***Research Article***

# An Investigation of Middle School Students' Views on the Contributions of Dioramas to Biodiversity Education *

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## Abstract

Dioramas are seen as unique teaching tools for environmental education in general and biodiversity education in particular as they present realistic learning environments that can reflect the components of the biodiversity, relationships among these components and changes occur over time. The aim of this study is to examine middle school students' views on diorama supported biodiversity education. A phenomenological approach based on student experiences were employed for the study. The study group of the research consists of twenty-four 7th grade students studying during the 2021-2022 academic year. Students participated in an 8 hours experimental process included diorama supported 5E constructivist teaching model. Interviews were used as the data collection tool. The analysis of data revealed that dioramas contribute positively to biodiversity education as they enhance learning, mitigate the effects of misconceptions, increase students' awareness to protect biodiversity and of biodiversity sustainability. Therefore, including and using dioramas in learning environments for biodiversity education can mediate learning as well as help students to benefit from a realistic environment that include living things, the ecosystems they form and the places they live in.

**Keywords:** Environmental education, biodiversity, middle school science, dioramas, 5E

## 1. INTRODUCTION

The quality of life maintained by human beings has been possible largely due to the opportunities offered by the biodiversity of resources in nature. Ensuring the continuation of this life depends on the sustainable use of consumed and distorted natural resources. The OECD Environmental Outlook 2030 has identified several issues such as climate change, the biodiversity loss crisis, water supply and sanitation and the reduction in the health impacts of environmental degradation as key challenges for the global environment (OECD, 2008). The loss of biodiversity is often seen as the most pressing global environmental problem of our time (Convention on Biological Diversity, 2010; Menzel & Bogeholz, 2010). There have are around 785 documented extinctions worldwide (IUCN, 2020; Sax & Gaines, 2008), but undocumented extinction estimates are often well above these numbers, up to 27,000 per year (IUCN, 2020). Increasingly strong evidence show that biodiversity has crucial effects on different aspects of our lives, including our health, well-being, food supply, wealth and security. Therefore, protecting biodiversity is essential in order to maintain human being's need today and carrying this diversity to the future generations. Increasing public awareness is one of essential ways to preserve the richness of life forms and conserve biodiversity. Environmental

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education programs that include biodiversity education for all levels of both formal and non-formal education come to the forefront in this respect (UNESCO, 1977). In times of climate change and the dramatic loss of biodiversity, there is a potential risk of raising a generation that do not pay enough attention for protecting animals, plants and landscapes. Nature plays a minor role in the daily life of the younger generation; their free time is often spent in front of computers by playing games, watching television and other multimedia (Kaşıkçı et al., 2014). Subjects related to nature education had for many years been a low priority in school curricula. Despite offering a wide range of topics in biology curriculum, biodiversity education does not get as much enough space within this scope considering its vitality for humans. Also teaching strategies for environmental education are often criticised as being too theory laden and lacking practice (Ulbrich, 2010). The main purpose of environmental education is "to provide every person with opportunities to acquire the knowledge, values, attitudes, commitments and skills necessary to protect and improve the environment" (UNESCO, 1977). These aims are closely related to biodiversity education since it has the potential to connect environmental education with nature conservation education (Gayford, 2000; Kassas, 2002). Therefore, the aim of basic biological diversity education is; to raise awareness of people about biodiversity and to provide them with the responsibility and ability to protect biodiversity (Mayer, 1996). Kassas (2002) discussed the purpose of biodiversity education in four dimensions: affective, ecological, ethical and political. There are a wide variety of elements involved in biodiversity, from environmental affiliations to individual sensitivities, values, moral norms, and social dilemmas. In this context, Gayford (2000) pointed out the importance of teaching biological diversity with its ecological, economic and social dimensions. "Human" comes first among the factors that threaten biodiversity. Therefore, reintegrating conscious individuals who have received biodiversity education into society would probably have a positive effect on preventing the reduction of biodiversity significantly. Biodiversity education should be given from the first stages of education, and students should be raised as individuals who are sensitive to the environment and have awareness from a young age. With this regard, biodiversity is seen in the centre of discussions for science, local- global challenges and often controversial socio-scientific topics (Menzel & Bögeholz, 2006). However, some researchers have highlighted that humans are increasingly disconnected from nature and biodiversity (Pyle, 2003). Lack of appropriate attention for the ordinary plants and animals in everyday life as seen as a possible reason for this disconnection (Miller, 2005), especially in urban areas (Turner et al., 2004). It is important, therefore, to investigate factors that increase public awareness for biodiversity in order to increase public participation in biodiversity related conservation activities (Miller, 2006). Unfortunately, species loss is thought to be between 10 and 30,000 species per year (Leakey & Lewin, 1996; Meffe & Carroll, 1997). Reports suggest that we are likely to lose most of the world's biodiversity in the next century, including species that are so far not discovered (Leakey & Lewin, 1996). Indeed, the rate of species extinction today exceeds the extinction rate that followed the meteor impact that led to the extinction of the dinosaurs (Leakey & Lewin, 1996).



There are various reasons that count for protection biodiversity. According to (Mayer, 1996) there are at least three major factors that affect human need for protecting biodiversity. First, human beings have natural affinity for living things. Second, the extinction of species leads to losing knowledge. And, finally, species provide irreplaceable goods and services. Humans are grateful to the nature for a wide range of resources from basic needs such as food, water and shelter to ideas in the forms of biomimicry (Mayer, 1996). Unfortunately, this value is often ignored, particularly, by students in our classroom when they do not have desired life experiences with nature. The importance of biodiversity education is underlined in the National Science Education Standards (NSES) as a strong component of "biodiversity" related concepts. Importantly, biodiversity and related concepts are mainly seen as teachable only in the field trips (Beiersdorfer & Davis, 1994).

The main purpose of biodiversity education is to raise awareness of individuals about the importance of biological diversity and to help students acquire them the responsibility and competences to protect biological diversity (Mayer, 1996). In order to achieve this goal, there is a need for biodiversity education that is an active process and students are able to observe plants and animals directly, and have knowledge about local species (Tunnicliffe & Scheersoi, 2010). Therefore, it is necessary to create educational environments where the opportunities for students to interact with the environment are not limited, where students can interact with nature, and where they can examine living things and interactions between living things through their own observations. One of the teaching materials used for this purpose is dioramas. A diorama can be defined as a scene from a certain time period. This definition covers a wide scope due to the nature of dioramas. Because dioramas are designed to capture any moment from a certain period of time, every detail of a certain moment captured is revealed with the help of different objects used (Assa & Wolf, 2007). Additionally, the relations of objects with each other and with their surroundings are described. These depicted elements are perfectly rendered in dioramas, which are the depiction of reality. Also, dioramas specifically can be used to show subjects and themes in achieving goals in teaching. For example, in biological dioramas, the real habitat of an animal species can be easily shown to students with real factors such as vegetation and soil structure (Tunnicliffe & Scheersoi, 2010). In addition to this, dioramas also provide benefits in the visualization of concepts such as prey-prey and symbiotic life, without using real animal examples. Moreover, it helps to define past biodiversity, including endangered species (Marandino et al., 2009). Likewise, dioramas are very suitable for displaying vital events that require long-term observation, such as the life cycle of the silkworm (Mifsud & Tunnicliffe, 2016). Therefore, it is a very facilitating factor in showing the changes in the habitats of living things from past to present and in transferring this knowledge to students. All these features of dioramas make it very useful tools to use them to achieve teaching goals. Various researchers have recently documented the educational potential of dioramas and their role in learning biodiversity (Peart & Kool, 1998). Since dioramas provide an important opportunity for achieving science learning outcomes (Stern, 2009), they are seen as a teaching tool with a strong potential in science teaching (Tunnicliffe, 2009).



While the concepts in science curricula are transformed into learning outcomes down to the smallest detail, the superficial handling of the learning outcomes for biodiversity creates an obstacle to the formation of cognitive and affective learning of the subject (Ulbrich 2010). This is reflected in biodiversity studies that has become the focus of educational research in recent years (Dikmenli, 2010). Various studies have reflected secondary and high school students' inadequacy in terms of knowledge related to biodiversity in their environment (Shepardson, 2005; Tunnicliffe & Reiss, 2000) and studying plants and animals in their immediate surroundings helps students to make better sense of biodiversity (Lindemann-Mathies & Bose, 2008). Although dioramas are an effective tool for biodiversity teaching, the scarcity of studies on this subject draws attention (Misfud & Tunnicliffe, 2018). This study investigates the effects of diorama supported biodiversity education based the participant students' reflections after eight hours of teaching.

## 2. METHODOLOGY

In this study, phenomenology, one of the qualitative research methods, was used. Phenomenology is the study of the individual universe and its basis consists of individual experiences. In this approach, the researcher deals with the participant's personal experiences, and examines the perception of the individual and the meanings attributed to events (Johnson & Christensen, 2020).

### 2.1. Participants

Students participated in the study were 24 (Girl: 10 Boy: 14) 7th grade students studying at a public school during 2021-2022 academic year.

### 2.2. Data Collection Tool

Focus group interviews and "reflection on the experience" forms were used to collect students' opinions about their experiences for diorama supported biodiversity teaching activities. Reflection on the experience form consisted of 6 questions. The focus group interviews allowed researchers to clarify students' views in the reflection forms and to further explore students' understanding of their experiences.

### 2.3. Analysis of Data

The collected data was analysed based on guidance for phenomenological analysis of interview data described by Hycner (1985). It involves transcribing, bracketing, delineating units of meaning, relating to research questions, eliminating redundancy, clustering, thematising, contextualising and summarising.

*2.3.3. Dioramas used for teaching biodiversity*

Dioramas of marten, squirrel, turtle, seagull, dragonfly, grasshopper, crab, frog, lizard and silkworm were prepared by the researchers with the help of specialists from the department of fine arts. The rest of dioramas used for teaching biodiversity were barrowed from the zoology museum of the university.

**Picture 1. Examples of dioramas used in the study.**

### 2.4. Intervention Process

In the study, the experimental intervention process lasted for 8 teaching hours. The topics were "Biodiversity Richness in Turkey and the World", "Animal Biodiversity Richness of the Southeast Anatolia Region", "Designing with Biomimicry". During the teaching activities the participant students were divided into groups of four in order to facilitate group discussions and provide room for social interaction. In addition to the science teacher and researchers, four student teachers on their teaching practice courses, provided support for students when necessary during the teaching process.

The teaching sequence was based on the 5E constructivist learning model. The teaching process started with questions to engage students. During the exploration phase, worksheets and dioramas were used to help students explore the topics. In the explanation phase, the theoretical framework was formed by the lecturers. In the elaborating phase, the process was supported with examples from contemporary life, and the relationship of activities with nature was emphasized. In final phase, the worksheets were evaluated.

#### *2.4.1. Teaching sequence*

*Topic 1: Biodiversity Richness in Turkey and the World.*

- Students fill in the estimation sections of the worksheet individually,
- Teacher presentation of biodiversity in Turkey and the world
- Students fill in the rest of the worksheet individually,
- Group discussions,
- Whole class discussion led by the teacher and evaluation.

*Topic 2: Animal Biodiversity Richness of the Southeast Anatolia Region*

Dioramas and related activities used in this topic

- In the worksheet, questions such as "What is the name of the animal?", "Where does it live?", "Which kingdom is it classified in?", "What does it feed on?" and "What is its function in nature?" for at least ten animal species exhibited in the dioramas were answered by students.
- Teacher presentation for the species exhibited in the dioramas.
- Group discussions and work on worksheets,
- A whole class discussion on the species exhibited in the dioramas and other species belonging to the same family.



Topic 3: Designing with Biomimicry

- Diagnosing students' pre-knowledge about the concept of biomimicry
- Groups examining biomimicry examples with the help of student teachers
- Teacher presentation of biomimicry.
- Brainstorming on biomimicry and designing biomimicry.
- Group presentation of the biomimicry designed by each group.
- Evaluation

### 2.5. Ethical Permission of Research

This research has the permission of the ethics committee dated 27 January 2020 and numbered 11342, which was granted by Dicle University Ethics Committee.

## 3. RESULTS and DISCUSSIONS

The analysis of the data produced four main themes; dioramas as tools for learning biodiversity, dioramas as tools for changing misconceptions, dioramas for raising awareness to protect biodiversity, dioramas for sustainability of biodiversity.

### 3.1. Dioramas as Tools for Teaching Biodiversity

The participant students' experiences in the research revealed that the use of dioramas in biodiversity teaching contributed positively to the learning process (Table 1). According to the participant students' responses, having dioramas in the learning environment enhances understanding and motivation, mediates group discussions and helps to realise the importance of biodiversity.

**Table 1. A summary of students' views on the contributions of dioramas as a tool for learning biodiversity**

| Dioramas importance | Students' evaluations |
|---|---|
| Dioramas as a learning tool | - It enables us to recognize the duties of living things in nature they live in.<br>- It helps us to see the feeding patterns of living things.<br>- It visualizes an organism's relationship to its species and to other species<br>- It is much easier to make group discussions when dioramas are present in the learning environment.<br>- It allows us to make new designs inspired by dioramas.<br>- It contributes to our understanding of the importance of biodiversity in the life cycle and that humans are also a part of this life cycle.<br>- Since students are active in the learning process, their motivation to learn is high. |

This is clearly evident in students' narratives based on their experiences with dioramas. All of the participant students stated that learning with diorama helps them to understand biodiversity better and easier.

*...I understood the relationship between living things and environment better. I understood why frogs always live in watery places… (Student 2).*

*...The knowledge we gained from the dioramas was helpful...the living things stood before our eyes. That's why I learned better… (Student 18).*

*... we usually copy from the board or from the book. But I think I understand better when it is visual…with dioramas everything is visual… The report we wrote here was about our own thoughts and creativity, so it was very useful (Student 15).*

*Dioramas provided students with opportunities to observe living thing in their environment that helps convey biodiversity knowledge that is often difficult to express in words. Observation is one of the scientific process skills that is thought to develop during students' interactions with dioramas. Reiss et al. (2011) states that observation skill is vital for scientific learning and should be developed and applied with students.*

*... I understood better because it allowed me to see the connections between the subjects... (Student 22).*

*Seeing the animals with the place they live in helped me to learn things I did not know about before. For example, I better understand why the marten is a wild animal. (Student 3).*

*The life cycle diorama of the silkworm gave me a better understanding of the life stages of the insects (Student 4).*

*...I understood the consequences of the reduction of biodiversity due to human influence (Student 17).*

*The continuity of the food chain… It made it easier for me to understand its importance. Because I took a closer look at the creatures in the chain and their lives (student 23).*

*...I couldn't recognize many of the animals in the dioramas… I didn't know what they were feeding on. I learned a lot (Student 8).*



The findings of the study support the previous studies that reported a positive relationship between the use of dioramas and the interpretation of biodiversity (Ash 2003; Zhbanova et al., 2019). Dioramas help develop critical thinking and questioning skills as well as classification, comparison and measurement skills (Zhbanova et al., 2019). The evidence from students' experiences in the study supports the assertion that teaching with dioramas facilitates learning by improving communication skills facilitated by dioramas include asking questions, forming hypotheses, and testing hypotheses (Reiss & Tunnicliffe, 2011):

*…When I had difficulties trying to recognize the animals in the dioramas, I asked my friends for help. We talked about dioramas. I learned better while discussing (Student 24).*

*…The dioramas showed how fun it is to study biodiversity (Student 20).*

*…Working with the diorama was like doing a puzzle. We saw, but we had little knowledge… Afterwards, the whole puzzle seemed to be completed with the activities (Student 1).*

*…I had a lot of fun working with the dioramas because we didn't sit around in the lesson. …We constantly studied dioramas, talked about and discussed. Then we tried to design new things by taking inspiration from them. It would be more difficult to design if we did not see the dioramas (Student 6).*

*…The diorama seems to have made it easier for me to understand. Because at the end of the lesson you asked us to make our own design. This intimidated me at first when I examined the dioramas again, my fear was gone. Because new ideas came to my mind (Student 10).*

*…Diorama made it easier for me to learn because I could discuss what I saw with my friend (Student 2).*

All of the students drew attention to the fact that the biodiversity, food chain and ecological order of the dioramas are more understandable and easier to learn through the dioramas. The use of dioramas, especially in teaching students about the ecosystem, supports academic achievement. Because with the help of dioramas, students have the opportunity to see different plant and animal forms living in the ecosystem. In their study, Reiss and Tunnicliffe (2011) states that dioramas make a significant contribution to students' understanding of biology, their understanding of biological structures, their interpretation of taxonomic structuring, and their depiction of species behaviour. In particular, it helps students to determine the relationships between organisms such as predator-prey, social group, and mutual life. Similarly, in their study, Marandino et al. (2009) determined that with the help of dioramas, the students were able to identify plant, animal, fungal species, their habitat, fauna, flora, soil type and rock forms. Mifsud and Tunnicliffe (2013) emphasizes that students who visit dioramas develop their scientific skills such as observing, matching observations, asking questions and forming hypotheses. It is stated in the literature that interacting with biological dioramas reveals the skills of identification, interest, interpretation and research (Tunnicliffe & Scheersoi, 2010).



The majority of the students stated that dioramas were sufficient to demonstrate the importance of biodiversity as a teaching tool. In particular, they expressed the opinion that dioramas are a cross-section of the life cycle, allowing them to better understand the relationship between the living thing and its habitat. They emphasized that they have very little relationship with nature due to urban life, and in this context, dioramas can better understand the close or distant relationship between living things and humans.

*… I was not aware of the commercial contribution of the silkworm to humankind. It made me realize what we have, thanks to the silkworm's life cycle in the diorama and the silkworm (Student 1).*

*…The creatures we see in our daily lives are limited. That's why I didn't know about living species. Thanks to the dioramas, I had the opportunity to see living things in their habitats. I learned a lot (Student 5).*

*…I like watching documentaries. But I couldn't recognize half of the creatures here. Now I know species that I will never forget (Student 8).*

*…I learned a lot of things that I did not know and the time passed very well (Student 21).*

*…It is very enjoyable to work with dioramas. It's like some kind of re-enactment. I felt as if the marten was looking at me and telling me about itself (Student 2).*

*…I loved dioramas. I wish science classes were always like this (Student 11).*

The use of dioramas as a teaching tool allows students to feel themselves in nature and as a part of nature. In this context, it is important that dioramas offer students the opportunity of environmental education in nature. Tunnicliffe and Scheersoi (2010) emphasized that dioramas are a unique teaching tool for environmental education since they present the living thing not as an object but as a part of the ecosystem. In this respect, dioramas provide students with the opportunity to perceive the ecosystem holistically, to observe the complex relationships in the ecosystem and to create a discussion about ecosystem mechanisms. In addition, the use of dioramas as a teaching tool provides students with the opportunity to work based on a discovery process. Recent studies point out the role and educational potential of dioramas in biodiversity education, which provide realistic learning environments (Reiss & Tunnicliffe, 2007). In addition, dioramas are considered important in terms of creating a social learning environment and enabling students to reach more information than they would acquire alone.

### 3.2. Diorama as a Tool to Change Misconception about Biodiversity

The analysis of data also revealed dioramas can be useful tool to overcome students' misconception about biodiversity. Different participant students expressed how dioramas helped them to change their previous knowledge of biodiversity:

> *I thought biodiversity consisted only of living things…I was also surprised to see that there were different the lizard species in the dioramas. I thought there was only one species of lizard. It was interesting to learn what genetic diversity is and how important it is (Student 8).*
>
> *It was very useful to learn that there is ecological diversity…I now know biodiversity does not include only the number of living things around us… we had the opportunity to see the habitats with dioramas. This helped me to correct my knowledge (Student 23).*
>
> *…there was a question during lesson that in which habitat can the dragonfly live? My answer was air… But now I know the right answer thanks to Diorama. Because it was like I went to visit the dragonfly house (Student 24).*
>
> *I thought I knew what biodiversity was. I learned the truth with dioramas (Student 1).*
>
> *I did not think loss of a species affects everyone. Learning with dioramas made me realise we have to be very careful about other living things (Student 5).*
>
> *I thought biodiversity was the number of living things. Dioramas helped me to change my knowledge (Student 12).*
>
> *Thanks to the dioramas, I realized the greatness and value of our biodiversity richness…I now know species compete for their needs in the ecosystem (Student 9).*



Misconception is an important factor hindering learning science. They are usually formed over a long period of time and present challenges for teachers to teach new topics. The implicit narrative in dioramas encourages remembering knowledge, integrating it with new knowledge, and creating one's own new narrative (Reiss & Tunnicliffe, 2011). Dioramas invite students to an atmosphere that is very close to the real thing they have not seen before, allowing them to combine everyday experiences with the more formal taxonomic structures of science. They provide an ideal setting for students of all ages to look, point, name and discuss how animals live and behave and wonder how these animals might adapt to their own lives. Students had the opportunity to see the relationship of living things living in the ecosystem with their own species and different species. Thus, the students could compare the previous knowledge with the new knowledge and reconstruct the new knowledge in their mind by interacting with dioramas (Mifsud & Tunnicliffe, 2013).

### 3.3. Diorama and Raising Awareness to Protect Biodiversity

One of the major findings that the analysis of data shows is that teaching with dioramas increased participant student awareness for protecting biodiversity. The majority of the students emphasized that their intention to protect biodiversity increased.

*Before this lesson, I did not know that I was so separate from nature, but I understood better that nature does not need humans, but humans need nature in order to live. All living things in dioramas are used for people's better living and this is not fair. We must protect nature (Student 9).*

*I realized how serious the job of protecting biodiversity is. If we don't protect other living things, humans could become extinct as well (Student 23).*

*This study gave me a new perspective on the plants my mother grew at home. Now I will help water the plants (Student 11).*

*I will begin to protect because I have a better understanding that humans are a part of the ecosystem (Student 10).*

*I have a better understanding of the importance of animals for life (Student 14).*

*(Before this lesson, I was killing a fly, bee, grasshopper and living things that entered our house. I'm definitely not going to kill anymore. I will put it between two papers and leave it to nature again (Student 21).*

*Before this lesson, I thought that everything was for humans. But I don't think so anymore. We must protect biodiversity… (Student 3).*

*… I saw the beauties in the dioramas and I realized that there are endless beauties that I have not seen. I have stronger intention to protect biodiversity (Student 24).*

*…biodiversity is very important to us. For example, if we kill snakes, mice will eat our food, spread disease, the balance of the world will be disturbed and it cannot be repaired again. Without plants, there would be no photosynthesis, no clean air, and we would be doomed. Therefore, we must protect it (Student 20).*

*I love nature very much. I am aware of its importance and I try to protect it, but when my friends don't act like me, I feel lonely… (Student 7).*

*I see some small children throwing stones at stray dogs. I want to be angry with them, but I do not dare when the adults next to them do not get angry (Student 16).*

*Biodiversity should be more strictly protected. So, the penalties should be high, there should be laws (Student 12).*



Dioramas can serve as a great tool for raising students' awareness for biodiversity protection. Because dioramas can reflect the interactions of the components within biodiversity, the environmental changes that occur over time (Tunnicliffe & Scheersoi, 2010) and human effect on biodiversity during this period. Therefore, it is reasonable to suggest that dioramas are a tool that can be used to inform students about ecological changes caused by environmental problems. Pohjakallio (2007) emphasizes that arts-based environmental education such as dioramas shows that humans and nature are mutually influencing factors. This approach to environmental education draws attention to the importance of seeing people as a part of nature, not as a user or consumer of nature. The fact that students see themselves as a part of nature is considered important in terms of developing their intentions to protect nature. This is evident in the participant students' views on the contributions of dioramas to increase their awareness to protect biodiversity.

### 3.4. Sustainability of Diorama and Biodiversity

All of the students shared a common view on the preservation of the healthy continuation of the life cycle of learning biodiversity with dioramas.

*…Dioramas show the animal and its habitat and feeding preferences. We must maintain this balance so that nature does not disappear (Student 4).*

*…I knew grasshoppers as pests. It helped plants to decompose and re-grow. And its number in the world is decreasing day by day. I just found out. I will no longer kill so that the plants continue to grow. Otherwise, the plants will die one day. Then the whole balance will be upset… I understood that human beings, who disturb the balance of nature, also have the ability to correct (Student 13).*

*…Dioramas taught me the importance of maintaining biodiversity in order to find clean air, clean water, clean soil (Student 24).*

*…When biodiversity disappears, the balance of nature is disturbed. The disease comes out. For example, asthma, allergies, cancer. We must protect nature for a healthy life. Dioramas are important because they show the pristine state of nature. Nature is beautiful (Student 18).*

*…All living things interact with each other, so every living thing is important to each other. Diorama allowed me to see this interaction better (Student 21).*

*…I understood that if people do not protect nature, nature and the world will perish (Student 2).*

*…Before this lesson, I was killing insects I encountered. Once I know its benefits, I won't do it anymore (Student 6).*

*…If you don't protect biodiversity, we might end up with extinct species (Student 22).*

*…We must make more efforts to ensure that the population balance of the animals in the diorama is not disturbed (Student 8).*

*…Biodiversity is important for the whole universe; how do we know that we are not destroying the universe by disrupting the world? (Student 2).*

*…As we see in the dioramas, animals are fed in the food chain. If a species disappears or cannot function by humans, this chain is broken and a butterfly effect occurs. This affects us negatively. That's why we need to protect biodiversity so that the cycle continues to turn (Student 20).*

The current ecological crisis, which deeply affects every geography in the world, calls for a global change in values and attitudes towards nature (Żeber-Dzikowska et al., 2016). Therefore, education systems must find a way to radically change their programs in order to educate the young generation who will inherit the world in the context of biodiversity sustainability. Żeber-Dzikowska et al. (2016) defines the main purpose of ecology as the discovery of connections between living organisms, including humans, and the environment. It is stated that ecological literacy, which is the result of this discovery, has an emotional component that directs the environmentally sensitive behaviours of individuals. Affective components, on the other hand, are based on the understanding that people see themselves as a part of the global ecosystem they affect (Zeber-Dzikowska et al., 2016). The understanding of individuals being a part of nature is one of the biggest steps in ensuring the formation of systems that improve sustainability.



## 4. CONCLUSIONS

This study investigated students' views on teaching biodiversity integrating dioramas in the learning environment. Based on the participant students' views on their experiences the study found that the use of dioramas has potential to enhance student learning of biodiversity, overcome the misconceptions about biodiversity, increase students' awareness for protection and sustainability of biodiversity. The importance of using dioramas during biodiversity instruction stems from the fact that dioramas have the potential to exhibit the components of an ecosystem, the interactions of these components with each other and environmental changes occur over time (Tunnicliffe & Scheersoi, 2010). As well as being a useful tool for teaching biodiversity, dioramas have the potential to provide students with a platform for informed discussions related to environmental problems. Thus, students engage in active learning and internalization of new knowledge. Based on the findings of the study, using dioramas in environmental education, particularly in biodiversity, should be an integral part of teaching activities. This should, particularly, be applied to the learning environments where teacher centred instruction is prevailing or outdoor activities are limited due to time, resources or any other restricting factors.

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