanning the literature, appropriate questions were chosen by the researchers. Then, experts' opinions were taken (3 science educators). Necessary corrections were made and incomplete sections were organized.

Interviews are one of the data collection techniques through verbal communication (Büyüköztürk et al., 2008). In this study, an individual semi-structured interview with relevant open-ended questions was also used as a data collecting tool. Semi-structured interviews were carried out in order to examine the thoughts of the students more thoroughly. The answers received were recorded by the researchers by taking written notes and analyzed later. Each student's interview lasted for approximately 30 min. One of the researchers was also the students' instructors. The instructor informed the students that they did a visit and this visit concept was related with their science concept. The students were informed that the visit they had was named outdoor activities.

Data analysis

Content analysis was performed in the process of analyzing interview records. The opinions of the students were analyzed by open-coding (Bryman and Burgess, 1994). At data coding stage, the data were categorized and arranged by the researchers. The organized data are divided into meaningful sections and researchers try to find out what each section means conceptually and define the codes (Creswell, 2003). The collected data was coded by the researchers. For the reliability, the researchers make analysis separately and then they compare their results. According to the compared codes, there is compatibility of 78%.

RESULTS

The results are separately examined for each question in the survey.

Q1: What do you think about using outdoor activities in science education?

The students' answers to this question were coded. Nine students were of the opinion that outdoor activities are important for science courses. As an example, a student answer to the question is as follows:

"It is important using outdoor activities in science

education because the students learn the subject with love and fun. So, it is beneficial for the brain."

Five students said outdoor activities help them in visual learning, two found using outdoor activities in science education fun. The rest of the students think that those activities are helpful for memorability.

This answer and the others show that outdoor activities have a positive impact on students because they thought that this types of activities are important and help them to understand concept well.

Q2: Do you like science class as structuring like that? What do you think about that?
The answers to this question were coded 7, students reported that they like science courses and find it fun if outdoor activities are used. 4 students found those activities instructive. One student reported those kinds of activities are almost real. In general, students find planetarium as fun and one of the students reported:
"We already watch and listen in the class, but planetarium was different because we feel we are in the video." This student above felt as if he is acting in a film and this was very fun.

In this step, both Q3 and Q4 were analyzed together. The questions and their analysis are as follows:

Q3: What are the deficiencies of the planetarium visit?
Q4: If you had a chance to go to planetarium again, what would you want to change?

The answers to the above questions are similar. Students stated that the visiting time was short. They want to have more time to go around the museum. Otherwise, there were no deficiencies about the outing, students said. If they had a chance, they would change the outing time duration. One of the students said:
"I would go out early and visit much more."
Another student said: "I would extend the time, if I had a chance."

The following questions were on astronomy concepts. Actually, the questions were analyzed to reveal students misunderstanding concept or challenging subjects in astronomy education. That is, the questions reveal how planetarium affects students understanding.

Q5: Did you like astronomy subjects? To you, what lecturing style should be used in teaching those subjects in science classes?
The students' answers were coded and ten out of two students said that the subjects in astronomy education should be lectured by short videos. Two students think that they like the subjects but they want to have more information about the subjects. Three students like the subjects and also like the visiting. Therefore, the above students think that structuring the science course can be combined by visiting activities. One of the students reported:

"Yes, I liked astronomy concept. The subjects would be enjoyable by going to museums, exhibition ext."

Two students think that the subjects require 3D thinking and because of this, the lesson should be supported with models. One of the students reported that:

"Astronomy is a discipline I liked since I was little. I was curious about astronomical subjects. These subjects should be lectured with the help of visual materials. When I see models, it is easy to remember the concept. Planetarium is the best example for that."

The last question was about the effect of the planetarium visit on students' understanding level. The question is that:

Q6: Was the planetarium visit helpful in understanding the subjects which you do not get? Explain, briefly.

The students' answers to that question were coded and five students said that they learned new things with the help of planetarium. Four students stated that planetarium helps us to be stronger in the subject. Two students pointed out that planetarium was intriguing, meaning that it causes curiosity about astronomy. One of the students says that:

"In the planetarium, I can say that things I have been curious about were revealed."

DISCUSSION

The aim of this research was to see the effect of using planetariums as outdoor activities in science education regarding students' opinion. In this direction, when the students' opinions about using planetariums as an outdoor learning environment in science education were examined, it seens that planetariums have positive effects on students. Pasachoff and Percy (2005) stated in their book that museums and planetariums can provide an informal learning environment to students, that is, very different from the formal one in a school. In another study, pre-service teachers stated that planetariums were educational, interesting, fun, and they had an impressive atmosphere which would promote students' motivation towards science courses (Bozdoğan and Ustaoğlu, 2016).

It is also stated that planetariums and museums are ideal places for providing wonder, for the opportunity of exploring variety of concepts and for expanding young minds (Pasachoff and Percy, 2005). In this research, it was found that the students wanted to spend more time in planetariums.

In this research, students are of the opinion that astronomy concepts should be lectured with short videos and visual materials like models. Planetariums include all of those strategies. A planetarium truly presents a “big picture”, with images that immerse an audience in science stories (Wyatt, 2004). The students that participated in this research also said planetariums are beneficial for understanding concepts by visualizing, which is useful for the brain (Pasachoff and Percy, 2005).

Most of the students who participated in this study reported that they learned new things with the help of planetariums. Dunlap (1990) opines that planetariums provide students with increase in the understanding of astronomical concepts.

In this study, it is stated and supported with the students’ opinions that the use of planetariums as an outdoor activity in science education has positive effect on students and the result have contributed to the literature on school learning environments in science education in Turkey.

CONFLICT OF INTERESTS

The author has not declared any conflict of interest.

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