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The Effect of Science-Based Courses on Student Teachers' Biophilia Levels

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ABSTRACT This study examines the effect of science-based courses on student teachers' biophilia levels. Based on the quantitative research approach, this study was conducted using a quasi-experimental method. The sample of the study consists of 146 student teachers studying at the education faculty of a state university in the fall semester of the 2022-2023 academic year. The sample group was conducted with student teachers who chose four different science-based courses and voluntarily participated in the study. The Biophilia Scale with 25 items was used as a data collection tool. The findings showed that the biophilia levels of the participants in all four courses showed significant differences in favor of the post-tests. The findings also showed that the "environmental science" course's scale scores significantly differed from the other courses. In other words, the biophilia levels of student teachers who attended environmental science courses increased less than in the other courses. When the increase in biophilia level of student teachers according to their genders is examined, no difference was observed. As a result of the findings, it was suggested that more activities should be included in science-based lessons to increase students' biophilia levels.

Keywords Science-Based Courses, Biophilia, Students

1. INTRODUCTION

Today, people are faced with many significant problems. Environmental protection is probably one of the most important of these human-induced problems (Alkayış, 2020). Because unconscious interventions against nature are preparing our demise. Since the destruction against nature continues rapidly, nature's living environments for all living things, including humans, are depleted. All such changes take human beings away from nature, of which they are a part and imprison them in the artificial environment they have created. In this context, humans have begun to break their bond with nature (Larson, Green, & Cordell, 2011). As a result, mental and physical diseases are more common in individuals who distance themselves from nature (Gullone, 2000). Bogner and Wiseman (2004) stated that, on the one hand, students' perceptions of protecting the environment increase with nature education. On the other hand, nature education regresses students' perceptions of only being "utilitarian" towards the environment.

It is seen that people who do not break their ties with nature are less stressed and are positively affected mentally and physically (Grahn & Stigsdotter, 2004; Hartig, Mang, & Evans, 1991; Ulrich et al., 1991). Research shows that individuals have an innate desire to be close to natural stimuli such as animals, vegetation, water, animal sounds or movements, and seasonal changes (Dubos, 1968; Iltis, Loucks, & Andrews, 1970; Kahn, 1997). Ultimately, human needs physical and spiritual interaction with nature. This need is based on interest. This interest in nature and living systems shows people's closeness to nature. This condition is called biophilia in general. Biophilia is a combination of two Greek words, love (philia) and life (bio) (Barbiero, 2021). Biophilia is not easy to define, as the word is used in many ways. Wilson (1984) coined the term biophilia to describe the evolutionarily adaptive trait of interest in the living and the vital. Grinde and Patil (2009) expressed the concept of biophilia as love for plants and other living things. Clowney (2013) stated that there is fertile ground for developing the virtue of biophilia in many communities and value traditions, and those communities that promote

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biophilia should rely on available scientific knowledge about ecology, biodiversity loss, and human environmental impact. Barbiero (2021) expressed the concept of biophilia as our emotional connection with life.

As a result, as understood from these different definitions, biophilia can generally be thought of as "loving living things" or "loving life". It is a fact that if people's biophilia level increases, they will be more conscious of nature and the environment. Because as the level of biophilia increases, one's attitude towards living things and nature also develops. Wilson (1984), an entomologist and a sociobiologist, must have been influenced by the social life of ants, as he explained the basic instinct that holds living things together under the Biophilia Hypothesis. This hypothesis explains why there is an interest in nature and living things and that this interest is based on genetics (Khan, 1997). Some studies express biophilia as an innate desire to know nature (Kellert, 2005; Tilbury, 1995). In this context, it is understood why people keep pets, grow ornamental plants, and visit zoos or botanical gardens. Biophilia sometimes results from people risking their lives to save a wild animal (Wilson, 1984).

In addition to the connection of human beings with animals and plants, their connection with nature is also crucial for the level of biophilia. Devotion to nature is the emotional relaxation of human connection with nature (Schultz, 2001). Individuals who are alone gain peace and positive experiences by gaining willing beliefs about natural environments (Disinger & Howe, 1992; Thomashow, 1996). The peace and relaxation of people in their attachment to nature show their psychological well-being. The psychological well-being mentioned here can be revealed by group activities such as hiking, camping, picnic, and sports that create a commitment to nature (Argan & Dursun, 2019). If the time spent in nature strengthens their commitment to nature, they may be more willing to protect nature and the environment (Schultz, 2000). In this context, deep love for nature is known as the responsibility of the person to protect nature (Perkins, 2010). There are also studies showing that individuals' interest in nature is associated with environmentally friendly behaviors (Çakır, Karaarslan, Şahin, & Ertepınar, 2015; Nisbet, Zelenski & Murphy, 2009; Mayer & Frantz, 2004; Schultz, 2001). As attitudes and knowledge towards the environment increase, individuals show environmentally friendly behaviors (Hines, Hungerford & Tomera, 1987; Vining & Ebreo, 1990). In addition, when we look at the interaction of human beings with nature, it is known that there are many effects on nature and humans. Therefore, one of the most effective ways to strengthen students' bond with nature is to offer them regular nature experiences where they can interact with the natural world (Kadirhanoğulları & Özay Köse, 2022; Yilmaz-Uysal, 2020).

Although there are a limited number of studies in the literature to directly determine the biophilia levels of students, there are hardly any studies in which activities to improve biophilia levels are applied. (Sefalı & Özay-Köse, 2022; Yılmaz & Olgan, 2017, Yılmaz-Uysal, 2020). Studies mainly focus on commitment to nature, attitude towards the environment, etc. focuses on topics (Tağrikulu, Cirit-Gül, & Çobanoğlu, 2021; Ozay, 2010). For example, in a study conducted by Tağrikulu et al. (2021), the level of commitment to the nature of student teachers studying in different classes and departments of education faculties was examined. As a result of the study, it was determined that there was a significant difference between female and male student teachers in the gender variable. It was generally determined that student teachers' commitment to nature was high. Yılmaz and Olgan (2017) investigated 60-66 months-old preschool children's affinity towards nature (biophilia) in another study. They identified the reasons for their positive (biophilic) and negative (biophobic) reactions to a natural stimulus. Researchers also aimed to explore if preschool children's levels of biophilia differ depending on two factors: the levels of naturalness of the outdoor environments of the early child care center children enrolled in and the gender. According to the results, children's levels of biophilia were pretty high and did not differ based on their school type (the level of naturalness of the school garden) and gender. It was found that culture was the prominent factor affecting the reasons for the children's biophilic and biophobic responses. In particular, mothers had an essential impact on their children's positive or negative responses to a natural stimulus.

Of course, the high level of biophilia in individuals and ensuring its continuity are primarily related to environmental and nature education. Particularly science-based courses can be counted among the most basic courses in gaining environmental awareness in students. According to Tağrikulu et al. (2021), as individuals reach certain levels of consciousness about nature, protect nature, and establish a close bond with it, they will encounter positive effects themselves. Because the way for individuals to get rid of biophobic behaviors is through nature education. A study that proves this reveals that the education process outside the classroom positively contributes to the participants who participate in this education process developing more commitment to nature and caring about it. This situation helped the participants to shape their relationship with nature within the framework of these feelings (Martin, 2004).

Considering the above situations, the biophilia levels of the students can be increased according to the quality of the education provided so that they can develop a positive attitude towards nature and the environment. Most of the problems related to the environment arise from the unconscious human attitude towards the environment (Kıyıcı, Aydoğdu, Doğru, Aslan & Özkaya, 2005). For this reason, it should be started by educating individuals who are the most influential factor in the environment to

protect the environment. In order to create a solution to environmental problems, it is seen as vital to give environmental education in schools. One of the most fundamental goals of environmental education is to raise individuals who can actively participate in the solution of environmental problems and have an environmental culture (Sefalı & Özay-Köse, 2022). Student teachers, who are the teachers of the future who will train these individuals, also have significant duties (Gul & Gul, 2022). Biophilia activities (such as nature education, nature walks, and zoo visits) in the lessons within the scope of this research can increase the level of biophilia tendency in individuals. Therefore, pre-service teachers can contribute to training individuals who can interpret the nature and environment they live in. In addition, with biophilia activities, pre-service teachers can understand how they interact with nature and can enable students to gain essential feelings such as loving nature and valuing nature. Because biophilia is expressed as an attachment to living things and nature (Çakır et al., 2015), how this attachment (interest) changes over time and, at the same time, the situation of the variables affecting this change should be examined in detail. At this point, it becomes clear why it is crucial to determine and increase the biophilia level of student teachers. From this point of view, the effect of science-based courses on student teachers' biophilia levels was examined in the study. For this aim, the following questions were sought in this research:

1. Do science-based courses have an effect on student teachers' biophilia levels?
2. Does student teachers' biophilia levels differ according to the type of science-based courses?
3. Is there a difference between student teachers' biophilia levels in terms of gender?

2. METHOD

Based on the quantitative research approach, this study was conducted using a randomized pretest-posttest comparison group design method. A comparison design uses two more variations of the independent variable and can use two or more groups (McMillan & Schumacher, 2010). The randomized pretest-posttest comparison group design would look like Figure 1.

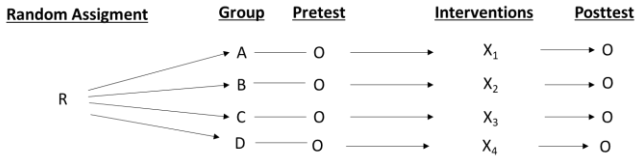

Figure 1 Research design

2.1 Sample

The sample of the study consists of 146 student teachers studying at the education faculty of a state university in the fall semester of the 2022-2023 academic year. The sample group was conducted with student teachers who chose four different science-based courses and voluntarily participated in the study. The same researcher conducted the course taken by each of the groups. One of the reasons these courses are used in practice is that they are courses conducted by one of the researchers per the readily accessible sampling method. Another reason is that the contents of these courses include activities that may affect biophilia levels. Looking at the individual courses: the Environmental Education course, one of the courses mentioned in the application, was found suitable for application in terms of ecosystem, symbiosis, and environmental awareness. The out-of-school Learning Environments course was preferred because it includes national parks, natural environments, and botanical and zoo gardens. The Pets and Responsibility Awareness course was preferred because the course content was entirely on animals. The early Childhood Science Education course was preferred because the course content was related to science. Demographic information about student teachers is given in Table 1.

2.2 Data Collection Tool

The Biophilia Scale (BS) was used as a data collection tool in the study. BS was initially developed by Glock, Meyer, and Wertz (1999) and consisted of expressions created to understand children's and young people's connection to nature. These statements were translated into Turkish as 39 items, and then their validity and reliability were tested by applying them to 868 university students. Thus, the final form of the BS was reduced to 25 items with 4 factors. In this study, 30 minutes was given to apply 5-point Likert type BS (never:1, rarely:2, sometimes:3, often:4, always:5) as pre-test and post-test. It consists of four sub-factors: level biophilia. Level I biophilia of the biophilia scale, II. level biophilia, III. level biophilia, and IV. When these factors are examined respectively, "I. level biophilia" factor, items indicating that the biophilic tendencies of individuals are suppressed (such as being involved in nature from afar, visiting zoos, and watching nature-related documentaries), "II. In the "level

Table 1 Demographic information of student teachers

Courses	Female	Male	Total
Environmental science	16 (57.1%)	12 (42.9%)	28
Early childhood science education	33 (75.0%)	11 (25.0%)	44
Pets and a sense of responsibility	25 (62.5%)	15 (37.5%)	40
Out-of-school learning environments	24 (70.6%)	10 (24.4%)	34
Total	98 (67.1%)	48 (32.9%)	146

biophilia" factor, substances containing biophilic tendencies seen in humans (they enjoy listening to nature, such as the sound of rain), "III. In the "level biophilia" factor, items containing more biophilic tendency (such as the desire to collect materials from the natural environment) and "IV. In the factor of "level biophilia", there are items that are excessively biophilic (such as the desire to classify almost everything living or non-living, and spending time in nature often and for a long time). When the sub-factors of the biophilia scale are examined, it is remarkable how detailed it measures the level of biophilia in individuals. By evaluating the data, it was determined that the reliability coefficient of the test was 0.91.

2.3 Research Procedure

At the beginning of the semester, the biophilia scale was applied to the students of each course as pre-tests, and at the end of the semester, the same scale was applied again as post-tests. The activities and activity durations related to these lessons are presented in Table 2 in detail.

In addition, some photographs of the creatures examined within the extent of the study are presented in Figure 2.

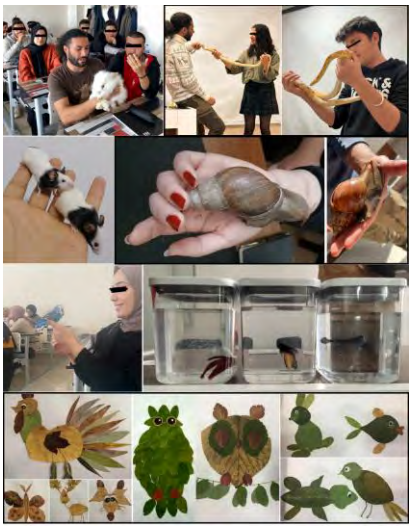

Figure 2 Examples of creatures used in practice and handling: a. netherland dwarf (oryctolagus cuniculus), b. corn snake (*pantherophis guttatus*), c. panda mice (*mus musculus*), d. giant african land snail (*achatina fulica*), e. budgie (*melopsittacus undulatus*), f. betta fish (*betta splendens*), g. materials made from leaves

Table 2 The activities in courses

Courses	Practices	Duration
Environmental Education	Visual elements (photographs) are included in the teaching process of this course. In these images, environmental pollution and the environmental problems that arise due to this pollution are included. Again, by using visuals, it has been tried to show why the extinction of living things is due to environmental pollution, construction, and the creation of new agricultural areas. Again, within the extent of the teaching, the Home Documentary (Home (Youtube, 2016)) was watched over three weeks. In addition, a live corn snake (*Pantherophis guttatus*) was examined as an example of a creature that people often fear and kill.	For visual elements: 5 weeks For the Home documentary: 4 Weeks Snake examination: 1 Week Total 10 Weeks
Out-of-School Learning Environments	This course is given to English Language Teaching. Therefore, teaching vocabulary is essential in foreign language teaching. In this context, national parks, natural environments, and botanical and zoo gardens were examined in the classroom environment. It has been discussed how to teach vocabulary by considering the striking features of living and non-living elements in these out-of-school environments. For example, the birch tree (*Betula pendula*) grown in Bayburt Yenişehir Park and the willow tree (*Salix alba*) were compared, and it was asked to find the most suitable words depending on the similarities and differences. Similarly, panda mice (*Mus musculus*) and corn snakes were brought to the classroom and asked to find words suitable for their distinctive features.	Botanical and Zoo: 2 National parks and natural environments: 2 weeks Examining trees: 1 Week Panda mice: 1 Week Corn snake: 1 Week Total 7 Weeks

Table 2 The activities in courses (*Continued*)

Courses	Practices	Duration
Pets and Responsibility Awareness	Within the extent of this course, creatures such as betta fish (*Betta splendens*), Giant African land snail (*Achatina fulica*), Netherland dwarf (*Oryctolagus cuniculus*), budgie (*Melopsittacus undulatus*), a corn snake and panda mice were examined by using images and videos throughout the semester. Students had the opportunity to examine it closely.	Visuals and videos in theory: 8 weeks Examined creatures: 6 weeks 14 weeks total
Early Childhood Science Education	This course is about science and one of the aims of the course is to show children the nature of science. In this context, it is about how we can benefit from nature in teaching some concepts to children inspired by nature. For example, the poplar tree is taller than the willow; the rabbit is softer than the hedgehog. Children were asked to make leaf collections to encourage collecting. Bayburt Yenişehir Park was used for leaf collection. In this park, students were asked to photograph creatures with different geometric shapes (such as different leaves, snails, and flowers) by looking at them with the eyes of a child. Within the extent of this course, it is aimed that students can make exciting materials for children using natural elements.	Theoretical practices :3 weeks Park trip (geometric shapes): 1 Week Park trip (leaf collection): 2 weeks Park trip (material design): 2 Weeks Total 8 Weeks

2.4 Data Analysis

The data in this study were analyzed using the SPSS 20.0 program. Parametric statistics were used because the distributions of the pre-test and post-test measurements showed normal distribution (Table 3).

Table 3 Analysis of the data suitability for normal distribution

Test	Teaching Groups	Skewness	Kurtosis	Kolmogorov-Smirnov	
				Statistics	p
Pre-test	Group 1	0.038	-0.523	0.064	0.200
	Group 2	-0.137	-0.396	0.087	0.200
	Group 3	0.362	0.030	0.074	0.200
	Group 4	0.318	-0.046	0.080	0.200
Post-test	Group 1	0.436	-0.840	0.128	0.200
	Group 2	-0.441	-0.439	0.114	0.095
	Group 3	-1.049	1.356	0.125	0.065
	Group 4	0.140	-0.574	0.092	0.200

Group 1: Environmental science, Group 2: Early childhood science education, Group 3: Pets and sense of responsibility, Group 4: Out-of-school learning environments

On the other hand, regarding the Likert scale, Harpe (2015) stated that the items containing at least five categories and the total scores obtained from the scale could be accepted as continuous. In addition, Tabachnick and Fidell (2013) state that the data obtained from the Likert scale can be included in the analysis as a continuous variable if it meets the other assumptions of the statistical analysis.

In this study, the Levene test analysis results also revealed that each variable's data were homogeneously distributed. According to the results, Levene's test showed that the variances between groups for the pre-test (F= 0.416, p=0.742) and post-test (F= 0.768, p= 0.514) were statistically equal.

In order to examine the effect of science-based courses on student teachers' biophilia levels, paired samples t-test was used. A one-way ANOVA test was used to determine whether there was a difference between student teachers' biophilia levels according to the type of science-based courses. In addition, independent samples t-test was used to compare the biophilia levels of student teachers by gender.

3. RESULTS

In the study, in light of the first research question, the pre-test and post-test scores of the student teachers for each science-based course were compared with the paired samples t-test (Table 4).

Table 4 The results of the paired samples t-test for each of the groups

Group	Group	Mean	sd	t	df	p
Group 1	Pre-test	3.03	0.68	-3.545	27	0.001
	Post-test	3.61	0.63			
Group 2	Pre-test	3.09	0.61	-4.479	43	0.000
	Post-test	3.68	0.53			
Group 3	Pre-test	2.88	0.61	-4.037	39	0.000
	Post-test	3.52	0.77			

Table 4 The results of the paired samples t-test for each of the groups (*Continued*)

Group	Group	Mean	sd	t	df	p
Group 4	Pre-test	3.19	0.56	-2.817	33	0.008
	Post-test	3.57	0.60			

The findings from Table 3 showed that the biophilia levels of the participants in all four courses (groups) showed significant differences in favor of the post-tests ($p<0.05$).

In the study, in light of the second research question, it was tested the difference between student teachers' biophilia levels according to the type of science-based courses. The results of one-way ANOVA was showed in Table 5.

Table 5 The results of one-way anova

Test		Sum of Squares	df	Mean Square	F	p
Pre-test	Between Groups	1.845	3	.615	1.621	0.187
	Within Groups	53.876	142	.379		
	Total	55.721	145			
Post-test	Between Groups	3.718	3	1.239	3.106	0.028
	Within Groups	62.251	156	0.399		
	Total	65.969	159			

According to the findings in Table 4, there was a statistically significant difference among student teachers' biophilia levels in favor of post-tests regarding the type of science-based courses. Duncan test was performed to determine the stem of this difference ($\bar{X}$: Environmental Education: 3.22; Out-of-School Learning Environments: 3.70; Pets and Responsibility Awareness: 3.59; Early Childhood Science Education: 3.57). The results of the Duncan test showed that the difference was due to the environmental science course ($p<0.05$).

In the study, in light of the third research question, it was tested the difference between student teachers' biophilia levels according to gender. According to the findings, it was founded that there was no statistically significant difference in terms of gender (Table 6).

Table 6 Analysis results of independent samples t-test for gender

Test	Gender	N	Mean	df	t	p
Pre-test	Female	98	3.01	0.63	0.90	0.36
	Male	48	3.11	0.59		
Post-test	Female	98	3.61	0.60	1.68	0.09
	Male	48	3.42	0.70		

4. DISCUSSION

In this study, in which the effects of science-based courses on the biophilia levels of student teachers were examined, the change in the biophilia levels of student teachers who took four different science courses was examined. Accordingly, within the scope of the first research question, the effect of each course on the level of biophilia was analyzed separately. The findings showed that the biophilia levels of the participants in all four courses showed significant differences in favor of the post-tests. In other words, science-based courses caused a significant increase in biophilia levels. Science-based courses are among the most basic courses in raising the awareness of students about the environment and living things. Therefore, science-based environmental and nature education should be given importance to increase the level of biophilia in individuals and ensure its continuity. If the level of biophilia in individuals is increased, they will be more conscious of nature and the environment (Sefalı & Ozay-Kose, 2021). Because as the level of biophilia increases, one's attitude towards living things and nature also develops. According to Tagrikulu et al. (2021), as individuals reach a certain level of consciousness about nature, they protect nature and establish a close bond with it, thus experiencing positive effects for themselves. Because the way for individuals to get rid of biophobic behaviors is through nature education. A study that proves this claim reveals that the education process outside the classroom contributes positively to the participants who participate in this education process developing more commitment to nature. This helped the participants to shape their relationship with nature within the framework of these feelings (Martin, 2004). Some of the content of the environmental science and out-of-school learning environments courses conducted within the scope of this study are given with out-of-class activities. This may be a reason why the findings of the study are parallel to the results of Martin (2004)'s study.

Within the scope of the study's second research question, ANOVA analysis was conducted to compare the effects of science courses on the level of biophilia according to the type of courses, and a statistically significant difference was found. As a result of the multiple comparison tests performed to determine the source of the difference, it was determined that the scale scores of the "environmental science" course were significantly different from the other courses. According to the findings, the biophilia level of the participants who took the environmental science course increased less than the other courses such as "early childhood science education", "pets and responsibility awareness," and "out-of-school learning environments". This finding may be because the environmental science course has a more general content than other courses. Furthermore, the biophilia level of the participants who took the out-of-school learning

environments course increased more than the others. This finding may be due to the fact that more practical activities were performed. However, the common point in the content of these four courses is to provide awareness and knowledge about their environment by providing students with nature experiences where they can interact with the natural world and gain environmentally friendly behaviors. Out-of-school uses such as adventure structures, cultural and cultural acquisitions, and youth groups can be made to realize collective interests and goals (Anderson, Lucas, & Ginns, 2003). There are also studies showing that individuals' interest in nature is associated with environmentally friendly behaviors (Çakır et al., 2015; Nisbet et al., 2009; Mayer & Frantz, 2004; Schultz, 2001). As the level of knowledge and attitude towards the environment increases, individuals exhibit environmentally friendly behaviors (Hines et al., 1987; Vining & Ebreo, 1990). Most of the problems related to the living environment are caused by the unconscious attitude of people toward the environment (Kıyıcı et al., 2005).

For this reason, protecting the living environment should be started by training individuals who are the most influential factors in the environment. In order to produce solutions to these problems, it is seen as an essential factor to provide education about science, nature, and the environment in schools. One of the primary purposes of this training is to raise individuals who can actively participate in the solution of environmental problems and have environmental culture (Sefalı & Özay-Köse, 2022). Considering the importance of environment and nature education given to students, biophilia levels can be increased in relation to the quality of education so that students can develop positive attitudes towards nature and the environment. Regarding this issue, Ballouard, Brischoux, and Bonnet (2007) emphasized that focusing on animals can effectively increase children's interaction with nature, mainly because of the emotional relationship children quickly establish with animals. In support of this situation, it is thought that the training given in the "pets and responsibility awareness" course in this study caused a significant increase in the biophilia levels of the participants. Of course, student teachers, who are the teachers of the future, who will train students in this regard, also have significant duties. Biophilia is an attachment to living things and nature (Çakır et al., 2015). However, it is seen how this commitment (interest) changes over time, and at the same time, one of the variables affecting this change is the science-based courses taken. In addition, one of the most effective ways to strengthen students' bonds with nature is to offer them regular nature experiences where they can interact with the natural world (Kadirhanoğulları & Özay Köse, 2022; Yılmaz-Uysal, 2020).

When the increase in biophilia level of student teachers according to their genders is examined, no difference was observed. No difference was observed between the genders because all students who attended the courses participated in the courses in a standard way, focusing on academic success since all four courses were compulsory for graduation. In addition, since male and female students worked together in groups in the activities in the lessons, they might have motivated each other about the subject, and relative values were obtained between the genders. Although there are a limited number of studies in the literature to directly determine the biophilia levels of students, there are hardly any studies in which activities to improve biophilia levels are applied (Sefalı & Özay-Köse, 2022; Yılmaz & Olgan, 2017; Yılmaz-Uysal, 2020). Studies mainly focus on issues such as commitment to nature or attitude towards the environment (Tağrikulu et al., 2021; Ozay, 2010). However, in the literature on the gender variable, studies on different age groups support this data. For example, in another study by Yılmaz and Olgan (2017), the closeness to nature (biophilia) of preschool children and the reasons for their positive (biophilic) and negative (biophobic) reactions to a natural stimulus were investigated. According to the results obtained, it was observed that the biophilia levels of the children were relatively high and did not differ according to gender. However, Tagrikulu et al. (2021) examined the level of commitment to the nature of student teachers studying in different classes and departments of education faculties. As a result of the research, it was observed that there is a significant difference between female and male student teachers. However, generally, it was observed that the level of commitment to the nature of student teachers was high.

5. CONCLUSION

This study has its strengths and weaknesses. As a result of the findings reached in the study, it is understood that science-based courses significantly increased the biophilia levels of student teachers. However, the effect of courses such as environmental science is somewhat more limited than other courses. Considering the course content, it is vital to include courses that include more specific topics about nature and living things in the curriculum or to include these courses as elective courses in the curriculum in order to improve the biophilia levels of student teachers. In addition, more time can be allocated for extracurricular activities in the lessons so that students can interact with nature and living things one-on-one.

On the other hand, this quantitative study measures the biophilia levels of student teachers with the help of a scale. Therefore, one of the most critical limitations of this study is the inclusion of qualitative data collection tools. In future research, biophilia levels can be examined through qualitative methods by conducting one-on-one interviews with participants or through observation. In addition, another limitation is the absence of control groups. In this study, student teachers' biophilia levels were also compared

regarding gender variables. However, comparisons can also be made according to variables such as growing plants/pets at home and the region where the individual lives (village or city). Finally, this study was conducted with student teachers studying at a state university. However, similar studies can be carried out with students studying at lower levels of education.

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