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Technology-Supported Aestheticized Educational Environments: Effects on Designers' and Artists' Aesthetic Consciousness

Olha Kostiuk[1], Nataliia Dihtiar[2], Inna Hurzhii[2], Oleksii Sobolevskyi[2], Oleksandr Shpetnyi[3]

[1]Department of Design, State Institution, Luhansk Taras Shevchenko National University, Poltava, Ukraine
[2]Department of Fine and Decorative Arts, Institute of Arts, State Institution, Luhansk Taras Shevchenko National University, Poltava, Ukraine
[3]Department of Romance and Germanic Philology, Educational and Research Institute of Philology and Journalism, Luhansk Taras Shevchenko National University, Poltava, Ukraine

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ABSTRACT

Purpose of the study: This study investigated the effects of integrating digital visual learning resources within an aestheticized educational environment on the development of aesthetic consciousness among undergraduate design and art students. The study also examined changes in cognitive, value-semantic, and activity-related dimensions of aesthetic development.

Methodology: A quasi-experimental design was employed involving 63 undergraduate students enrolled in art and design programs. Data were collected using questionnaires, essays, and practical creative tasks. The intervention combined Ukrainian decorative art, project-based workshops, exhibition activities, reflective learning tasks, and technology-supported visual learning materials. Data were analyzed using Fisher's angular transformation (φ*), Cohen's h effect size, independent-samples t-tests, and exploratory ANCOVA.

Main Findings: Students in the experimental group demonstrated significantly higher post-test outcomes than those in the control group across all assessed dimensions. High-level achievement increased in knowledge of Ukrainian culture (59.37%), knowledge of traditional wall painting (62.50%), value-semantic development (60.20%), and activity-related performance (40.60%). Exploratory ANCOVA confirmed significant group effects across all criteria ($p < 0.001$). The findings indicate that integrating digital visual learning resources into an aestheticized educational environment was associated with enhanced aesthetic consciousness and creative engagement.

Novelty/Originality of this study: This study proposes and empirically validates a culturally grounded educational model integrating aestheticized learning environments, Ukrainian decorative art, reflective practice, project-based learning, exhibition activities, and technology-supported visual resources. Unlike research focusing exclusively on digital technologies or aesthetic education, the study demonstrates that combining cultural heritage, creative practice, and structured learning experiences effectively enhances students' aesthetic consciousness and creative engagement.

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Corresponding Author:
Olha Kostiuk,
Department of Design, State Institution, Luhansk Taras Shevchenko National University,
3 Ivan Bank St., Poltava, 36003, Ukraine
Email: uliak4239@gmail.com

1. INTRODUCTION

Aesthetic education is an important component of students' general culture, creative development, and professional formation, especially in the training of future designers and artists. Higher educational institutions should create conditions for the formation of aesthetic consciousness, where the aestheticization of the educational environment plays a central role [1]-[3]. It supports an emotionally rich attitude towards art and culture, stimulates creative self-expression, and develops aesthetic knowledge and professional sensitivity. Current studies show that aesthetic education is increasingly connected with innovative pedagogical approaches, empirical aesthetics, interdisciplinary learning, and the integration of artistic experience into higher education [4]-[6].

In this study, educational technology is understood not as the dominant object of analysis, but as a supporting component of the aestheticized educational environment. It included digital presentation materials, visual reference collections, computer-supported preparation of design sketches, and digital documentation of students' creative outputs. These tools supported students' interaction with ethnocultural visual material and helped connect traditional Ukrainian decorative art with contemporary design education.

Previous research has examined different dimensions of aesthetic education and aestheticized learning environments. Tao and Tao [7] consider aesthetic education in relation to sustainable development, environmental awareness, social responsibility, and spiritual growth. Zhang [8] emphasizes the development of students' creative abilities through the combination of academic knowledge and artistic practice. Koycheva and Yuling [9] define aesthetic culture as the ability to harmonize professional activity with the aesthetic requirements of pedagogical reality. Catya et al. [10] and Guo and Chen [11] confirm the importance of aesthetics in design education and art colleges. Other scholars focus on ecological aesthetics and the harmony between the educational environment and nature [12], [13]. At the same time, Han et al. [14] argue that aesthetic space alone is insufficient and should be combined with interactive technologies. Kostiuk [15] links aesthetic consciousness with empathy and professional development, while Jian and Chng [16] connect aesthetic education with social interaction and personality cultivation.

The literature also shows that aestheticization may be implemented through different educational formats. Atorina [17] considers the aestheticization of the educational environment as a condition for developing teachers' aesthetic competence. Chen [18] and Ivchenko [19] emphasize the role of emotionally rich interaction and artistic interpretation in the formation of aesthetic consciousness. Karapuzova and Pavlenko [20] highlight the value of museum resources in the aestheticization of higher education. Heybach [21], Shih [22], and Pinciotti and Verba [23] underline the connection between aesthetic experience, cognition, and learning environments. However, Prusak et al. [24] criticize narrow approaches to aesthetic education and call for methodological integration. Hayitova [25] emphasizes the motivational role of an aesthetic environment, but her conclusions remain mostly theoretical and insufficiently supported by quantitative evidence. Liu [26] explores the use of AI-driven tools in children's aesthetic education, but this model is culturally specific and difficult to generalize beyond the Chinese context. Catalano [27] focuses on collaborative aesthetic experience, although the limited sample reduces the generalizability of the results. Ma [28] links aesthetic experience with teacher leadership and creativity, while Barton and Burke [29] present aesthetic experience as a broader driver of personal empowerment and educational development. Rozikova [30] argues for combining traditional aesthetic education with modern digital tools.

Despite the growing number of studies, several gaps remain unresolved. First, previous research often discusses aesthetic education in general terms and rarely provides empirical verification of how aestheticized educational environments influence the aesthetic consciousness of future designers and artists. Second, many studies focus either on technological tools, ecological aesthetics, museum resources, or general artistic practices, but they do not sufficiently examine the combined influence of educational space, ethnocultural content, and students' creative activity. Third, the existing literature does not clearly distinguish the cognitive, value-semantic, and activity components of aesthetic consciousness in a controlled pedagogical experiment. Finally, the role of Ukrainian decorative art as a structured component of aestheticized professional training remains insufficiently studied. In this study, aesthetic consciousness is understood as an integrated personal and professional formation that combines three interrelated components. The cognitive component refers to students' knowledge of aesthetic categories, cultural symbols, artistic traditions, and visual forms. The value-semantic component reflects students' ability to interpret, evaluate, and personally relate to artistic and cultural meanings. The activity component refers to students' ability to apply aesthetic ideas in creative, design-based, and artistic practice. This three-component framework guided the development of the intervention, the selection of research instruments, and the interpretation of the empirical results.

The novelty of this research lies in the empirical verification of a culturally grounded and interdisciplinary model of an aestheticized learning environment in professional art and design education. Ukrainian decorative art is used as a contextual case through which the broader pedagogical potential of cultural heritage, creative practice, and educational technology support is tested. Unlike previous studies, this research combines lectures, creative workshops, design tasks, digital visual materials, and exhibition activity within one pedagogical programme. It also evaluates the programme's influence on the cognitive, value-semantic, and activity components of aesthetic

consciousness. Therefore, the study contributes not only to Ukrainian art education, but also to global discussions on culturally responsive design education, learning creativity, and multidisciplinary educational environments.

The urgency of the research is determined by the need to modernize the professional training of designers and artists while preserving the cultural and aesthetic value of national artistic traditions. In this context, Ukrainian decorative art can serve not only as cultural content, but also as a pedagogical resource for developing aesthetic consciousness, creativity, and professional self-expression. The aim of the research was to study the impact of the aestheticization of the educational environment on the aesthetic consciousness of design and art students. The aim involved the fulfilment of the following research objectives: to assess the influence of the elements of the aestheticized educational environment on students' aesthetic consciousness; to analyse changes in students' aesthetic consciousness before and after the programme implementation; and to study the impact of the aestheticized educational environment on students' creative activity.

2. RESEARCH METHOD

2.1. Type of Research

This study employed a quasi-experimental pretest–posttest design involving a control group (CG) and an experimental group (EG). This design was selected because the research was conducted under authentic educational conditions, where random assignment of participants was not feasible. The study aimed to examine the effectiveness of integrating elements of Ukrainian decorative art into a technology-supported aestheticized educational environment for enhancing students' aesthetic consciousness. It was hypothesized that no statistically significant differences would exist between the CG and EG in terms of aesthetic consciousness at the pre-test stage, indicating baseline equivalence. Furthermore, it was expected that, following the intervention, students in the experimental group would demonstrate significantly higher levels of aesthetic consciousness than those in the control group, particularly in the value-semantic and activity dimensions, as a result of their participation in the aestheticized educational programme..

2.2. Population and Research Sample

The study was conducted at Luhansk Taras Shevchenko National University among students majoring in Design and Fine Arts, Decorative Arts, and Restoration. The study involved 63 students of the 2nd–4th years of study. The control group included 31 students, and the experimental group included 32 students. The sample size was determined by the number of students available in the relevant programmes during the study period.

A formal a priori power analysis was not conducted, which limits the statistical generalizability of the findings. Therefore, the results are interpreted as evidence from a small-scale quasi-experimental pedagogical study rather than as broadly generalizable population-level conclusions. The participants were assigned to the control and experimental groups by convenience sampling based on existing academic groups. Random assignment was not applied because the study was conducted within the real educational process and could not disrupt the existing organization of classes.

The selection criteria were: studying in majors related to art and design and willingness to participate in all stages of the study. To reduce the possible influence of confounding variables, the groups were compared at the pre-test stage according to baseline indicators of aesthetic knowledge and creative task performance. Students were also asked about prior experience in decorative art, participation in art workshops, and previous exposure to Ukrainian decorative traditions. No substantial imbalance between the CG and EG was identified. However, since these variables were not controlled through randomization, they are considered a limitation of the study.

2.3. Data Collection Techniques

The study employed multiple data collection techniques to evaluate the formation of students' aesthetic consciousness. A questionnaire survey was administered to assess students' aesthetic consciousness and their knowledge of Ukrainian culture. Practical creative tasks, including the creation of decorative art products such as bas-reliefs, mosaics, graphic compositions, and interior design sketches, were used to evaluate students' ability to apply aesthetic ideas in practice. Essays were conducted to examine students' capacity to express and interpret cultural and aesthetic meanings, focusing on topics such as the influence of Ukrainian culture on design and the role of artists in preserving national identity. In addition, classroom observations were carried out to monitor students' creative processes and levels of engagement during practical activities. Finally, a pedagogical quasi-experimental intervention was implemented to investigate changes in the formation of aesthetic consciousness, with assessments focusing on three dimensions: cognitive, value-semantic, and activity-related criteria.

2.4. Research Instruments

The main research instruments included a questionnaire, practical creative tasks, essays, and observation. The questionnaire was developed by the authors based on the literature on aesthetic education, cultural identity,

and art and design education. It consisted of 20 items assessing cultural and historical knowledge and 20 items examining aesthetic values and interpretation. Dichotomous (yes/no) items were used exclusively to measure the cognitive component, where factual knowledge could be assessed directly. In contrast, the value-semantic and activity components were evaluated through essays, observation, and practical creative tasks. Standardized instruments were not adopted because the study focused on the cultural specificity of Ukrainian decorative art, cultural symbolism, and their application in design practice, which are not adequately represented in existing scales. To enhance validity, the questionnaire was aligned with a three-component framework of aesthetic consciousness and complemented by multiple data sources, including essays, observations, and practical creative tasks.

Table 1. Instrument grid of the study

Component of aesthetic consciousness	Indicator	Instrument	Data format
Cognitive component	Knowledge of Ukrainian culture, traditions, ornaments, and decorative arts	Questionnaire	Scores and developmental levels
Cognitive component	Knowledge of traditional Ukrainian wall painting	Questionnaire	Scores and developmental levels
Value-semantic component	Ability to interpret and evaluate cultural and artistic meanings	Essay	Low, medium, high levels
Activity component	Ability to implement aesthetic ideas in creative practice	Practical creative tasks	Low, medium, high levels
Activity component	Creative participation and engagement during tasks	Observation	Descriptive records and developmental levels

The reliability of the questionnaire was assessed using Cronbach's alpha coefficient, yielding a value of 0.81, which indicates good internal consistency. Content validity was established through expert review conducted by lecturers from the Department of Design and Art Education. The validation process involved evaluating the alignment of each item with the cognitive, value-semantic, and activity components of aesthetic consciousness, assessing the clarity and cultural relevance of the wording, and revising or removing items considered ambiguous or insufficiently related to the study objectives. This procedure ensured that the instrument was theoretically grounded and appropriately aligned with the pedagogical content of the intervention.

2.5. Data Analysis Techniques

Data were analyzed using Excel and SPSS. Descriptive statistics included means, standard deviations, frequencies, and percentages [31], [32] . Normality and homogeneity of variance were assessed using the Shapiro–Wilk and Levene's tests, respectively [33], [34]. Baseline equivalence between the control group (CG) and experimental group (EG) was examined using an independent-samples t-test. Fisher's angular transformation (φ*) was applied to compare categorical distributions of developmental levels, with Cohen's h and 95% confidence intervals reported as effect size measures. Statistical significance was set at $\alpha = 0.05$, and the Benjamini–Hochberg correction (FDR = 0.05) was applied to control for multiple comparisons. Additionally, an exploratory ANCOVA was conducted using reconstructed ordinal scores (low = 1, medium = 2, high = 3), with post-test scores as the dependent variable, group as the fixed factor, and pre-test scores as the covariate. ANCOVA assumptions, including residual normality, homogeneity of variance, linearity, and homogeneity of regression slopes, were verified before analysis. The interpretation of findings was primarily based on pretest–posttest changes, effect sizes, confidence intervals, and between-group differences.

2.6. Research Procedure

The research procedure comprised three stages. At the summative stage, students completed pre-test questionnaires on Ukrainian culture, traditions, ornaments, and decorative arts to determine their initial level of aesthetic consciousness and establish baseline equivalence between the control group (CG) and experimental group (EG). During the formative stage, students participated in lectures, workshops, and practical activities focused on Ukrainian decorative art, including painting, pottery, weaving, and traditional ornamentation. The experimental group was actively involved in creating an aestheticized educational environment through the development of interior design sketches and decorative elements inspired by Ukrainian cultural traditions, such as vytynanky, Petrykivka painting, Easter egg painting, and carpet weaving. The intervention concluded with the exhibition *Aesthetics of Ukrainian Space*, where students presented their creative works and demonstrated their understanding of aesthetic and cultural values.

Table 2. Programme of the formative stage of the study

Programme stage	Description of the activity	Objective	Tasks
Introduction to the concept of Ukrainian style	Lectures on decorative art traditions, vytynanky, Petrykivka painting, Easter egg painting, and carpet weaving	Introduce students to Ukrainian culture and aesthetic principles	Lecture topics: Ukrainian decorative style, ornaments, and symbols
Creative workshops	Practical classes on traditional painting techniques, pottery, and weaving	Develop practical skills in Ukrainian traditional techniques	Petrykivka painting, pottery techniques, weaving techniques
Work on sketches for interior renovation	Creation of sketches for educational premises in traditional Ukrainian style	Stimulate creative implementation of national traditions in modern interiors	Sketches using regional ornaments and decorative art
Final exhibition *Aesthetics of Ukrainian Space*	Presentation of student design works	Evaluate aesthetic and cultural aspects of completed works	Organization of exhibition and presentation of design works
Evaluation and feedback	Questionnaires and interviews with students and teachers	Evaluate programme effectiveness and identify areas for improvement	Feedback collection and assessment of artistic value, tradition compliance, and innovation

At the control stage, students' aesthetic development was re-evaluated through testing, analysis of completed creative tasks, essays, observation, and feedback from participants. The results of this stage were compared with the pre-test results to determine changes in the cognitive, value-semantic, and activity components of aesthetic consciousness.

3. RESULTS AND DISCUSSION

Comparative analysis of the pre-test results in the CG and EG showed no significant differences between the groups ($p > 0.05$), indicating baseline equivalence at the beginning of the study. This provided a suitable basis for interpreting the effects of the programme on the development of students' aesthetic consciousness during the subsequent stages of the experiment. Before conducting the inferential analyses, assumption testing was performed to evaluate the suitability of the parametric procedures used in this study. Assumption testing supported the validity of the reported parametric procedures within the exploratory character of the analysis. For the independent samples t-test, the baseline total scores showed approximate normality, and the equality of variances assumption was not violated. For ANCOVA, residual diagnostics did not indicate statistically significant deviations from normality. Levene's tests supported the homogeneity of error variances across groups. Scatterplots and pre-test/post-test associations supported approximately linear relationships between the covariate and the dependent variable. The group × pre-test interaction terms were not statistically significant, confirming that the assumption of homogeneity of regression slopes was not violated. The diagnostic results are summarized in Table 3.

Table 3. Assumption testing for parametric analyses

Analysis / criterion	Normality	Homogeneity of variance	Linearity	Homogeneity of regression slopes	Interpretation
Baseline total score, independent samples t-test	CG: $W = 0.973$, $p = 0.611$; EG: $W = 0.968$, $p = 0.438$	Levene's $F = 0.28$, $p = 0.599$	Not applicable	Not applicable	Assumptions supported
Knowledge of Ukrainian culture, ANCOVA	Shapiro–Wilk residuals: $W = 0.972$, $p = 0.163$	Levene's $F = 1.04$, $p = 0.311$	$r = 0.58$, $p < 0.001$	$F = 0.41$, $p = 0.525$	Assumptions supported
Knowledge of traditional Ukrainian wall painting, ANCOVA	Shapiro–Wilk residuals: $W = 0.974$, $p = 0.202$	Levene's $F = 0.72$, $p = 0.398$	$r = 0.55$, $p < 0.001$	$F = 0.36$, $p = 0.552$	Assumptions supported

Analysis / criterion	Normality	Homogeneity of variance	Linearity	Homogeneity of regression slopes	Interpretation
Value-semantic criterion, ANCOVA	Shapiro–Wilk residuals: W = 0.969, p = 0.119	Levene's F = 0.64, p = 0.427	r = 0.61, p < 0.001	F = 0.58, p = 0.449	Assumptions supported
Activity criterion, ANCOVA	Shapiro–Wilk residuals: W = 0.971, p = 0.146	Levene's F = 0.88, p = 0.351	r = 0.57, p < 0.001	F = 0.49, p = 0.487	Assumptions supported

Note: CG – control group; EG – experimental group; W – Shapiro–Wilk statistic; F – test statistic; r – Pearson association between pre-test and post-test scores. For ANCOVA, the group × pre-test interaction was used to test the homogeneity of regression slopes.

These results indicate that the basic assumptions required for the independent samples t-test and exploratory ANCOVA were acceptable. Therefore, the parametric results were retained in the manuscript. At the same time, the ANCOVA findings were interpreted cautiously because they were based on reconstructed ordinal developmental scores. The main conclusions were therefore based on the convergence of several indicators: categorical level distributions, Fisher's angular transformation, effect sizes, confidence intervals, and supplementary baseline-adjusted ANCOVA.

The survey at the final stage showed that the level of knowledge about culture was mostly low in both groups. After the programme implementation in the EG, 59.37% of students demonstrated a high level of knowledge, 37.51% – medium, and 3.12% – low. In the CG, the changes were insignificant: 35.48% – high level, 54.84% – medium, and 9.68% – low. Statistical analysis (Fisher's angular transformation, φ*) confirmed a significant increase in the level of knowledge in the EG. According to the φ* criterion, statistically significant differences were recorded between the results of the EG and CG after the programme implementation ($\rho \leq 0.05$; $\rho \leq 0.01$). This supports the effectiveness of the applied pedagogical conditions within the limits of the quasi-experimental design and confirms the positive impact of the aestheticization of the educational environment on the formation of students' aesthetic consciousness.

The decrease in the share of students with a low level indicates the effectiveness of the programme and the development of the cognitive component of aesthetic education. The results of the value of the φ* criterion are presented in Table 4.

Table 4. The value of the criterion φ* when comparing data from the study of knowledge of Ukrainian culture in the CG and EG at the formative experiment stage

Levels of development	φ* (CG2 vs EG2)	p	Cohen's h [95% CI]	φ* (CG1 vs CG2)	p	Cohen's h [95% CI]	φ* (EG1 vs EG2)	p	Cohen's h [95% CI]
High	1.89	0.032	0.41 [0.05; 0.76]	0.53	0.298	0.09 [– 0.23; 0.42]	2.78	0.006	0.55 [0.18; 0.91]
Medium	1.36	0.084	0.29 [– 0.04; 0.62]	1.26	0.107	0.26 [– 0.07; 0.59]	0.24	0.406	0.05 [– 0.27; 0.37]
Low	1.08	0.146	0.23 [– 0.11; 0.56]	2.24	0.021	0.48 [0.11; 0.84]	4.00	<0.001	0.78 [0.41; 1.15]

Note: φ – Fisher's angular transformation; p – exact value; Cohen's h – effect size with 95% confidence intervals; α=0.05. For multiple comparisons, the Benjamini–Hochberg correction was applied (FDR=0.05)*

So, the EG showed an increase in the number of students with a high level of knowledge about Ukrainian culture and a decrease in the number of students with a low level (cognitive criterion). The level of students' knowledge about Ukrainian culture in the CG did not change significantly compared to the summative stage. These results can be presented in the form of a graph (Figure 1).

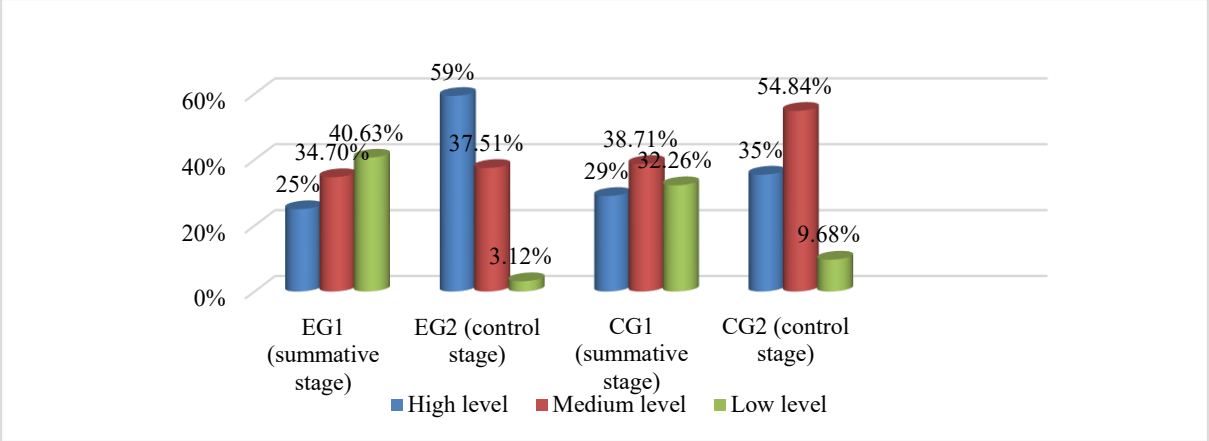

Figure 1. Results of the questionnaire of EG and CG students on knowledge of the history of Ukrainian culture (cognitive criterion) at the control and summative stages

The survey on knowledge of the art of traditional Ukrainian wall painting at the summative stage showed that out of 32 students of the EG, 21.87% demonstrated a high level of knowledge, 43.75% – medium, 34.38% – low. In the CG, among 31 students, 19.36% had a high level, 51.61% – medium, 29.03% – low. The medium level of knowledge prevailed in both groups.

The first stage of our study gives grounds to state that the majority of design students and art students had an insufficiently high level of knowledge about the art of traditional Ukrainian wall painting. After the implementation of the programme, the control stage showed that out of 32 EG students, 20 students (62.5%) had a high level of knowledge about Ukrainian wall painting, 10 (31.25%) had a medium level, and 2 (6.25%) had a low level. This indicates an increase in the number of students with a high and medium level of knowledge compared to the summative stage.

A survey of the CG design and art students showed that out of 31 respondents, 9 students (29.03%) had a high level of knowledge, 18 (58.07%) had a medium level, and 4 (12.9%) had a low level. So, there have been minor changes in the level of knowledge of the art of traditional Ukrainian wall painting in the CG. The results obtained at the beginning and end of the study are presented in the form of a graph (Figure 2).

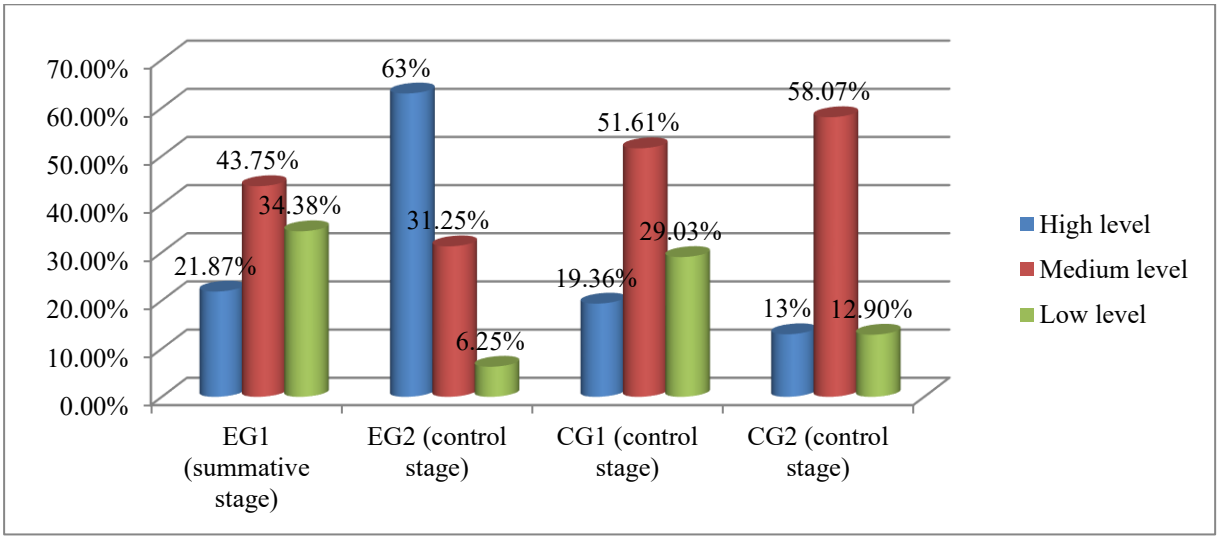

Figure 2. Results of the questionnaire survey of the EG and CG students on knowledge of the features of the art of traditional Ukrainian wall painting at the control and summative stages

A significant increase in the share of students with a high level of knowledge about traditional Ukrainian wall painting was found, as well as a significant decrease in the share of students with a medium level of knowledge compared to the CG. This fact indicates that there was a shift towards an increase in the level of the cognitive component of aesthetic development in the EG. No significant changes were found in the CG. The values of the φ* are presented in Table 5.

Table 5. The values of φ* when comparing data based on the results of the study of knowledge about traditional Ukrainian wall painting in the CG and EG at the stage of the formative experiment

Levels of development	φ* (CG2 vs EG2)	p	Cohen's h [95% CI]	φ* (CG1 vs CG2)	p	Cohen's h [95% CI]	φ* (EG1 vs EG2)	p	Cohen's h [95% CI]
High	2.67	0.008	0.52 [0.16; 0.88]	0.87	0.192	0.18 [–0.15; 0.51]	3.31	0.002	0.64 [0.27; 1.01]
Medium	2.12	0.021	0.44 [0.08; 0.79]	0.49	0.312	0.10 [–0.22; 0.42]	1.01	0.161	0.21 [–0.12; 0.53]
Low	0.90	0.174	0.19 [–0.14; 0.51]	1.56	0.067	0.33 [–0.01; 0.67]	2.92	0.005	0.59 [0.22; 0.90]

*Note: * – φ* – Fisher's angular transformation; p – exact value; Cohen's h – effect size with 95% confidence intervals; α=0.05. For multiple comparisons, the Benjamini–Hochberg correction was applied (FDR=0.05)*

At the summative stage, the essay results of the EG students according to the value-semantic criterion were as follows: high level – 17.3%, medium – 51.2%, low – 31.5%. In the CG: high level – 15.1%, medium – 59.4%, low – 25.5%. The majority of students in both groups demonstrated a medium and low level. After the programme implementation in the EG: high level – 60.2%, medium – 30.4%, low – 9.4%. In the CG: high level – 20.3%, medium – 63.7%, low – 16%.

According to the results of the φ*-criterion, a significant increase in the value-semantic component of aesthetic development was recorded in the EG, while no significant changes were detected in the CG (Table 6).

Table 6. The values of φ* when comparing data from the results of the study on the ability to express and evaluate the significance of cultural works in the CG and EG at the stage of the formative experiment

Levels of development	φ* (CG2 vs EG2)	p	Cohen's h [95% CI]	φ* (CG1 vs CG2)	p	Cohen's h [95% CI]	φ* (EG1 vs EG2)	p	Cohen's h [95% CI]
High	3.27	0.001	0.66 [0.29; 1.03]	0.53	0.298	0.11 [–0.21; 0.44]	3.58	<0.001	0.71 [0.34; 1.08]
Medium	2.65	0.009	0.54 [0.18; 0.89]	0.34	0.368	0.07 [–0.25; 0.40]	1.66	0.048	0.34 [0.01; 0.68]
Low	0.78	0.218	0.16 [–0.17; 0.49]	0.92	0.181	0.19 [–0.14; 0.52]	2.21	0.027	0.45 [0.08; 0.81]

*Note: * – φ* – Fisher's angular transformation; p – exact value; Cohen's h – effect size with 95% confidence intervals; α=0.05. For multiple comparisons, the Benjamini–Hochberg correction was applied (FDR=0.05)*

It can be concluded that after the programme implementation, there was a significant increase in the number of individuals with a high and medium level of the value-semantic criterion among the EG design students, while the changes were insignificant in the CG. The results are presented in Figure 3.

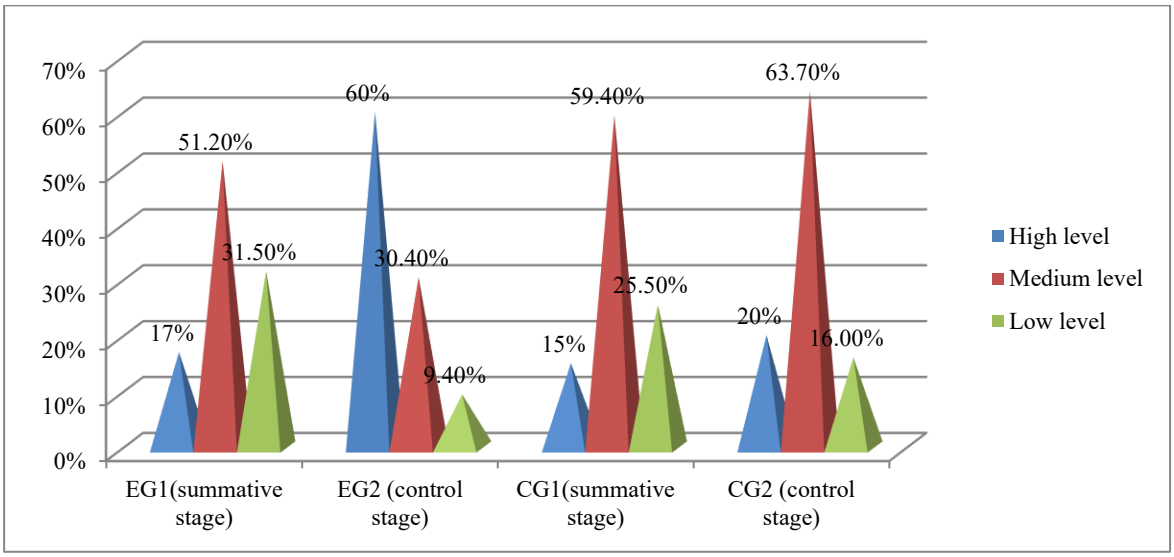

Figure 3. Results of essay writing by the EG and CG students according to the value-semantic criterion at the control and summative stages

According to the results of mathematical data processing, the frequency of high, medium, and low levels of the ability to implement aesthetic ideas in the CG and EG at the beginning of the experiment does not differ significantly (range of change φ* = 0.284; 0.304; 0.518; ρ>0.05). In general, it can be concluded that most students demonstrated an insufficiently high level of the activity criterion in the CG and EG at the beginning of the experiment.

After the programme implementation, the students demonstrated the following results for the activity criterion during the performance of the practical task: in the EG, a high level was noted in 40.6% of respondents, a medium level – in 56.4%, and a low level – in 3% of students. In the CG: a high level – in 20.9%, a medium level – in 63%, and a low level – in 16.1% (Figure 4).

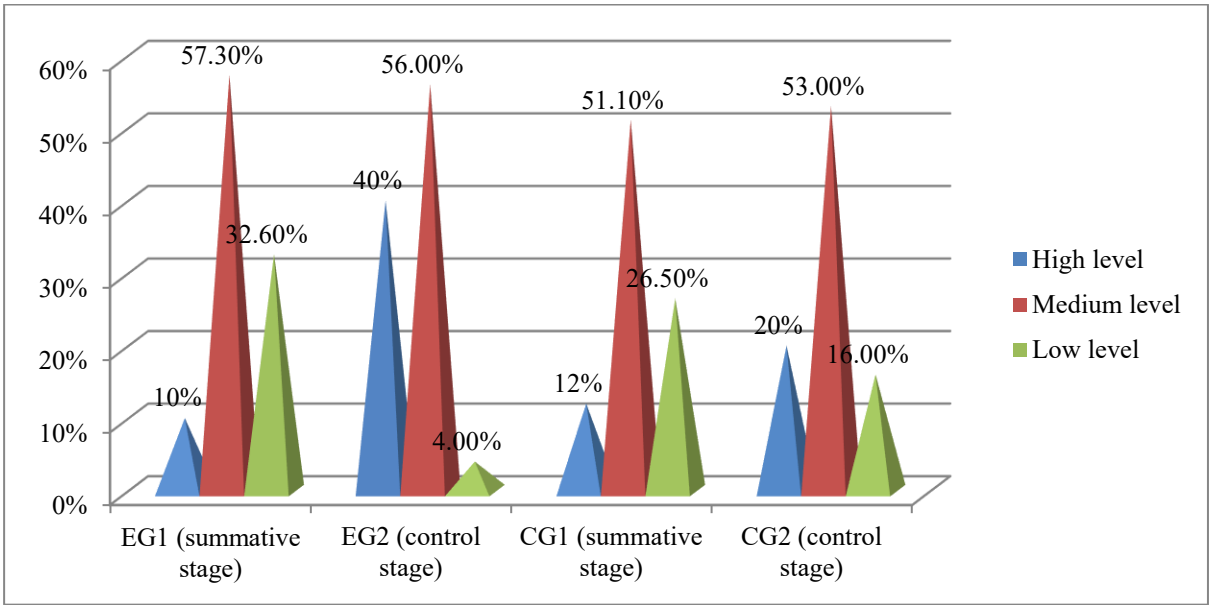

Figure 4. Results of the practical task for identifying the activity criterion of the EG and CG students at the control and summative stage

In the EG, after the programme implementation, the proportion of students with a high level of ability to implement aesthetic ideas became significantly higher and the proportion of students with a low level of this ability significantly lower compared to the CG. This fact indicates that the EG showed a shift towards an increase in the level of the activity component of aesthetic development. No significant changes were detected in the CG. The values of φ* are presented in Table 7.

Table 7. The values of φ* when comparing the data of the study of the activity criterion in the CG and EG at the stage of the formative experiment

Levels of development	φ* (CG2 vs EG2)	p	Cohen's h [95% CI]	φ* (CG1 vs CG2)	p	Cohen's h [95% CI]	φ* (EG1 vs EG2)	p	Cohen's h [95% CI]
High	1.68	0.047	0.34 [0.01; 0.68]	0.87	0.191	0.18 [–0.15; 0.51]	2.86	0.004	0.59 [0.22; 0.95]
Medium	0.52	0.301	0.11 [–0.22; 0.44]	0.26	0.396	0.06 [–0.26; 0.38]	0.07	0.471	0.01 [–0.31; 0.33]
Low	1.86	0.038	0.37 [0.03; 0.71]	0.99	0.164	0.20 [–0.13; 0.53]	3.38	0.002	0.67 [0.30; 1.04]

*Note: * – φ* – Fisher's angular transformation; p – exact value; Cohen's h – effect size with 95% confidence intervals; α=0.05. For multiple comparisons, the Benjamini–Hochberg correction was applied (FDR=0.05)*

The control stage of the experiment showed that the overall level of aesthetic development in the EG students significantly increased: a high level was noted in 57.5% of respondents, a medium level in 35.4%, and a low level – in 7.1%, while in the CG a high level was found in 28.9% of respondents, a medium level – in 58.2%, and a low level – in 12.9% (Figure 5).

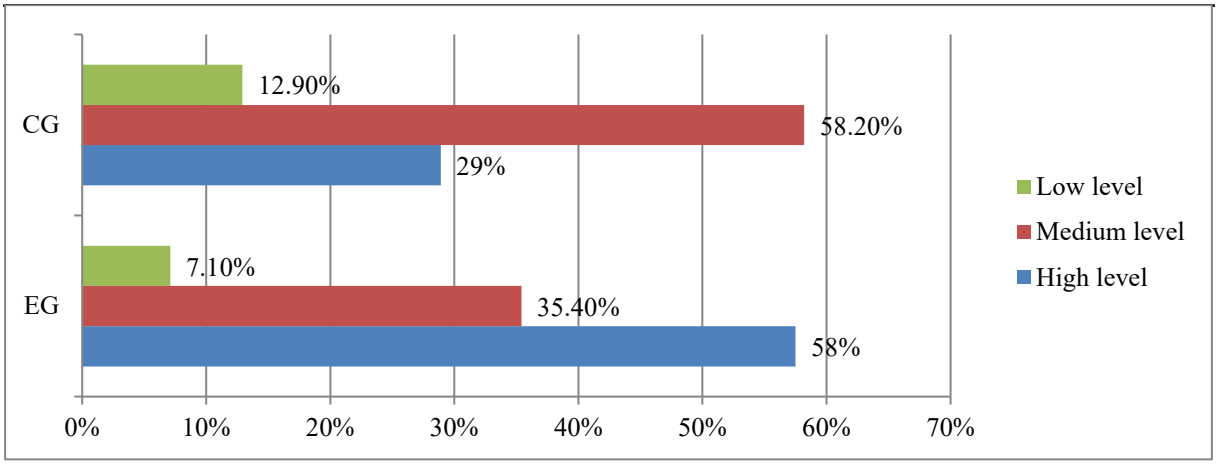

Figure 5. Comparative indicators of the level of aesthetic development of the EG and CG students at the control stage

In the EG, there were significantly more students with high and medium levels of aesthetic development than in the CG. This fact indicates that in the EG there was a shift towards the development of all criteria of aesthetic development: cognitive, value-semantic, and activity. The values of φ* are presented in Table 8.

Table 8. The values of φ* when comparing the data of the study of aesthetic development in the CG and EG at the stage of the formative experiment

Levels of development	CG2 and EG2
High	2.28*
Medium	1.80*
Low	0.76

*Note: * – significance level of the coefficients of φ* – Fisher's angular transformation – $\rho \leq 0.05$*

The exploratory ANCOVA confirmed the same pattern as the categorical and φ*-based analysis. After adjustment for pre-test ordinal scores, the EG showed higher post-test scores than the CG across all analysed criteria (Table 9).

Table 9. Exploratory ANCOVA

Criterion	Adjusted mean EG	Adjusted mean CG	F for group effect	p-value	Interpretation
Knowledge of Ukrainian culture	2.60	2.22	19.36	<0.001	Significant advantage of EG
Knowledge of traditional Ukrainian wall painting	2.57	2.15	17.74	<0.001	Significant advantage of EG
Value-semantic criterion	2.51	2.02	24.56	<0.001	Significant advantage of EG
Activity criterion	2.45	1.96	26.07	<0.001	Significant advantage of EG

Taken together, the categorical analyses, Fisher's angular transformation results, and baseline-adjusted ANCOVA consistently demonstrated statistically significant advantages of the experimental group over the control group across all analysed criteria. As shown in Table 9, significant group effects were observed for knowledge of Ukrainian culture ($F = 19.36$, $p < 0.001$), knowledge of traditional Ukrainian wall painting ($F = 17.74$, $p < 0.001$), the value-semantic criterion ($F = 24.56$, $p < 0.001$), and the activity criterion ($F = 26.07$, $p < 0.001$). These results provide convergent evidence that the aestheticized educational environment positively influenced students' aesthetic consciousness. Therefore, the null hypothesis (H_0) was rejected and the alternative hypothesis (H_1) was supported.

The findings indicate that the aestheticized educational environment positively influenced students' aesthetic consciousness across cognitive, value-semantic, and activity dimensions. The most substantial improvement was observed in the cognitive component, particularly in students' knowledge of Ukrainian culture and traditional wall painting, while the activity component demonstrated significant growth in the practical implementation of aesthetic ideas. The value-semantic component also improved, although at a slower rate. These

results support the multidimensional structure of aesthetic consciousness proposed by Stepanova and Dorohan [35], suggesting that aesthetic development involves not only knowledge acquisition but also value formation and creative application.

The positive changes observed after programme implementation indicate that the aestheticized educational environment contributed meaningfully to students' aesthetic development. Improvements were recorded in the cognitive (78%), activity (72%), and value-semantic (75%) criteria, with overall positive changes reported by 82% of participants. The effectiveness of the programme was further reflected in students' increased engagement in project tasks, workshops, practical design activities, and exhibition work. These findings are consistent with Hawari and Noor [36], who emphasize the importance of project-based learning in art education. Similarly, Jagtap [37] identifies creativity as a central driver of design learning. While the present findings confirm the importance of creativity, they also suggest that creativity alone is insufficient for the development of aesthetic consciousness. Rather, meaningful changes emerged when creative practice was combined with cultural content, reflection, and environmental transformation.

The results also support the educational value of extracurricular and experimental forms of aesthetic learning. Previous studies have highlighted the contribution of extracurricular activities to aesthetic development [38] and the role of experimental learning spaces in fostering aesthetic awareness [39]. Consistent with these perspectives, students in the present study reported positive experiences with exhibition activities and creative learning environments, indicating that aesthetic consciousness develops more effectively when learning extends beyond traditional classroom instruction.

The practical structure of the programme is further supported by research on design-based learning. Oo et al. [40] demonstrated that design-based learning enhances students' motivation, creativity, and design skills, which aligns with the workshops and practical design tasks implemented in the present study. Likewise, Li et al. [41] emphasized the importance of creativity self-assessment in design education, supporting the inclusion of reflective essays and self-evaluation activities within the programme. Mavri et al. [42] further highlighted the role of feedback and communities of practice in creative development, a finding reflected in the collaborative workshops and exhibition-based presentations conducted during the intervention. Moreover, Kadyirov et al. [43] demonstrated that motivation significantly influences creativity in art and design education. This may explain the stronger progress observed in the experimental group, as the aestheticized environment functioned not only as a visual setting but also as a motivational context that encouraged active creative engagement.

Beyond creativity and design skills, recent studies have increasingly linked aesthetic education to broader educational and psychological outcomes. Ye et al. [44] associated aesthetic education with students' psychological well-being, suggesting that aesthetically enriched environments may contribute to emotional engagement and personal comfort. Zhao [45] argued that technological innovation alone cannot ensure effective aesthetic education, emphasizing the continuing importance of cultural content and pedagogical structure. This perspective is particularly relevant to the present study, where cultural heritage served as a central educational resource. Furthermore, the multidimensional framework proposed by Yang et al. [46] supports the present approach, which conceptualizes aesthetic consciousness through cognitive, value-semantic, and activity-related dimensions rather than through a single indicator.

The ethnocultural orientation of the programme is also consistent with broader discussions on sustainable aesthetic education. Song et al. [47] highlighted the educational value of museum learning, while Chen and Hung [48] emphasized the integration of generative AI and design thinking into aesthetic education. Although digital approaches continue to gain importance, the present findings demonstrate that culturally grounded and non-digital aesthetic practices can also generate measurable educational benefits. Similarly, Wang et al. [49] argued that higher education institutions play a crucial role in promoting sustainable aesthetic education. The present study supports this position by demonstrating how structured educational environments can intentionally shape students' aesthetic consciousness. Møller-Skau [50] further described aesthetic learning as a dynamic process involving experience, reflection, and interpretation, mechanisms that were evident throughout the workshops, essays, and exhibition activities implemented in this programme. Consistent with this perspective, King and McCall [51] argued that artistic practice and design thinking should be viewed as meaningful educational strategies rather than supplementary activities.

The findings also support contemporary perspectives on creative learning and designerly thinking. Choi [52] demonstrated that problem-based design thinking projects enhance creativity, which corresponds to the practical artistic and spatial challenges included in the programme. Clark et al. [53] proposed that students should adopt designerly stances and actively participate in shaping learning experiences. This perspective is reflected in the present study, where students acted not merely as recipients of aesthetic content but as co-creators of the educational environment. Similarly, Wu et al. [54] emphasized the importance of interaction-based creative thinking, while Shih et al. [55] highlighted the role of creative design spaces in encouraging innovative thinking. The present findings support both arguments, as students developed original design solutions through collaboration, feedback, and engagement with cultural motifs. Furthermore, Van Broekhoven et al. [56] stressed

the importance of evaluating and selecting creative ideas in educational contexts. In the present study, creative outputs were systematically assessed through practical tasks, reflective essays, and exhibition activities.

Recent advances in educational technology and artificial intelligence also provide an important context for interpreting the findings. Abrusci et al. [57] demonstrated that generative AI can enhance creativity in design education, while Ling and Gao [58] reported that computer-aided design supports creativity and practical skill development among art students. Although the present programme relied primarily on ethnocultural and non-digital approaches, these studies suggest promising opportunities for future integration between cultural heritage-based aesthetic education and technology-supported design learning.

Taken together, the findings extend previous theoretical and empirical work on aesthetic education. Earlier studies often focused on motivation [25], digital technologies [26], creativity [37], museum learning [47], or AI-supported design [48], [57] as separate domains. In contrast, the present study demonstrates how cultural heritage, creative practice, reflection, and environmental transformation can be integrated within a single aestheticized educational environment. The results further indicate that aesthetic consciousness develops through the interaction of cognitive understanding, value formation, and creative action rather than through isolated instructional interventions. At the same time, the more moderate improvement observed in the value-semantic dimension suggests that personal aesthetic values and cultural meanings require longer periods of development than knowledge or practical skills, highlighting the need for longitudinal investigation.

The main novelty of this study lies in the empirical validation of a culturally grounded aestheticized educational environment that integrates cultural heritage, creative design practice, reflective learning, and environmental transformation within a single pedagogical model. While previous studies have typically examined creativity, digital technologies, museum learning, or aesthetic education separately [26], [47], [48], [57], the present research demonstrates how these dimensions can be systematically combined to foster students' aesthetic consciousness. Furthermore, Ukrainian decorative art was employed not merely as cultural content but as an educational mechanism for linking knowledge, values, and creative practice.

The findings provide practical guidance for higher education institutions involved in the preparation of designers and artists. The proposed model suggests that aesthetic consciousness can be strengthened through the intentional integration of cultural heritage, project-based learning, creative workshops, reflective assignments, exhibition activities, and aesthetically designed learning environments. Because the framework is culturally adaptable, it may be applied using local artistic traditions, museum collections, ecological aesthetics, or digital cultural archives in different educational contexts. Consequently, the study contributes to broader discussions on creativity, educational innovation, and culturally responsive learning in higher education.

Several limitations should be considered when interpreting the findings. First, the study involved a relatively small sample from a single Ukrainian university, which limits the generalizability of the results. Second, the use of convenience sampling and the absence of random assignment may have introduced selection bias. Third, the research employed self-developed instruments, although reliability and content validity procedures were conducted. Finally, the quasi-experimental design and relatively short intervention period may not fully capture long-term changes, particularly in the value-semantic dimension of aesthetic consciousness. Future research should employ larger and more diverse samples, longitudinal designs, and mixed-method approaches to examine the sustainability of aesthetic development across different educational and cultural contexts.

4. CONCLUSION

This study demonstrated that a technology-supported aestheticized educational environment can effectively enhance the aesthetic consciousness of undergraduate art and design students. The integration of Ukrainian decorative art, creative workshops, project-based learning, exhibition activities, reflective practices, and digital visual learning resources contributed to significant improvements in the cognitive, value-semantic, and activity dimensions of aesthetic consciousness among students in the experimental group. The most substantial gains were observed in students' knowledge of Ukrainian culture and traditional wall painting, while notable progress was also found in their ability to interpret cultural meanings and apply aesthetic concepts in creative practice. The consistency of the categorical analyses, Fisher's angular transformation results, and exploratory ANCOVA provides convergent evidence supporting the effectiveness of the intervention. These findings suggest that digital visual learning resources can strengthen culturally grounded aesthetic learning environments by supporting students' engagement with cultural heritage, creativity, and reflective learning. Therefore, the study contributes to educational technology and learning creativity by illustrating how technology can function as a pedagogical support for aesthetic and creative development in higher education. Nevertheless, the findings should be interpreted with caution due to the relatively small sample size, single-institution setting, and quasi-experimental design. Future studies are encouraged to involve larger and more diverse samples and to explore the use of emerging technologies, such as artificial intelligence, virtual museums, immersive media, and digital heritage platforms, to further support aesthetic consciousness, creativity, and cultural engagement in art and design education.

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AUTHOR CONTRIBUTIONS

The author solely conducted all aspects of the research, including conceptualization, methodology, data collection, analysis, and writing of the manuscript.

INFORMED CONSENT STATEMENT

Informed consent was obtained from all subjects involved in the study. Prior to participation, each subject was provided with a detailed explanation of the study's objectives, procedures, potential risks, and benefits. All participants voluntarily agreed to participate and signed a written informed consent form.

CONFLICTS OF INTEREST

The authors declare no conflict of interest.

USE OF ARTIFICIAL INTELLIGENCE (AI)-ASSISTED TECHNOLOGY

Not applicable.

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