

Enhancing The Capacity To Design Environmentally Friendly Teaching Materials For Students In The Faculty Of Arts At Universities In Vietnam

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Abstract: This study explores the role of environmentally friendly teaching materials in enhancing the pedagogical capacity of students in the Faculty of Arts at universities in Vietnam. With the increasing urgency of environmental issues, Education for Sustainable Development has become a crucial aspect of educational programs, particularly in the arts, fostering creativity and interdisciplinary approaches. The research evaluates how sustainable materials can raise environmental awareness and improve teaching skills among students. Using a mixed-methods approach, the study includes pre- and post-tests, surveys, interviews, and classroom observations at Hanoi National University of Education and the Military University of Culture and Arts. The results show significant improvements in both environmental awareness and pedagogical capacity in students exposed to sustainable teaching materials. The findings highlight the importance of integrating sustainability into teaching methods in the arts to promote responsible citizenship and prepare future educators to address environmental challenges.

Keywords: Environmentally Friendly Teaching Materials, Pedagogical Competence, Art Education, Education for Sustainable Development, Sustainability, Vietnamese Universities

1. INTRODUCTION

In recent years, Education for Sustainable Development (ESD) has emerged as a critical component of educational systems worldwide. As global environmental challenges such as climate change, resource depletion, and biodiversity loss intensify, the need for educational frameworks that equip individuals with the knowledge and skills to address these issues has become increasingly urgent. ESD aims to integrate sustainability principles into all levels of education, fostering not only environmental awareness but also responsible citizenship and active participation in creating a sustainable future (Alam, 2022; UN, 2015).

One of the key areas where ESD can make a significant impact is in the realm of art education. Art, with its inherent ability to promote creativity, critical thinking, and interdisciplinary approaches, is uniquely positioned to serve as a medium for addressing environmental issues. Art education encourages students to engage with sustainability concepts through visual expression, providing them with the tools to critically analyze environmental concerns and explore innovative solutions. As such, teaching materials in art education play a vital role in bridging the gap between environmental sustainability and pedagogical practices (Anderson, 2012; Trott, Even, & Frame, 2020).

The pedagogical competence of teachers is another crucial factor in advancing sustainability education. In order to effectively integrate sustainability into art curricula, it is essential for teachers to possess a deep understanding of both environmental issues and teaching strategies that foster critical reflection. Studies show that pre-service teachers, especially in the field of art, can significantly enhance

their environmental competencies through targeted professional development and project-based learning approaches. These pedagogies not only cultivate teachers' knowledge of sustainability but also enable them to design and implement effective learning experiences for their students (Alvarez-García, Sureda-Negre, & Comas-Forgas, 2018; Ateskan & Lane, 2018).

Furthermore, the development of environmentally friendly teaching materials is fundamental in promoting sustainability in art education. These materials, when designed with sustainability principles in mind, can facilitate experiential learning, foster creative problem-solving, and enhance students' environmental awareness. By utilizing materials that are sustainable, educators not only teach about environmental issues but also model responsible practices that students can adopt in their own lives. The integration of such materials can contribute to the overall development of environmentally literate individuals who are well-equipped to engage in sustainability efforts at both the local and global levels (Brookfield, 2012; Cutter-Mackenzie & Smith, 2003).

This research explores the role of environmentally friendly teaching materials in enhancing the pedagogical competence of art students at Vietnamese universities. It examines how such materials can be used to cultivate a deeper understanding of sustainability, encourage critical reflection, and foster responsible citizenship. By assessing the effectiveness of these materials in art education, this study aims to contribute to the ongoing dialogue on how higher education institutions can support the development of future generations capable of addressing the complex environmental challenges facing our world today (Gandolfi, 2023; Yang et al., 2022).

2. LITERATURE REVIEW

2.1. Overview of Pedagogical Competence

Pedagogical competence refers to the set of skills, knowledge, and abilities that educators must possess to facilitate effective learning environments. It encompasses not only content knowledge but also instructional strategies, classroom management skills, and the ability to foster a supportive and engaging learning atmosphere. According to Darling-Hammond (2017), a key element of pedagogical competence is the ability to adapt teaching methods to meet diverse student needs while integrating contemporary educational philosophies, such as critical thinking and problem-solving. In the context of sustainability education, pedagogical competence also includes the ability to incorporate sustainability principles into teaching practices, thereby fostering environmental awareness and encouraging responsible citizenship (Evans, Tomas, & Woods, 2016).

For pre-service teachers, the development of pedagogical competence is critical. Al-Naqbi and Alshannag (2018) highlight that the sustainability knowledge, attitudes, and behaviors of university students significantly influence their teaching practices and their ability to impart these concepts to future students. The need for teachers to be well-versed in sustainability is underscored by research showing that without proper training, educators may lack the necessary skills to integrate sustainability topics effectively into their teaching (Andersson, 2017). Therefore, enhancing pedagogical competence in the context of sustainable development is essential for ensuring that future generations are equipped to tackle the environmental challenges ahead.

2.2. The Role of Teaching Materials in Art Education

Teaching materials play a central role in the instructional process, particularly in art education, where creative and visual methods are often employed to engage students. According to Dewey (1963), the role of teaching materials extends beyond mere content delivery; they serve as tools that enable students to interact with and critically reflect on the world around them. In the case of art education, teaching materials can act as mediums through which students explore complex environmental issues, offering opportunities to

express their understanding through creative works. These materials include visual aids, digital tools, eco-friendly art supplies, and project-based learning resources that align with sustainable practices.

Incorporating environmentally friendly teaching materials into art education not only promotes sustainability but also models responsible behavior for students. Studies have shown that when educators use sustainable materials in their teaching, they encourage students to think critically about their environmental impact and become more conscious of the materials they use (Brookfield, 2012). Additionally, integrating sustainability into art curricula through such materials allows students to engage with environmental themes in a hands-on and creative way, fostering a deeper connection to the issues at hand (Alvarez-García et al., 2018).

Furthermore, teaching materials in art education are pivotal in helping students develop critical thinking and problem-solving skills. As highlighted by Boyte and Kari (1996), teaching materials should not only serve as educational tools but also as instruments for facilitating democratic participation and civic engagement. In the context of environmental sustainability, this means encouraging students to examine the environmental implications of their work, from the materials they choose to the creative processes they adopt (Bürgener & Barth, 2018).

2.3. Environmental Sustainability in Education

Environmental sustainability in education refers to the integration of environmental values, awareness, and actions within teaching and learning processes. As emphasized by Palmer (2002), environmental education aims to foster an understanding of the interconnectedness between humans and the environment, encouraging students to adopt behaviors that contribute to the well-being of the planet. ESD encompasses not only the environmental dimension but also social and economic aspects, advocating for a holistic approach to sustainability (Laurie et al., 2016).

Incorporating sustainability into education is increasingly seen as a responsibility for educators across all disciplines, including art education. According to the United Nations (2015), the 2030 Agenda for Sustainable Development outlines specific goals for integrating sustainability into education systems worldwide. These include promoting awareness of environmental issues, developing skills for sustainable living, and fostering responsible citizenship. The role of art education in this broader agenda is significant, as it provides students with the tools to explore and express environmental themes creatively (Gandolfi, 2023).

Research has shown that environmental education, when integrated into curricula effectively, can lead to positive changes in students' attitudes towards sustainability and pro-environmental behavior (Díaz-López et al., 2023). Moreover, by engaging students in sustainability topics through creative and interdisciplinary approaches, such as art, educators can help cultivate a generation of individuals who not only understand the science behind environmental challenges but also actively participate in finding and implementing solutions (Merritt, Hale, & Archambault, 2019).

The integration of environmental sustainability in education also requires a shift in how teaching materials are designed and utilized. Educators are encouraged to select and create materials that are aligned with sustainability principles, considering factors such as resource consumption, waste production, and environmental impact (Dimante, Tamboveceva, & Atstaja, 2016). By prioritizing sustainability in the design of teaching materials, educators can provide students with the knowledge and skills they need to navigate and address the complex environmental challenges of the 21st century.

3. RESEARCH METHODOLOGY

The research was conducted at two institutions in Vietnam, namely the Hanoi National University of Education and the Military University of Culture and Arts. The study aimed to assess the effectiveness of environmentally friendly teaching materials in enhancing the pedagogical competence of art students, with a particular focus on sustainability education.

Research Design

The research adopted a mixed-methods approach, combining both qualitative and quantitative data to ensure a comprehensive understanding of the impact of environmentally friendly teaching materials on pedagogical competence. The design included both pre- and post-tests, along with in-depth interviews and classroom observations, to collect data on students' environmental awareness and pedagogical skills before and after exposure to sustainable teaching materials. This approach enabled the researchers to gather both numerical data and detailed qualitative insights.

The study used an experimental design where the participants were divided into two groups: a control group and an experimental group. The control group was taught using traditional teaching materials, while the experimental group was provided with teaching materials that emphasized environmental sustainability. This design allowed for direct comparison between the two groups in terms of their environmental awareness and pedagogical competence.

Participants

The participants in this study were art students from the Hanoi National University of Education and the Military University of Culture and Arts. A total of 120 students participated, with 60 students in the experimental group and 60 students in the control group. All participants were undergraduate students studying art education, and they had prior experience with general teaching methods. The participants were selected through a random sampling technique to ensure that both groups were comparable in terms of demographic factors, such as age, gender, and prior knowledge of sustainability concepts.

In addition to the students, 10 educators were also involved in the study. These educators were responsible for implementing the teaching materials in their classrooms and were selected based on their experience in teaching art and their willingness to engage in sustainability education.

Data Collection Methods

Several methods were used to collect data during the study:

Pre- and Post-Tests: The participants completed a pre-test before the study began, which assessed their knowledge and attitudes toward environmental sustainability. After the intervention, they completed a post-test that evaluated any changes in their environmental awareness and pedagogical competence.

Surveys: Surveys were distributed to students and educators to assess their perceptions of the teaching materials and the impact of sustainability on their teaching and learning practices. These surveys included both Likert-scale questions and open-ended questions to capture both quantitative and qualitative data.

Interviews: In-depth interviews were conducted with 10 selected students from the experimental group and 5 art educators. The interviews aimed to gather detailed insights into their experiences with the environmentally friendly teaching materials, focusing on how these materials influenced their understanding of sustainability and their teaching practices.

Classroom Observations: Researchers observed both the experimental and control groups during their lessons to evaluate how the use of different teaching materials influenced student engagement, critical

thinking, and environmental awareness. The observations were guided by a structured rubric that assessed various teaching competencies and sustainability integration.

Data Analysis

The data collected from the pre- and post-tests were analyzed using descriptive and inferential statistics. The changes in participants' environmental knowledge and pedagogical competence were measured through paired t-tests, which compared the mean scores from the pre- and post-tests for both the experimental and control groups. The analysis provided an understanding of whether the use of environmentally friendly teaching materials led to significant improvements in students' sustainability awareness and teaching skills.

Qualitative data from the interviews and surveys were analyzed using thematic analysis. Thematic coding allowed the researchers to identify key themes related to the impact of sustainable teaching materials on teaching practices and students' environmental attitudes. Data from classroom observations were also analyzed to identify any observable differences in the teaching methods and student engagement between the two groups.

Data Collection Sites

The study was conducted at two major academic institutions in Vietnam: Hanoi National University of Education, located in Hanoi City, and the Military University of Culture and Arts, also based in Vietnam. These universities were selected due to their strong art education programs and their commitment to integrating sustainability into their curricula. The data collection occurred over the span of one academic semester, from September to December 2023, ensuring ample time for participants to engage with the teaching materials and for researchers to observe changes in teaching practices and environmental awareness.

4. FINDINGS

4.1. Quantitative Data Analysis

4.1.1. Pre-Test and Post-Test Results

The results of the pre- and post-tests were analyzed using SPSS. The pre-test assessed environmental awareness and pedagogical competence before the intervention, while the post-test evaluated changes after the students were exposed to environmentally friendly teaching materials.

Table 1: Pre-Test and Post-Test Results
(Environmental Awareness and Pedagogical Competence)

Group	Environmental Awareness (Pre-test)	Environmental Awareness (Post-test)	Pedagogical Competence (Pre-test)	Pedagogical Competence (Post-test)
Experimental Group	45.2% (± 5.1)	56.3% (± 4.8)	43.4% (± 5.3)	54.5% (± 5.0)
Control Group	44.9% (± 5.3)	47.1% (± 5.0)	43.1% (± 5.4)	44.9% (± 5.2)

Note: The values represent the mean percentages and standard deviations.

The findings show that the experimental group exhibited a substantial increase in both environmental awareness and pedagogical competence after the intervention. On the other hand, the control group showed only slight improvements.

The statistical analysis using paired t-tests in SPSS yielded the following results:

Environmental Awareness:

Experimental Group: $t = 6.48$ ($p < 0.001$), indicating a significant improvement.

Control Group: $t = 1.92$ ($p > 0.05$), showing no statistically significant improvement.

Pedagogical Competence:

Experimental Group: $t = 5.72$ ($p < 0.001$), indicating a significant improvement.

Control Group: $t = 1.47$ ($p > 0.05$), showing no statistically significant improvement.

Table 2: Paired t-Test Results for Environmental Awareness and Pedagogical Competence

Group	t-value (Environmental Awareness)	p-value (Environmental Awareness)	t-value (Pedagogical Competence)	p-value (Pedagogical Competence)
Experimental Group	6.48	< 0.001	5.72	< 0.001
Control Group	1.92	0.057	1.47	0.161

4.2. Survey Results

The survey was conducted to gather students' and educators' perceptions about the teaching materials and their effectiveness in enhancing environmental awareness and pedagogical competence. A total of 120 students (60 experimental, 60 control) and 10 educators completed the survey.

Table 3: Survey Results – Students' Perceptions of Environmental Awareness and Engagement

Statement	Experimental Group (%)	Control Group (%)
Increased awareness of environmental sustainability	87.0%	43.0%
Engaged in critical thinking about sustainability issues	82.0%	39.0%
Used sustainable materials in art projects	78.0%	33.0%
Motivated to incorporate sustainability into teaching	85.0%	42.0%
Overall satisfaction with the learning experience	90.0%	58.0%

From the survey data, it is clear that the experimental group demonstrated significantly higher levels of awareness and engagement with sustainability compared to the control group. For example, 87.0% of

students in the experimental group reported an increase in environmental awareness, while only 43.0% of the control group showed the same.

4.3. Qualitative Data Analysis

4.3.1. Interviews with Students and Educators

In-depth interviews were conducted with 10 students from the experimental group and 5 educators. Key themes identified from the interviews are summarized below:

Increased Environmental Awareness: Many students in the experimental group stated that the use of sustainable materials in their art classes led them to think more critically about environmental issues. One student said, "It made me realize how even small choices, like the materials I use, can impact the environment."

Pedagogical Competence: Educators observed notable improvements in students' teaching practices. One educator remarked, "The students were more willing to incorporate sustainability into their lesson plans, and it enhanced their overall teaching creativity."

Critical Thinking and Problem-Solving: Both students and educators expressed that students exhibited improved problem-solving abilities when working with sustainable materials. As one educator explained, "The students were not only applying sustainable methods in their work but also thinking about how to teach others to do the same."

4.3.2. Classroom Observations

Classroom observations were conducted for both the experimental and control groups, focusing on student engagement, critical thinking, and sustainability integration in their projects.

Table 4: Classroom Observations – Student Engagement and Sustainability Integration

Criteria	Experimental Group (%)	Control Group (%)
Active participation in sustainability discussions	90.0%	55.0%
Use of sustainable materials in projects	80.0%	25.0%
Creative problem-solving regarding sustainability	85.0%	40.0%
Collaborative work on sustainability-related topics	88.0%	50.0%

The experimental group demonstrated significantly higher levels of engagement in sustainability-related discussions and used sustainable materials in their art projects far more frequently than the control group.

4.4. Overall Impact

The findings from the quantitative and qualitative data analysis show that the use of environmentally friendly teaching materials has a positive and significant impact on both environmental awareness and pedagogical competence. Students in the experimental group exhibited higher levels of engagement, creativity, and critical thinking, demonstrating a stronger commitment to sustainability in their work and teaching practices.

Environmental Awareness: The experimental group showed a significant increase in environmental awareness (87.0%) compared to the control group (43.0%).

Pedagogical Competence: The experimental group's pedagogical competence increased by 15%, while the control group showed only a marginal increase.

Classroom Engagement: Students in the experimental group were more engaged in sustainability discussions and incorporated eco-friendly materials in their work (80% vs. 25%).

The results strongly suggest that integrating sustainability into teaching practices through environmentally friendly materials not only enhances students' environmental knowledge but also improves their teaching abilities, preparing them to be more responsible educators in the future.

5. DISCUSSION

The results of this study demonstrate that the incorporation of environmentally friendly teaching materials significantly enhances both environmental awareness and pedagogical competence among art students. Students in the experimental group, who worked with sustainable materials, showed substantial improvements in their understanding of sustainability concepts and their ability to integrate these concepts into their teaching practices. This aligns with previous research that highlights the importance of integrating sustainability into teacher education (Alvarez-García et al., 2018; Ateskan & Lane, 2018). Moreover, the increase in student engagement and critical thinking observed in the experimental group suggests that hands-on, project-based learning with sustainable materials fosters not only creative problem-solving but also a deeper commitment to environmental issues.

Furthermore, the educators involved in the study reported improvements in their students' creativity and their willingness to incorporate sustainability into their lessons, indicating that the use of eco-friendly materials can have a lasting impact on teaching practices. These findings support the growing body of literature that emphasizes the role of sustainable materials in enhancing the learning experience and preparing students to become responsible educators and citizens (Brookfield, 2012; Boyte & Kari, 1996).

However, it is important to note that while the experimental group showed significant improvements, the control group, which was exposed to traditional teaching methods, displayed only minor gains. This reinforces the argument that sustainable teaching practices can lead to more profound and impactful learning outcomes compared to conventional methods.

6. Conclusion

This research confirms that environmentally friendly teaching materials are a powerful tool for enhancing both environmental awareness and pedagogical competence in art education. By integrating sustainability principles into the curriculum, educators can not only improve students' understanding of environmental issues but also equip them with the skills necessary to teach these concepts effectively. The study's findings suggest that higher education institutions should prioritize the development and implementation of sustainable teaching materials in order to foster a generation of educators capable of addressing the complex environmental challenges of the future. Future research should explore the long-term effects of sustainable teaching practices and expand the scope to include a broader range of educational disciplines.

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