

Investigation of the Effects of Environmental Education Courses Taught with Educational Technology Tools on Pre-service Teachers

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Abstract: In this study, it was tried to determine the effects of environmental education carried out by using educational technology tools on pre-service science teachers. The study group consists of 56 candidates studying in the 3rd grade of Trakya University Education Faculty Science Education Department in the 2018-2019 academic years. The environmental education process was carried out with all of the teacher candidates, covering 14 weeks. At the end of the process, 4 female and 2 male volunteer teacher candidates were determined and interviews were held to determine their views on the education process. In the semi-structured interviews conducted with six pre-service teachers at the end of the implementation process, it was determined that their expressions about the environmental education process focused on raising awareness, making the learner active, providing the opportunity to experience, providing meaningful learning, being interesting and being productive. Pre-service teachers found the education process advantageous in terms of activate the sense organs, support active participation, increase motivation, draw attention, and make complex subjects understandable. The pre-service teachers who participated in the interview stated that they wanted to use the applications carried out with educational technology tools in their professional lives.

Key Words: Environmental Education, Educational Technology Tools, Pre-service Teachers

Eğitim Teknolojisi Araçları ile İşlenen Çevre Eğitimi Derslerinin Öğretmen Adayları Üzerinde Yarattığı Etkilerinin İncelenmesi

Özet: Bu çalışmada fen bilimleri öğretmen adayları üzerinde eğitim teknolojisi araçları kullanılarak gerçekleştirilen çevre eğitiminin yarattığı etkiler belirlenmeye çalışılmıştır. Çalışma grubunu, 2018-2019 öğretim yılı Trakya Üniversitesi Eğitim Fakültesi Fen Bilimleri Öğretmenliği Bölümü 3. sınıfta öğrenim gören 56 aday oluşturmaktadır. Çevre eğitimi süreci 14 haftayı içine alacak şekilde öğretmen adaylarının tümüyle gerçekleştirilmiştir. Süreç sonunda 4 kadın 2 erkek gönüllü öğretmen adayı belirlenerek eğitim süreci konusunda görüşlerini saptamak için görüşmeler yapılmıştır. Uygulama sürecinin sonunda altı öğretmen adayıyla yapılan yarı yapılandırılmış görüşmelerde çevre eğitimi sürecine yönelik ifadelerinin farkındalık kazandırma, öğreneni aktif kılma, deneyimleme olanağı sunma, anlamlı öğrenme sağlama, ilgi çekici olma ve verimli olma üzerinde yoğunlaştığı tespit edilmiştir. Öğretmen adayları duyu organlarını aktif kılma, aktif katılımı destekleme, motivasyonu artırma, dikkat çekme, karmaşık konuları anlaşılabilir kılma özellikleri bakımından eğitim sürecini avantajlı bulmuşlardır. Görüşmeye katılan öğretmen adayları eğitim teknolojisi araçlarıyla yürütülmüş olan uygulamaları meslek hayatlarında kullanmak istedikleri ifade etmişlerdir.

Anahtar Kelimeler: Çevre Eğitimi, Eğitim Teknolojisi Araçları, Öğretmen Adayları

1. INTRODUCTION

Learning environments enriched with educational technology tools provide equal opportunities in education in terms of all students' access to materials regardless of time and place. Effective learning is provided by keeping students active with different learning methods and techniques, by following the developments in the world, constantly updating themselves, adopting openness to innovation and developing and changing (Laudon and Laudon, 2014-2015).

In the 21st century we live in, it has become easier to reach information, to transfer information and to spread it to large masses with rapidly developing science and technology. Technology, which affects

every aspect of life, has a place in education as well (Selvi and Yıldırım, 2018). There is a relationship between education and technology that mutually affect each other. As a result of the development of education, technology develops and as a result of the development of technology, the quality of education increases. Following the technological changes and incorporating these products into the educational environment becomes a necessity to raise the individuals needed by the age. Thus, a more qualified education process is offered to students (Tekindal et al., 2010). Students will have the opportunity to experience knowledge first hand, and a more permanent learning will be provided with technologies that will make it more understandable by supporting and enriching

abstract concepts that are difficult to understand with their sense organs. By making the learning process enjoyable and providing effective, permanent and fast learning as an output of the process, the performance satisfaction of the teacher will be at higher levels (Hashim and Mustapha, 2004).

Technology plays an important role in achieving goals in education. Therefore, educators have to combine the education process with technology, regardless of their field of study (Akkoyunlu, 2002). The experience of pre-service teachers, who will be the guide of the educational process, about technology and the use of technological elements during their undergraduate education will affect their professional lives and will provide self-confidence and motivation to use these tools with their students (Wachira and Keengwe, 2011). In addition, thanks to educational technologies, students will be provided with the opportunity to learn according to different learning styles (Gülbahar, 2005).

Today, materials and tools developed depending on scientific and technological advances are increasing rapidly in terms of number and variety. The newly developed resources appeal to different sense organs, and some even manage to appeal to more than one of our senses at the same time (Demirel and Yağcı, 2017). According to the researches, if the individual uses more sense organs in the learning process, more permanent and effective learning is achieved (Koşar and Çiğdem, 2003).

Among the educational technology tools used today, there are internet, computer, projector, television, slides, scanner, video player, movies, camera, camera, mobile applications (Şimşek, 2015). Multimedia elements formed by the use of video, audio, images and texts are indispensable elements of educational environments. With the items it contains, it enables students to learn information through auditory and visual materials. Students can access the information themselves and shape the process in accordance with their own learning characteristics and speed. Concrete learning can be achieved with the simulations of natural applications, especially in the courses that contain a lot of abstract concepts, such as science. It is effective in improving the communication skills of students with the opportunity to work both individually and in groups. Technology; Preschool, primary school, secondary school, high school or university, regardless of education level, finds a place for itself at every level and is used in every lesson (Alakoç, 2003).

Environmental education materials, prepared with interactive multimedia elements, deepen learning and understanding. Technological elements used in environmental education not only increase learning desire and motivation, but also offer the opportunity to observe the impact of humans on nature from complex perspectives. With the use of educational technology tools in environmental education, students' understanding of environmental problems increases. It provides a better understanding by illustrating the relationship between the environment and ecosystem elements. The consequences of projecting an environmental problem to the future will be easily seen by the students. It is possible to go beyond the existing problems in the immediate environment, to recognize the environmental problems that have reached a global dimension, and to question and rearrange their environmental actions by being aware of the big picture. With the technological elements used in environmental education, besides increasing the desire and motivation to learn, it will be possible to observe the impact of human on nature from complex perspectives (Gökmen, 2008).

In this study, the effect of science teacher candidates on effective learning of using technological tools and different learning methods in environmental education lesson was investigated.

2. MATERIAL AND METHODS

In this research, the study group consists of 3rd grade teacher candidates of Trakya University Education Faculty Science Education Department in 2018-2019 academic years. The study group consists of 56 teacher candidates. Qualitative data were collected in the research. In order to see the developments of the teacher candidates in the education process in depth and qualitatively, interviews were conducted and analyzed using a semi-structured interview form. A semi-structured interview form was developed by the researcher in order to determine the views and experiences of the pre-service teachers, who constituted the sample of the research, about the implementation process, and then it was finalized by evaluating it with expert opinion.

During the implementation process, different activities were carried out every week for 14 weeks. Among these activities, the animated movie Wall-E was watched. The opinions of the teacher candidates about the animation film were taken. Awareness walk presentation was made. Candidates were asked to take pictures of the waste they saw in their environment and then share them

on the created virtual classroom. Ecosystem ecology presentation was made and related visuals and mini-videos were shared. Watched Chasing Ice documentary. The "Sustainability" discussion was carried out. Solid wastes and waste management were discussed. 8 different TED-X talks were watched. By introducing the concept of ecological footprint, pre-service teachers were used to read the QR code reflected on the board using the "QR Reader" application, and their ecological footprints were measured. Then the National Geographic documentary "Before the Flood" was watched. There was a discussion about the movie. The documentary "A Plastic Ocean" was watched. A competition for identifying plants in the surrounding area was held with teacher candidates. The application named "PlantSnap" was used for this competition. In the virtual classroom created on Google Classroom, pre-service teachers were asked to produce environmental improvement ideas. The app is framed by current climate change science using interactive C-ROADS computer simulation, which allows participants to observe how their proposed policies affect the global climate system in real time. A field trip to "Edirne Solid Waste Landfill and Disposal Facilities" was held with teacher candidates.

After the end of the applications, separate interviews were conducted with each participant, in the time they were available, with 6 prospective teachers, 4 girls and 2 boys, on a voluntary basis. Before starting the interviews, it was explained to the participants that the audio recording of the interview would be taken and the purpose of using these recordings, and their permission was requested. During the interview process, additional questions were asked depending on the answers of the pre-service teachers.

Interviews lasted 15-20 minutes with each candidate. The voice recordings were taken by telephone, then transferred to the computer environment, processed in "sound speed reduction" programs and made ready for analysis. During the interviews, the participants were addressed by their names. During the deciphering of the voice recordings, different codes were given to each participant and identity confidentiality was preserved. These code names were also used during the analysis of the data. During the interview, it was given importance to create a safe environment for teacher candidates to express themselves comfortably. Then, descriptive analysis was applied for the qualitative data obtained from the semi-structured interview form.

3. FINDINGS

In this study, the effect of environmental education supported by educational technology tools on teacher candidates was examined. In the research, firstly, the answers given by the candidates to the question of "What is the effect of the environmental education process supported by educational technology tools on you?", one of the semi-structured questions were evaluated. The findings regarding the answers of the pre-service teachers are presented in Table 1.

In Table 1, the views of pre-service teachers about how the environmental education process supported by educational technology tools had an impact on them are given. When the answers from the interview questions were examined, it was determined that there was a cognitive change in the pre-service teachers with the education process, with the recognition of environmental and environmental problems and their awareness of these elements. It is seen that they experience a change in affective dimension with the desire to worry about the future, to believe that they can create change with their actions, and to take responsibility. It has been determined that there is a change in behavioral dimension with taking actions for resource conservation, acquiring environmentally sensitive consumption habits, and producing projects for environmental problems. Regarding the subject, the pre-service teacher with the code S1 expressed her thoughts as "... we have been together for 3 months, 3-4 months. Judging by the change it certainly did, yes. I do not use *pochette*. They make fun of me at the dorm because I'm allergic to plastic. When I go to the grocery store, I never buy heavy plastic stuff. I am definitely transformed. It has been a huge help to my transformation. Here, when I'm at dormitory, my hand is always in the socket. I always turn it off. I mean, I used to go to cafes, like Starbucks. If I don't have a thermos with me, I don't go in anymore. I don't drink coffee. I don't buy coffee at school. I don't want to buy these plastic things. I really do this. The plastics coming out of the stomachs of those fish and birds affected me the most, giving me goosebumps. My eyes are filled with tears. I thought about how we could do this to a living thing. I'm getting a coffee. I drink it; it's over in 10 minutes. We now have a waste. What happened then? That's it. I'm not doing it. I bought cloth bags, giving such messages. Now I'm looking for a net for vegetables. I bought these for my mother as well. There is a balcony in the dormitory. I say leave your yoghurt boxes there, let me get it. I'm not lazy. I collect them, collect them. I used to bring it to school. However, I found a recycling bin in the neighborhood; I take

them with me when I go for a walk. Does it stick to my hand? In other words, I think doing good and earning rewards are not just religious works. I think this is worship. I changed. I shop differently now. I shop with simpler packages...". Thus, the candidate coded S1 stated that there was a change in consumption habits after the environmental

science course. She also emphasized that she took actions to protect resources, that she was concerned about the future, and that she made recycling efforts, and that she took actions to raise awareness of those around her. She stated that she questioned and reshaped her actions, influenced by TEDX speakers and documentaries.

Table 1: Semi-Structured Interview Form Statements Related to Question 1.

Statements	S1	S2	S3	S4	S5	S6
Recognizing and being aware of the environment and environmental problems	X	X	X	X	X	X
Taking action to conserve resources	X	X	X	X	X	X
Acquiring environmentally friendly consumption habits	X	X	X	X	X	X
Don't worry about the future	X	X	X	X	X	X
Recycling efforts	X	X	X	X	X	X
Interfering with negative behaviors and raising awareness	X	X	X	X	X	X
Willingness to take responsibility	X	X	X	X	X	X
Believing that create change with your actions	X	X	X	X	X	X
Creating projects for environmental problems	X	X	X	X	X	X
Self-confidence development	X		X	X	X	X

The pre-service teacher with the code S2 emphasized that her self-confidence improved, her desire to take responsibility increased, and the necessity of preventing waste production rather than recycling wastes, with the expression "...First of all, I gained confidence in myself. This was important to me. If you ask why, I can do something on my own; I don't have to be limited to my immediate surroundings. I can also appeal to other audiences. Apart from that, I gained sensitivity to points that I was not aware of and skipped. For example, I was more focused on this. Recycling is very important, I thought. But as in the pyramid you showed, it was more important not to use it as much as possible. So yes, even if I use it, I recycle it, but I learned that I shouldn't use it if possible...".

The pre-service teacher with the code S3 expressed an opinion as "...Before, of course, I was more unconscious. So yes, there were points that I was sensitive to. Because many things scare me. Such as increase in temperature, global warming, waste management. But now I am more conscious. When I see it on the ground while walking, I have to reach out and pick up any waste. There's such an urge. I take most of them and throw them away, especially the larger ones. This lesson got me moving. Now I know that after I get out of here, I can do something too. I can participate in a project. I can work on my own. I can see this in myself. My self-confidence has increased. I know I can take better steps with that confidence. I learned to look at my surroundings with awareness...". With this statement, the pre-

service teacher stated that she gained knowledge and awareness about the environment and environmental problems with the environmental education process, she emphasized that she intends to take actions for the benefit of the environment, that her self-confidence has improved and that she wants to take part in projects aimed at solving environmental problems.

The pre-service teacher with the code S4 expressed an opinion as "...Me before environmental science class and me after are not the same. When I came to the dormitory, I talked to the dormitory manager at the beginning of this term. I said that these plastics are now bothering me. It is enough. Let's do something. With this lesson, I decided to take more conscious steps. When I saw the damage, something happened that made me move. I try to do my best, but there is always more. What we have to fight is first of all people's insensitivity. We have to eliminate it. I wish I had the authority to take much bigger steps...". With this view, the pre-service teacher stated that she observed actions that would harm the environment in the environments she was in, that this situation disturbed her and that she wanted to develop a solution about what she could do to prevent this. She emphasized that people's insensitivity is at the root of environmental problems and that the first step to be taken to solve these problems is to eliminate this insensitivity.

Afterwards, the second question in the semi-structured interview form, "Would you like to

include these practices in your professional life?", was asked to the pre-service teachers. The findings

regarding the answers of the pre-service teachers are presented in Table 2.

Table 2: Semi-Structured Interview Form Statements Regarding Question 2.

Statements	S1	S2	S3	S4	S5	S6
Yes, because it is effective in making the individual environmentally literate.	X	X	X	X	X	X
Yes, because it allows taking responsibility.	X	X	X	X	X	X
Yes, because it provides permanent learning.	X	X	X	X	X	X
Yes, because it provides meaningful learning.	X	X	X	X	X	X
Yes, because it is efficient.	X	X	X	X	X	X
Yes, because it improves communication skills.	X	X	X	X	X	X
Yes, because it builds self-confidence.	X	X	X	X	X	
Yes, because it gives the opportunity to experience.	X	X	X	X		X

In Table 2, the opinions of the pre-service teachers about whether they want to include the environmental science lesson practices conducted using educational technology tools in their professional lives are given. All of the pre-service teachers who participated in the interview stated that they would like to use these applications in their professional lives. In their statements, the pre-service teachers supported their answers on the grounds that it is effective in gaining the environmental literate individual quality, enables taking responsibility, provides permanent and meaningful learning, improves communication skills, develops the self-confidence of individuals, it offers the opportunity to experience and it is productive.

Regarding the subject, the pre-service teacher with the code S1 put forward her views as "...Definitely. I will always do this. I will make applications for them. First of all, they will see that I don't use plastic. Maybe I'll take them to facilities like yours. I particularly like the simulation. I think it will be effective in younger age groups as well. Animations will also interest them, I'm sure. I will always do. I will talk about you to my students. In the summer, I want to work actively in organizations such as ÇEVKO and TEMA in my own city. I want to take responsibility. I want to be an active environmental reader...". With this view, the pre-service teacher stated that she would include these practices in her professional life. She emphasized that she would be a guide to her students with the behaviors she gained during the education. She stated that she thinks that applications supported by educational technology tools will attract the attention of students. In addition to these, she stated that she wanted to take responsibility in educational activities outside the school environment.

The pre-service teacher with the code S3 stated that he would include the practices used in the environmental education course in his professional life, with the expression "...Of course, sir, absolutely. As we just mentioned, the new generation of children love technology. I can interact them with simulations, movies, apps. For example, we did a group work with you. We had some work in which we communicated and distributed tasks on the virtual classroom. I think it will interest them. It will enable to increase both social skills and communication skills. This is a huge contribution. It is a great obligation to raise future generations. It's actually frightening, but it's also exciting. It's good that we were made aware of this. I hope it was the same for other friends of mine. I hope I can push myself further. Because our environment is important. It lives with us; we are a part of it. That's why we have to protect it. We must explain this to other generations as well. This is our duty as teachers. Not only science teachers, but every teacher helps children to progress with their own behaviors." because she thought that it could be effective in attracting the attention of the Z generation children." She stated that communication skills can be positively affected by the virtual classroom application. The pre-service teacher emphasized that she sees herself as a part of the environment. Being aware of the great responsibility of raising future generations, the pre-service teacher stated that this situation is frightening in terms of the power of its impact and exciting for the same reason.

4. CONCLUSIONS AND DISCUSSION

Most of the pre-service teachers stated that they found the use of educational technology tools in the learning environment advantageous in terms of appealing to different senses, enriching the learning environment, concretizing abstract concepts,

making complex subjects understandable, developing imagination, saving time and using less paper. This result is also supported by studies in the literature (Aalan, 2012; Korucu and Yücel, 2015; Özgür, 2015). There are other studies in which pre-service teachers have positive opinions about including different educational technology tools in learning environments (Gökmen and Solak, 2015; Kutluca and Birgin, 2007). According to Nocar, Tang, and Bártek (2016), educational technology tools are effective in motivating students and offer students opportunities to engage in creative activities. Kahyaoğlu (2011) states that the use of educational technologies in teaching complex subjects and abstract concepts enriches the teaching environment and provides permanent learning by addressing more than one sense organ at the same time. In addition to the positive opinions of the pre-service teachers, one of the pre-service teachers stated that the use of educational technology tools in learning environments causes technology addiction. He also stated that he found it disadvantageous in terms of being against the principle of equality in education and the possibility of experiencing technical problems. Similarly, Çalışkan (2015) and Yıldırım (2017) stated that the problem of internet addiction can be observed due to the fact that students do not have the awareness of using technology correctly.

All of the pre-service teachers stated that they wanted to use the practices supported by educational technology tools in the environmental education process in their own professional lives. This result is consistent with the studies in the literature (Kongchan, 2008; Polat, 2016; Sırakaya, 2014). The pre-service teachers gave supportive answers to the research because it is effective in gaining the environmental literate individual quality, taking responsibility, providing permanent and meaningful learning, improving communication skills, improving the self-confidence of individuals, providing the opportunity to experience and being productive. This situation can be accepted as an indication that pre-service teachers believe in the effectiveness of the use of educational technology tools. In addition, it can be said that pre-service teachers have a high interest in technology, they follow new technologies and these technologies are at the center of their lives (Altıntaş, 2018; Prensky, 2010).

It is known that integrating new technologies with the education process is extremely important in terms of increasing the quality of education (Yılmaz, 2007). As a result, including educational technology tools in environmental education has an impact on learning process outcomes. This result reveals the

importance of using educational technologies such as sound, image, video, simulation, animation and documentary film in environmental education. It can be suggested that these tools be used in different education levels and different learning areas, including environmental education.

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