To cite this article: Şeren, N. & Gül, S. (2022). An Innovative and Interdisciplinary Perspective on Environmental Issues Through Ecological Art Projects: A Mixed Methods Study. *Romanian Review of Geographical Education, 11*(1), 73-91. DOI: 10.24193/RRGE120225

ROMANIAN REVIEW OF GEOGRAPHICAL EDUCATION
Volume XI, Number 1, February 2022

pp. 73-91

DOI: 10.24193/RRGE120225

AN INNOVATIVE AND INTERDISCIPLINARY PERSPECTIVE ON ENVIRONMENTAL ISSUES THROUGH ECOLOGICAL ART PROJECTS: A MIXED METHODS STUDY

NURBANU ŞEREN

Ondokuz Mayıs University, Faculty of Education, Samsun, Turkey, e-mail: nurbanuseren@gmail.com

SEYFULLAH GÜL

Ondokuz Mayıs University, Faculty of Education, Samsun, Turkey, e-mail: seyfullah.gul@omu.edu.tr

(Received: January 2022; in revised form: February 2022)

ABSTRACT

This study investigated the effect of ecological art (eco-art) projects on preservice classroom teachers' attitudes towards and views on environmental issues. Ecological art is an art-oriented teaching model. The study adopted a mixed embedded research design and integrated ecological art into the "Environmental Education" course. The sample consisted of 78 first-year students from the department of classroom education of Ondokuz Mayıs University in the spring semester of the 2020-2021 academic year. Data were collected using student logs and a semi-structured interview questionnaire developed by the researchers, and the Environmental Problems Attitude Scale developed by Güven (2013). We developed a 14-week project and integrated visual arts education into the "Environmental Education" course. The project aimed to raise awareness through artistic expression. Each participant chose an ecological problem. The quantitative data were analysed using the Wilcoxon test. There was a significant difference between pre-test and post-test scores (p= 0.001). The qualitative data were analysed using content analysis. The results showed that the eco-art projects had cognitive, affective, and behavioural effects on participants. In other words, the eco-art projects raised their awareness of environmental issues. Participants stated that eco-art projects should be integrated into environmental education classes because they believed that art conveyed universal messages. We can conclude that eco-art projects bring an innovative and interdisciplinary perspective to environmental education and help preservice classroom teachers develop positive attitudes and views on environmental issues.

Keywords*: eco-art, environment education, art education, attitude, embedded design.*

ISSN 2285 – 939X
ISSN – L 2285 – 939X

INTRODUCTION

Environmental issues have severe effects on human beings and natural resources. They have become more widespread and intense due to increasing industrial and human impacts on the environment since the twentieth century. They are so complicated that they require international responses and solutions (Cairns, 2002).

The world is facing an environmental crisis. Therefore, researchers have focused their attention on environmental education to help people develop the skills necessary to solve environmental issues. According to Özdemir (2010), environmental education is a way to encourage people to acquire the necessary knowledge and develop the right skills and attitudes to undo what they have been doing to mother nature. However, there is an ongoing debate about what methods to use to provide students with environmental education. Therefore, researchers have developed different definitions, guidelines, methods, goals, and standards over the past three decades to help educators know how to distinguish environmental education from other educational endeavours (Monroe, Andrews & Biedenweg, 2008). However, environmental education fails to promote cognitive, affective, or behavioural development because most countries stick to conventional methods and techniques (Smith-Sebasto, 2007).

Research shows that visual elements make environmental education relevant, effective, and sustainable (Erzen, 2005; Simon, 2006; Olivier, 2007; Wallen, 2012; Rathwell & Armitage, 2016). People have turned into consumers of videos and photographs because social media has been an integral part of modern life in the twenty-first century (Al-Zaman, 2021). Everybody can easily access a myriad of visual content anywhere, anytime. People trust what they see because visual content can easily alter how they perceive things (Pickard-Jones, 2019). Visual content is the educational aspect of visual arts as long as it is developed within the framework of ideas and supported by artistic forms (Al-Zaman & Khan, 2021). In other words, visual arts are alternative tools that accomplish things to promote social change that plain text articles struggle with (Lewis & Greene, 1983; Hansen, 2019) and increase the effectiveness of environmental education and ecological literacy.

As an interdisciplinary integration of visual arts and environmental education, ecological art (eco-art) is an effective method for raising students' awareness of the environment. Inwood (2013) defines eco-art as an educational approach that helps students develop awareness and attitudes that encourage them to change their environmental behaviour in the long run. Figure 1 shows eco-art education.

Eco-art is an important art movement mainly for two reasons. First, we are witnessing an environmental crisis on a global scale. Second, art is a universal form of expression. Concerned with conveying messages, eco-art has the power to raise awareness and contribute to ecological sustainability by drawing attention to ecological destruction and environmental problems (Curtis, Reid & Reeve, 2014). Eco-artists use their works to raise people's

awareness of the environment and to help them develop critical perspectives regarding the relationship between humans and nature (Mamur, 2017; Çınar, 2019). Eco-art also encourages students to think critically about the relationship between arts and the environment and mobilises them to support the positive ecological changes in society (Stankiewicz & Krug, 1997). Liu and Chen (2018) argue that eco-art education promotes cognitive skill development and creativity. Therefore, it can help students comprehend interdisciplinary learning outcomes and develop high-level skills (critical thinking, questioning, problem-solving, analysing, comprehending, evaluating, and decision-making) and make them so creative and self-aware that they can come up with or promote innovations.

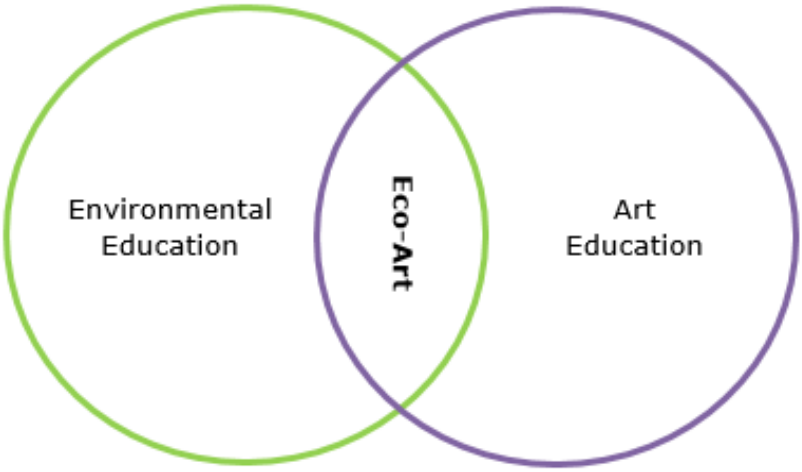

Fig. 1. Eco-art education (Inwood, 2013)

Inwood (2013) also maintains that eco-art education provides all parties (teachers and learners) with a learning environment that pushes them toward sustainability goals. To him, eco-art education plays a crucial role in promoting creativity and awareness as it helps students combine environmental education outcomes with knowledge, skills, and values based on visual art. Eco-art education is a nascent field that provides teachers and preservice teachers with a perspective on how they can adopt an interdisciplinary approach to achieving environmental change, because teachers are supposed to be role models who are part of environmental education with their awareness of environmental issues (Yavetz, Goldman & Pe'er, 2009).

Academics should integrate new educational methods into their lectures to raise their students' (preservice teachers) awareness of environmental issues and turn them into teachers with environmental

literacy (Genc, 2015). A qualified environmental education becomes more strategic for preservice classroom teachers as they will take charge in the first stage of formal education and undertake a critical mission. The departments of classroom teaching in Turkey offer an "Environmental Education" course in the spring semester of the first academic year to help students acquire knowledge about the environment and develop the right skills and attitudes. The "Environmental Education" course addresses the basic ecological concepts and principles, environmental problems, correct use of resources, environmental awareness, environmental literacy, and environmental education in primary school (Higher Education Institution, 2018). The course involves student-centred activities (Şahin et al., 2004) and ecology- (Güler, 2010), moral reasoning- (Saraç & Sarıkaya, 2020), and argumentation-based (Karakaş & Sarıkaya, 2020) sustainable environmental education (Tanriverdi, 2010) in line with green classroom models (Uzun, Sağlam & Varnacı Uzun, 2008).

There is a small body of research on eco-art. Researchers have focused on ecological management in arts education (Lankford, 1997), mapping in eco-arts education (Inwood, 2008), the relationship between art and environmental education (Song, 2012), development of an eco-arts curriculum for primary school students (Inwood, 2013), the effects of eco-art on STEM and problem solving (Liu & Chen, 2018), the role of eco-art in providing environmental communication (Al-Zaman & Khan, 2021) and the impact of eco-arts education on environmental empathy (Sunassee, Bokhoree & Patrizio, 2021). This study was conducted for two reasons. First, there is no applied study on the use of eco-art projects in environmental education. Second, environmental education and art are suitable for an innovative and interdisciplinary practice because they are interrelated fields. In this context, this study aimed to determine the effect of eco-art projects on preservice classroom teachers' attitudes towards environmental problems. The sample consisted of 78 first-year students. Data were collected using student logs and a semi-structured interview questionnaire (qualitative data), and the Environmental Problems Attitude Scale (EPAS) (quantitative data).

The research questions are as follows:

1. Do eco-art projects affect preservice classroom teachers' EPAS scores?
2. What do preservice classroom teachers think about eco-art projects?

Is there a substantial convergence between the qualitative and quantitative data?

METHOD

This chapter comprises the research model, study group, intervention, data collection tools, and data analysis.

Research Model

This study adopted a mixed-methods research design, which is a procedure for collecting, analysing, and "mixing" quantitative and qualitative methods to understand a research problem (Greene, Caracelli & Graham, 1989). Mixed-methods research designs help researchers combine quantitative and qualitative data to get more comprehensive and in-depth results (Johnson & Onwuegbuzie, 2004). The embedded research design was the design of choice because this study aimed to thoroughly test the usability of eco-art projects as an innovative teaching model in environmental education. The embedded research design is a type of design where qualitative data are embedded in quantitative data, primarily in experimental studies (Creswell & Plano Clark, 2011). This study involved a 14-week project (intervention). Quantitative data were collected before and after the intervention, while qualitative data were collected during and after the intervention. The goal was to ensure that the quantitative and qualitative aspects supported each other and generated data richness. Figure 2 shows the flow chart of the study.

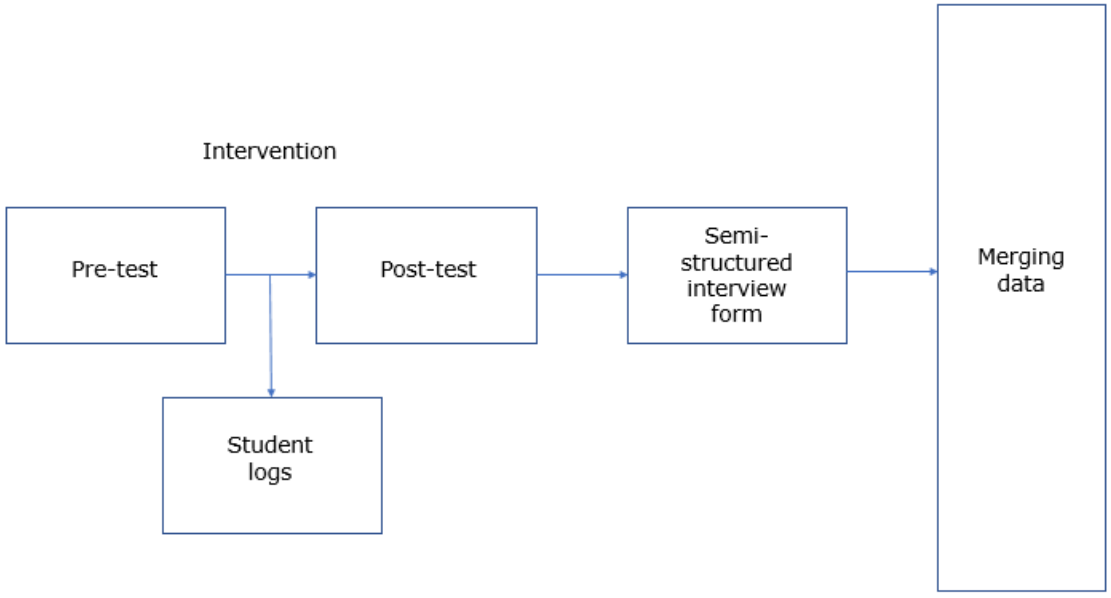

Fig. 2. Research model process

Study Group

The sample consisted of 78 first-year students from the department of classroom education of Ondokuz Mayıs University in the spring semester of the 2020-2021 academic year. The inclusion criterion was students taking the "Environmental Education" course for the first time. Table 1 shows all participants' sociodemographic characteristics.

Table 1. Sociodemographic characteristics

Gender	**n**
Woman	55
Man	23
GPA	**n**
High	34
Moderate	29
Low	15
Total	**78**

The sample of the qualitative stage consisted of nine participants (five women and four men) with high, moderate, or low GPAs. Participants were recruited using maximum variation sampling. For anonymity, each participant was assigned a code (P1, P2…, P9).

Intervention

The 14-week intervention was implemented in the first-year "Environmental Education" course of the department of classroom education in the spring semester of the 2020-2021 academic year. Firstly, all participants filled out the EPAS (pre-test). Secondly, they were informed about the eco-art projects and the intervention schedule. Table 2 shows the intervention schedule.

Table 2. Intervention schedule

Date	
Week 1	- Administering the pre-test - Informing participants about the course content - Distributing the intervention schedule - Informing participants about the purpose and significance of the study
Week 2	- Art - Branches of art - Elements of art (line, colour, shape, form, texture, value, space, etc.)
Week 3	- Design principles of art (balance, emphasis, movement, rhythm, unity, contrast, motif, proportion, diversity, harmony, etc.) - Classification of arts (surface arts, sound arts, volume arts, movement arts, spatial arts, dramatic arts, language arts)
Week 4	- Creativity - Creativity models (preparation, incubation, enlightenment, validation) - Characteristics of creative teachers
Week 5	- Emphasising the relationship between ecology and art - Showing examples of eco-art projects - Asking participants to do research on ecological problems
Week 6	- Listening to participants talking about the research they conducted about ecological problems - Asking participants to choose the ecological problems they would like to turn into eco-art projects

Week 7	- Discussing why participants have chosen those ecological problems
Week 8	- Designing eco-art projects and giving feedback
Week 9	- Designing eco-art projects and giving feedback
Week 10	- Designing eco-art projects and giving feedback
Week 11	- Designing eco-art projects and giving feedback
Week 12	- Designing eco-art projects and giving feedback
Week 13	- Presenting the eco-art projects and giving feedback
Week 14	- Displaying the eco-art projects - Administering the post-test - Conducting semi-structured interviews

The first seven weeks focused on art and environmental topics before participants conceived their eco-art projects. Each participant chose an environmental problem and moved on to plan his/her eco-art project. Three experts (environmental education, classroom education, and art) monitored and guided the eco-art projects and gave participants feedback. Participants kept logs of their projects. They did presentations about their projects in front of the whole class. They shared visuals and information and made recommendations for solutions to those problems. At the end of the intervention, all participants took the post-test, and some were interviewed.

Data Collection Tools

The data were collected using student logs, a semi-structured interview questionnaire, and the Environmental Problems Attitude Scale.

Environmental Problems Attitude Scale

The Environmental Problems Attitude Scale (EPAS) was developed by Güven (2013) based on the affective domain steps of Bloom's Taxonomy. The scale consists of 45 items on the causes of environmental problems, global-local environmental problems, and elimination of environmental problems. The scale has five subscales: receiving, responding, valuing, organisation, and characterisation. The items are rated on a three-point Likert-type scale: Disagree (0), Neutral (1), and Agree (2). The total score ranges from 0 to 90. Data collected from 203 preservice teachers were used to determine the validity and reliability of the scale. For content validity, the explanatory factor analysis (EFA) and confirmatory factor analysis (CFA) were performed. The scale has a Cronbach's alpha of 0.88.

Student logs

The student logs were developed by the researchers based on expert feedback. Each participant filled out the log every week based on three open-ended questions:

1. What have you done to improve your eco-art project this week?
2. What have you liked and disliked about your eco-art project this week?
3. What have you learned about eco-art projects this week?

Semi-structured interview questionnaire

The semi-structured interview questionnaire was developed by the researchers based on expert feedback. The questionnaire consisted of three questions:

1. What do you think about eco-art projects?
2. Do you think what you have learned about eco-art projects is important to you? Why?
3. What are your thoughts about using eco-art projects in the "Environmental Education" course?

Data Analysis

This part comprises how the data were analysed in this study. First, the analysis of quantitative data and then the analysis of qualitative data were presented.

Analysis of quantitative data

The quantitative data were analysed using the Statistical Package for Social Sciences (SPSS, v. 23.0) at a significance level of 0.05. First, the Kolmogorov–Smirnov test was used for normality testing because the sample was greater than 50. The test results showed a significant difference at < 0.05. The skewness and kurtosis values did not range from 1 to -1. These results showed that the data were non-normally distributed. Therefore, the Wilcoxon test (a nonparametric test) was used to determine the effect of the eco-art projects on participants' attitudes towards environmental problems. The Wilcoxon test is used to compare two groups and see whether they are significantly different in terms of the variable of interest. Cohen's d value was calculated to check the effect size of statistical significance. Cohen (1992) suggests that an effect size of 0.20-050, 0.50-0.80, and >0.80 is small, moderate, and large, respectively.

Analysis of qualitative data

The qualitative data were analysed using content analysis, which is used for the in-depth processing of data (Yıldırım & Şimşek, 2016). The content analysis was the method of choice because this study aimed to provide in-depth syntheses that will contribute to future research and education policies. First, the researchers recorded the focus group interview and then transcribed it. Second, they checked the student logs and coded the recurrent events and phenomena. Third, they developed themes out of the codes. Each researcher checked the codes and themes. Fourth, they calculated the intercoder reliability using Miles and Huberman's (1994) formula: [Reliability = (number of agreements)/(number of agreements + number of disagreements)*100]. The intercoder reliability in the present study was 93%. They also used direct quotes to increase reliability. They improved internal validity (1) by making sure that all participants played an active role in the intervention and (2) by having them confirm the interview data after the analysis.

RESULTS AND DISCUSSION

In this chapter quantitative results, qualitative results, and consistency between both were presented. Quantitative results include the effect of eco-arts projects on EPAS scores, and qualitative results include participants' views on eco-art projects.

The results on the effect of eco-arts projects on EPAS scores

Participants filled out the EPAS both before (pre-test) and after the intervention (post-test.) Table 3 shows the descriptive statistics for the pre-test scores.

Table 3. Descriptive statistics for pre-test EPAS scores

Subscales	n	Min	Max	Mean	Std. Deviation
Receiving	78	14.00	24.00	21.38	2.04
Responding	78	30.00	51.00	45.47	4.89
Valuing	78	6.00	12.00	9.61	1.16
Organisation	78	17.00	33.00	26.75	3.61
Characterisation	78	8.00	15.00	11.69	1.76
Total	78	84.00	131.00	114.92	10.66

Participants had the highest pre-test score on EPAS "responding" subscale, followed by the "organisation," "receiving," "characterisation," and "valuing" subscales. The highest and lowest total score was 84 and 131, respectively. Table 4 shows the descriptive statistics for the post-test scores.

Table 4. Descriptive statistics for post-test EPAS scores

Subscales	n	Min	Max	Mean	Std. Deviation
Receiving	78	16.00	24.00	22.30	1.79
Responding	78	32.00	51.00	48.07	3.66
Valuing	78	7.00	12.00	9.94	1.18
Organisation	78	16.00	33.00	27.75	3.66
Characterisation	78	8.00	15.00	12.88	1.64
Total	78	83.00	135.00	120.97	9.26

Participants had the highest post-test score on EPAS "responding" subscale, followed by the "organisation," "receiving," "characterisation," and "valuing" subscales. Although the ranking did not change, participants had higher post-test total and subscale scores than the pre-test scores.

Participants had mean post-test and pre-test EPAS scores of 120.97 and 114.92, respectively. This result suggested that the intervention

positively affected participants' attitudes towards environmental issues. Table 5 presents the Wilcoxon test results.

Table 5. Wilcoxon test results for pre-test and post-test EPAS scores

Post-test-Pre-test	n	Mean rank	Sum of Ranks	z	p
Negative ranks	27	29.37	793.00	-3.471	.001
Positive ranks	49	43.53	2133.00		
Ties	2				

The Wilcoxon test results showed a statistically significant difference between pre-test and post-test scores [p=.001; p<.05]. Forty-nine participants had a significantly higher post-test score than the pre-test score. Twenty-seven participants had a significantly lower post-test score than the pre-test score. Two participants had the same post-test and pre-test scores. The mean of the positive ranks was larger than that of the negative ranks, suggesting two things. First, there were more participants with higher post-test scores than pre-test scores. Second, the intervention was effective. Cohen's d was calculated to measure the effect size of the mean difference between the pre-test and post-test. The effect size (r) was 0.39, which was moderate (Cohen, 1992). This result indicated that the intervention had a moderate effect on participants' attitudes towards environmental problems.

Participants' views on eco-art projects

Participants filled out student logs during the intervention and underwent a semi-structured interview after the intervention to help the researchers determine their views on eco-art projects.

Participants stated that they did research on environmental problems, environmental pollution and types of pollution, campaigns of non-governmental organisations (NGOs) and sample eco-art project images. For example, Participant 4 stated, "*I did research to find out what has been done about the environment so far, the magnitude of the national and international pollution and numerical data. I checked articles and videos and reports of NGOs.*" Participants noted that they watched videos and documentaries on YouTube, read articles, books and newspapers, and asked people about their experiences to prepare their eco-art projects. They remarked that they first chose the art forms suitable for their projects and then decided what materials to use. Afterwards, they bought materials (e.g., crayons) and started drawing drafts. Participant 1 talked about the process as follows: "*I got more and more aware, so I had a better idea of what I wanted to do. I got the crayons and started working on my draft*."

Participants raised their own awareness of environmental issues and art by researching those two topics. They went through different resources,

which helped them familiarise themselves with different perspectives and obtain information from different media channels. Therefore, we can state that the path they took to develop eco-art projects was consistent with the goals of the intervention.

Participants addressed the strengths and weaknesses of the intervention. They stated that the intervention helped them become more aware of environmental issues. For example, Participant 8 noted, "*I had no idea that environmental problems were that serious. I did some research for the project, and I found out about them. I didn't think it would affect me this much if we'd covered those problems in classes. I feel like I've come to my senses about environmental problems because of the project*." Participant 9 remarked that other people gave him positive feedback about his project: "*Everybody was interested in my project. I could see that they were impressed by its purpose. It was very flattering, and I thought like, I was on the right track*." The project helped them be creative and come up with original work. They were also more interested in art and enjoyed working on their projects because they were artistically engaged in the process. For example, Participant 5 stated, "*I was very happy to be involved in such a project. I was always passive in other classes, just listening to the teacher and doing nothing else. But, in this class, I was fully active and created something, which was so great*."

Some participants expressed negative views on the project. Almost all participants remarked that they had difficulty choosing environmental problems for their projects. For example, Participant 7 noted, "*My research made me realise that environmental problems were much graver than I'd thought. So, I had a hard time choosing one because I kept thinking about which one I should choose to create more effective awareness. So, I was undecided about it. Maybe, it would've been much easier for us if there was some sort of narrowing down*." Participants with low artistic skills had difficulty conceiving their projects and experienced higher anxiety as the deadline approached. For example, Participant 8 remarked, "*I'm not very creative when it comes to drawing pictures. So, the whole process was pretty hard for me. I don't think I have a talent for art, so it was also obvious in my project. I would much rather have feedback on the artistic dimension of the project.*

The number of participants with positive opinions about the eco-art projects was higher than those with negative opinions about them. We can state that the eco-art projects helped participants develop various skills. In addition, the projects were instrumental in raising not only the public's but also the participants' awareness of environmental problems. As a multidisciplinary educational approach, the eco-art projects also allowed participants to attain some learning outcomes. Some participants had negative opinions about the projects because they were bounded by no limits and no direct feedback was given to the artistic dimensions of their projects.

Participants agreed that teachers should integrate eco-art projects into the "Environmental Education" course because they believed that art was everywhere, that art and environment were two intertwined concepts,

and that art affected and was affected by the environment. For example, Participant 9 stated, "*Art is in every aspect of our lives. It's everywhere and all around us. If our environment is clean, we realise the beautiful side of art. But if it's dirty, that aesthetic is lost*." Participant 5 noted, "*I think that art is very functional in raising people's awareness of environmental problems. Seeing a stunning piece of art about water pollution is much more effective than telling people not to throw garbage in the sea*." With this statement, Participant 5 emphasised that art appealed to people, captured their attention, urged them to question things, and made them aware of problems by offering impressive perspectives and catchy visual and auditory elements. All in all, we can state that preservice classroom teachers are for the idea of integrating eco-art projects into the "Environmental Education" course because they are aware of the relationship between art and the environment and believe that art conveys universal messages.

Participants remarked that the eco-art projects made them so aware of environmental problems that they decided to become conscious consumers and volunteer in NGOs. For example, Participant 1 stated, "*As soon as I realised how serious environmental problems were, I had the opportunity to check what NGOs had been doing about them. It was an opportunity for me to apply to volunteer*." Participants noted that they reduced the amount of plastic, electricity, and water they used, provided recycling bins from municipalities for their buildings, raised their parents' and friends' awareness of environmental problems, and warned people when they saw them littering. For example, Participant 3 stated, "*The project's made me so aware of environmental problems that nothing is the same for me anymore. I'll use plastic as little as possible*, *especially single-use plastics, I'll never use them again.* Participant 6 stated, *"I can say that the project has done more than what it was intended to do because I told everything I've learned to my parents and friends. We all talked about those problems. Apparently, we all need to learn about environmental problems. Now, we're all very careful about it. We even contacted the municipality to get a recycling bin for our building*."

We can state that the eco-art projects have changed participants' lives, making them more aware of environmental problems and helping them develop more positive attitudes towards eco-friendly actions.

The consistency between the quantitative and qualitative results

The quantitative results showed that the eco-art projects raised most participants' awareness of environmental problems. The qualitative results also showed that the eco-art projects helped participants recognise the gravity of environmental problems and adopt eco-friendly behaviours. Eco-art projects effectively raise preservice classroom teachers' awareness about environmental issues for three reasons. Firstly, art is an appealing tool that makes them question things. Secondly, the eco-art projects encouraged them to do research on environmental problems. Thirdly, the

eco-art projects were engaging activities that allowed them to actively participate in and come up with products.

CONCLUSIONS AND DISCUSSION

This study investigated the effects of eco-art projects on preservice classroom teachers' attitudes towards environmental problems and views on environmental problems. In general, the results showed that the eco-art projects raised participants' awareness of environmental problems and encouraged them to adopt a more eco-friendly and sustainable lifestyle.

The quantitative results showed that participants had higher EPAS post-test scores than the pre-test scores, suggesting that the eco-art projects had a moderate effect on participants' attitudes towards environmental problems.

The qualitative results showed that most participants had positive views of the eco-art projects. They stated that the projects helped them develop research skills, become more aware of environmental problems, and made them more interested in art. According to Inwood (2008) and Lankford (1997), eco-art activities increase students' creativity, awareness, and ecological interest. Eco-art projects are effective tools for developing imagination, creativity, and environmental awareness (Cronin Jones, 2005) because they help students express their cognitive and emotional reactions to environmental problems (Bowker, 2007). Eco-art projects allow educators to put theory into practice because they integrate environmental education with art (Geffen et al., 2022). However, our qualitative results also showed that the eco-art projects caused indecisiveness and anxiety in some participants. In other words, not all participants were able to create eco-art projects easily because they were different in terms of interest, skills, and readiness. Although some participants expressed negative opinions about the eco-art projects, there were more participants with positive opinions about the fact that the eco-art projects helped them develop an awareness of environmental problems and adopt a more eco-friendly and sustainable lifestyle.

While conceiving their eco-art projects, participants did research about environmental issues and artistic expressions at the beginning and end of the intervention. In this way, they developed different perspectives regarding environmental problems and art. The eco-art projects also encouraged participants to adopt a more eco-friendly and sustainable lifestyle and volunteer in NGOs. Inwood (2013) provided teachers with a project to develop an eco-arts curriculum that integrated arts and environmental education. He found that the project motivated the participants to lead many eco-art activities, such as organising eco-art exhibitions in schools, providing various training programs, establishing eco-clubs, setting up websites to share information with other teachers, and developing projects to involve both students and parents in ecological literacy. Song (2010) provided students with an eco-art project about

plastic pollution and determined that the project helped them think and express their emotions authentically, and encouraged them to take action to prevent plastic pollution in their own lives. Our participants agreed that teachers should integrate eco-art projects into the "Environmental Education" course because they believed art raised public awareness of environmental problems. We can use artistic expressions to express environmental problems and find solutions because art and the environment are inextricably linked (Erzen, 2005; Simon, 2006; Olivier, 2007; Wallen, 2012; Rathwell & Armitage, 2016). Thus, students who recognise the relationship between the environment and art have the power to make sense of nature and turn it into works of art (Anderson & Guyas, 2012; Song, 2012).

Eco-art projects bring an innovative and interdisciplinary perspective to environmental education. Our results showed that the intervention helped our participants become more aware of environmental problems and develop positive attitudes towards eco-friendly habits. This is the first study that adopted a mixed research design to unveil the relationship between eco-art projects and environmental awareness. This and earlier studies (Anderson & Guyas, 2012; Song, 2012; Inwood, 2013) have focused on eco-art theoretical and practical aspects. Therefore, we should use those theoretical and practical aspects to raise students' and teachers' awareness of environmental issues and help them develop positive attitudes towards eco-friendly and sustainable practices. For example, we should expand the application areas of eco-art projects and provide various training programs to students, teachers, and preservice teachers so that they can bring environmental education to an art-based interdisciplinary position (Sauvé, 1998; Gurevitz, 2000). The primary purpose of those projects should be educational. We should avoid aesthetic concerns that involve complex and abstract conceptualisation as much as possible. Thus, visual elements can make things easier to understand and appeal to wider audiences (Al-Zaman & Khan, 2021). Primary and secondary school teachers should organise ecological art activities and exhibitions and involve parents in the process. Higher education institutions should also cooperate with NGOs to promote environmental awareness through environmental education. In their advertisements, promotions, posters, and brochures, NGOs should use ecological art projects developed by preservice teachers. Thus, the outcomes of formal education can also pioneer informal education.

Limitations

This study had six limitations. First, the quantitative and qualitative data are inconclusive due to research limitations. Second, the sample of the quantitative stage was 78, whereas the sample of the qualitative stage was only nine. Third, the semi-structured interview questionnaire and logs had only three questions to determine participants' attitudes towards environmental problems. Fourth, the sample consisted of first-year students from only one university. Fifth, not every participant had the same means to develop eco-art projects. Sixth, some interviews were kept short due to the COVID-19 pandemic.

APPENDIX

Fig. 3. 3D eco-art project example

Fig. 4. Eco-art project example

Fig. 5. 3D eco-art project example

Fig. 6. 2D eco-art project example

References

Al-Zaman, M.S. & Khan, T. (2021). Eco-Painting in Environmental Communication. *Media Asia*, 48, 1-6.

Al-Zaman, M.S. (2021). Are Social Media Users Becoming More Visually Biased? *Media Asia*, 1-4.

Anderson, T. & Guyas, A.S. (2012). Earth Education, Interbeing, and Deep Ecology. *Students in Art Education*, 53, 223-245.

Bowker, R. (2007). Children's Perceptions and Learning About Tropical Rainforests: An Analysis of Their Drawings. *Environmental Education Research*, 13, 75-96.

Cairns, J. (2002). Sustainability and Sacred Values. *Ethics in Science and Environmental Politics*, 13, 15-27.

Çınar, S. (2019). Ekolojik sanat projeleri'nde okyanus atıklarının sanatsal nesnelere dönüşümü [Artistic Object Conversion of Ocean Wastes in Ecological Art Projects]. *Uluslararası Disiplinlerarası ve Kültürlerarası Sanat*, 4(9), 203-215.

Cohen, J. (1992). Statistical Power Analysis. *Current Directions in Psychological Science*, 1(3), 98-101.

Creswell, J.W. & Plano Clark, V.L. (2011). *Designing and Conducting Mixed Methods Research* (2nd ed.). CA: Sage.

Cronin-Jones, L.L. (2005). Using Drawings to Assess Student Perceptions of Schoolyard Habitats: A Case Study of Reform-Based Research in the United States. *Environmental Education Research*, 10, 225-240.

Curtis, D.J., Reid, N. & Reeve, I. (2014). Towards Ecological Sustainability: Observations on the Role of the Arts. *SAPIENS Surveys and Perspectives Integrating Environment and Society*, 7(1), 1-15.

Erzen, J. (2005). An Ecological Approach to Art Education: Environmental Aesthetics. *International Journal of Education through Art*, 1(2), 179-186.

Geffen, A., Rosenthal, A., Fremantle, C. & Rahmani, A. (Eds.). (2022). *Ecoart in Action: Activities, Case Studies, and Provocations for Classrooms and Communities*. New Village Press. Retrieved 24 December 2021, from https://nyupress.org/9781613321461/ecoart-in-action/

Genc, M. (2015). The Project-Based Learning Approach in Environmental Education. *International Research in Geographical and Environmental Education*, 24(2), 105-117.

Greene, J.C., Caracelli, V.J. & Graham, W.F. (1989). Toward a Conceptual Framework for Mixed-Method Evaluation Designs. *Educational Evaluation and Policy Analysis*, 11(3), 255-274.

Güler, T. (2010). Ekoloji temelli bir çevre eğitiminin öğretmenlerin çevre eğitimine karşı görüşlerine etkileri [The Effects of an Ecology Based Environmental Education on Teachers' Opinions about Environmental Education]. *Eğitim ve Bilim*, 34(151).

Gurevitz, R. (2000). Affective Approaches to Environmental Education: Going Beyond the Imagined Worlds of Childhood? *Ethics, Place and Environment*, 3*(*3), 253-268.

Güven, E. (2013). Çevre Sorunlarına Yönelik Tutum Ölçeğinin Geliştirilmesi ve Öğretmen Adaylarının Tutumlarının Belirlenmesi [Development of Environmental Problems and Determination of Teacher Candidates' Attitudes]. *Gazi Üniversitesi Gazi Eğitim Fakültesi Dergisi*, 33(2), 411-430.

Hansen, A. (2019). *Environment, Media and Communication* (2nd ed.). London: Routledge.

Higher Education Institution (2018). Classroom Teaching Undergraduate Program, New Teacher Training Undergraduate Program. Retrieved 10 December 2021, from https://www.yok.gov.tr/Documents/Kurumsal/egitim_ogretim_dairesi/Yeni-Ogretmen-Yetistirme-Lisans-Programlari/Sinif_Ogretmenligi_Lisans_Programi09042019.pdf

Inwood, H. (2008). Mapping Eco-Art Education. *Canadian Review of Art Education: Research and Issues*, 35, 57-73.

Inwood, H. (2013). Cultivating Artistic Approaches to Environmental Learning: Exploring Eco-Art Education in Elementary Classrooms. *International Electronic Journal of Environmental Education*, 3*(*2), 129-145.

Johnson, R.B. & Onwuegbuzie, A.J. (2004). Mixed Methods Research: A Research Paradigm Whose Time Has Come. *Educational researcher*, 33(7), 14-26.

Karakaş, H. & Sarıkaya R. (2020). Çevre-enerji konularına yönelik gerçekleştirilen argümantasyon temelli öğretimin sınıf öğretmeni adaylarının argüman oluşturabilmelerine etkisi [The Effect of Argumentation-Based Teaching Carried Out for Environment-Energy Subjects on the Argumentation Skills of Prospective Teacher]. *Pamukkale Üniversitesi Eğitim Fakültesi Dergisi*, 48, 346-373.

Lankford, E.L. (1997). Ecological Stewardship in Art Education. *Art Education*, 50(6), 47-53.

Lewis, D. & Greene, J. (1983). *Your Child's Drawings...Their Hidden Meaning*. London: Hutchinson.

Liu, Y. & Chen, M. (2018). From the Aspect of STEM to Discuss the Effect of Ecological Art Education on Knowledge Integration and Problem-Solving Capability. *Ekoloji*, 27(106), 1705-1711.

Mamur, N. (2017). Ekolojik Sanat: Çevre Eğitimi ile Sanatın Kesişme Noktası [Ecological Art: The Intersection Point of Environmental Education and Art]. *Mersin Üniversitesi Eğitim Fakültesi Dergisi*, 13(3), 1000-1016.

Miles, A.M. & Huberman, M.B. (1994). *Qualitative Data Analysis: An Expanded Sourcebook.* Thousand Oaks: Sage.

Monroe, M.C., Andrews, E. & Biedenweg, K. (2008). A Framework for Environmental Education Strategies. *Applied Environmental Education & Communication*, 6(3-4), 205-216.

Olivier, B. (2007). Ecological Art and the Transformation of the World. *South African Journal of Art History*, 22(1), 24-34.

Özdemir, O. (2010). Yeni bir çevre eğitimi perspektifi: "Sürdürülebilir gelişme amaçlı eğitim" [A New Environmental Education Perspective: "Education for Sustainable Development"]. *Eğitim ve Bilim*, 32(145), 23-38.

Pickard-Jones, B. (2019). How Our Unconscious Visual Biases Change the Way We Perceive Objects. *The Conversation*. Retrieved 24 December 2021, from https://theconversation.com/how-our-unconscious-visual-biases-change-the-way-we-perceive-objects-109039

Rathwell, K.J. & Armitage, D. (2016). Art and Artistic Processes Bridge Knowledge Systems about Social-Ecological Change: An Empirical Examination with Inuit Artists from Nunavut, Canada. *Ecology and Society*, 21(2), 21.

Şahin, N.F., Cerrah, L., Saka, A. & Şahin, B. (2004). Yüksek öğretimde öğrenci merkezli çevre eğitimi dersine yönelik bir uygulama [A Practice for Student Centred Ecology Course in Higher Education]. *Gazi Üniversitesi Gazi Eğitim Fakültesi Dergisi*, 24(3).

Saraç, E. & Sarıkaya, R. (2020). Sınıf öğretmeni adaylarının çevre kimlikleri ve çevreye yönelik materyalist eğilimleri: Ahlaki muhakeme temelli çevre eğitimi [Pre-Service Elementary Teachers' Environmental Identities and Materialistic Tendencies Towards the Environment: Moral Reasoning Based Environmental Education]. *Eğitimde Nitel Araştırmalar Dergisi*, 8(3), 950-979.

Sauvé, L. (1998). Environmental Education Between Modernity and Postmodernity: Searching for an Integrating Educational Framework. In Jarnet, A. (ed.), *A Colloquium on the Future of Environmental Education in a Postmodern World* (pp. 44-55). Whitehorse: Whitehorse Yukon College.

Simon, S. (2006). Systemic Educational Approaches to Environmental Issues: The Contribution of Ecological Art. *Systemic Practice and Action Research*, 19(2), 143-157.

Smith-Sebasto, N.J. (2007). A Reinvestigation of Teachers' Motivations Toward and Perceptions of Residential Environmental Education: A Case Study of the New Jersey School of Conservation. *The Journal of Environmental Education*, 38(4), 34-42.

Song, Y.I.K. (2010). Art in Nature and Schools: Nils-Udo. *Journal of Aesthetic Education*, 44(3), 96-108.

Song, Y.I.K. (2012). Crossroads of Public Art, Nature and Environmental Education. *Environmental Education Research*, 18(6), 797-813.

Stankiewicz, M.A. & Krug, D.H. (1997). Art & Ecology. *Art Education*, 50(6), 4.

Sunassee, A., Bokhoree, C. & Patrizio, A. (2021). Students' Empathy for the Environment through Eco-Art Place-Based Education: A Review. *Ecologies*, 2, 214-247.

Tanrıverdi, B. (2010). Sürdürülebilir çevre eğitimi açısından ilköğretim programlarının değerlendirilmesi [Analysing Primary School Curriculum in Terms of Sustainable Environmental Education]. *Eğitim ve Bilim*, 34(151).

Uzun, N., Sağlam, N. & Varnacı Uzun, F. (2008). Yeşil sınıf modeline dayalı uygulamalı çevre eğitimi projesinin çevre bilinci ve kalıcılığına etkisi [The Effect of the Green Class Model Nased Applied Environmental Education Project on Environmental Consciousness and Its Retention]. *Ege Eğitim Dergisi*, 9(1), 59-74.

Wallen, R. (2012). Ecological Art: A Call for Visionary Intervention in a Time of Crisis. *Leonardo*, 45(3), 234-242.

Yavetz, B., Goldman, D. & Pe'er, S. (2009). Environmental Literacy of Pre-Service Teachers in Israel: A Comparison Between Students at the Onset and End of Their Studies. *Environmental Education Research*, 15(4), 393-415.

Yıldırım, A. & Şimşek, H. (2016). *Sosyal bilimlerde nitel araştırma yöntemleri [Qualitative Research Methods in the Social Sciences]*. Ankara: Seçkin.