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Cultural heritage and transdisciplinary approaches in modern art education: influence on artistic perception, interpretation and development of creative thinking of students

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Cultural heritage and transdisciplinary learning are increasingly recognized as important components of modern art education. However, limited empirical evidence exists regarding their influence on students' artistic perception, interpretation of cultural heritage, and creative thinking, particularly within the context of Kazakhstan's art education system. This study employed a quantitative research design involving 200 students enrolled in art and art-pedagogical educational programs. Data were collected using a structured questionnaire and analyzed through Partial Least Squares Structural Equation Modeling (PLS-SEM) in SmartPLS 4. The conceptual model examined the effects of cultural heritage integration and the transdisciplinary approach on artistic perception, interpretation of cultural heritage, and creative thinking, while cultural awareness and educational experience were tested as moderating variables. The findings revealed that cultural heritage integration was positively associated with artistic perception ($\beta = 0.412$, $p < 0.001$) and interpretation of cultural heritage ($\beta = 0.365$, $p < 0.001$). The transdisciplinary approach demonstrated the strongest relationship with creative thinking ($\beta = 0.438$, $p < 0.001$). Interpretation of cultural heritage was also positively associated with creative thinking ($\beta = 0.327$, $p < 0.001$). Cultural awareness and educational experience showed significant moderating effects, although the moderation effect of cultural awareness was relatively small. The results confirm that cultural heritage functions not only as educational content but also as a pedagogical resource supporting artistic perception, interpretation, and creative development. Transdisciplinary learning expands students' opportunities for creative reinterpretation and original artistic expression. The study highlights the importance of integrating cultural heritage and transdisciplinary approaches into contemporary art education and provides empirical evidence from Kazakhstan to support more reflective, interpretive, and creativity-oriented educational practices.

KEYWORDS
art education, artistic perception, creative thinking, cultural heritage, interpretation, transdisciplinary approach

1 Introduction

Currently, modern art education is developing in an environment where cultural heritage is considered not only as a historical or aesthetic resource, but also as an active pedagogical basis for the formation of artistic perception, interpretive thinking and creative self-expression of students (Smith et al., 2024). In the context of globalization, digital transformation and the increasing interaction of different cultures, the issues of preserving and rethinking cultural heritage are becoming particularly important for the education system. Art education is no longer limited to the transfer of technical skills or the study of art history; on the contrary, its most important task is to develop students' ability to understand, interpret and creatively transform cultural meanings into a broad historical, philosophical, social and technological context (Saribas et al., 2023).

In this regard, cultural heritage is an important source of formation of the artistic worldview of the individual. It includes traditional art forms, national artistic symbols, historical and cultural monuments, craft practices, ornamental systems, folklore, architectural forms and other tangible and intangible cultural values. Their integration into the educational process allows us to consider art not as an isolated aesthetic phenomenon, but as a carrier of collective memory, cultural identity and generational continuity. At the same time, modern art education requires approaches that go beyond a single discipline, which increases scientific and pedagogical interest in transdisciplinary approaches that combine knowledge and methods of art, history, cultural studies, pedagogy, philosophy, design, digital technologies and social sciences (Di Dio et al., 2024, Zulpykhar et al., 2025).

Transdisciplinarity in art education creates conditions for the formation of an educational environment in which students not only reproduce existing artistic patterns, but also analyze cultural meanings, compare various artistic traditions and create new creative interpretations. Unlike traditional interdisciplinary interaction, the transdisciplinary approach focuses on solving complex educational and cultural challenges through the synthesis of various forms of knowledge and practical experience. In the context of cultural heritage, this approach allows us to consider artistic objects simultaneously as aesthetic images, historical evidence, cultural texts, symbols of identity and sources of modern creative search.

Despite the increasing relevance of cultural heritage and transdisciplinary learning in art education, a number of research gaps remain in this area. Firstly, most research and educational practices focus primarily on the preservation and popularization of heritage, while the impact of heritage on the artistic perception of students has not been studied enough. Artistic perception is of fundamental importance because it reflects students' ability to see the visual structure, symbolic content, emotional expressiveness, and cultural context of a work of art. Without the development of this perception, cultural heritage can remain only an object of formal study, without becoming a source of deep artistic understanding.

Secondly, insufficient attention is paid to the interpretative aspect of students' interaction with cultural heritage. Interpretation is not limited to describing a work of art or determining its historical origin. It includes the ability to reveal meanings, connect visual forms with cultural values, compare traditional and modern artistic practices, and form one's own artistic judgments. In the context of modern art education, this ability becomes particularly important, since students must not only know the cultural heritage, but also understand its role and relevance in the modern cultural and educational space.

Thirdly, the relationship between cultural heritage, transdisciplinary approaches and the development of students' creative thinking has not been sufficiently investigated. Creative thinking in art education includes originality, flexibility, imagination, the ability to symbolically transform and create new visual ideas based on cultural experience (Rakhmetov et al., 2026; Zulpykhar et al., 2026). When using exclusively reproductive teaching methods, cultural heritage can be perceived as a set of traditional forms to be copied. However, with the integration of transdisciplinary strategies, heritage becomes the basis for creative experiment, artistic reinterpretation, and the creation of new cultural meanings.

In this regard, the present study is aimed at studying the impact of the integration of cultural heritage and transdisciplinary approaches in modern art education on the artistic perception, interpretation and development of creative thinking of students. The research is based on the assumption that cultural heritage becomes pedagogically effective when it is considered not only as historical material, but also as part of an integrated educational model combining artistic practice, cultural analysis, historical reflection, symbolic interpretation and modern creative design. This work aims to identify how heritage-oriented and transdisciplinary learning contributes to the formation of a more meaningful, reflective and creatively oriented model of art education.

The novelty of this study lies in several aspects. First, unlike previous studies that mainly examined cultural heritage as a tool for preservation or artistic reproduction, this research investigates cultural heritage as a pedagogical mechanism influencing artistic perception, interpretation, and creative thinking simultaneously. Second, the study proposes an integrated conceptual model combining cultural heritage integration, transdisciplinary learning, artistic perception, interpretation of cultural heritage, and creative thinking within a single structural framework. Third, the research introduces moderation effects by examining the role of cultural awareness and educational experience in strengthening the relationships between the studied variables. Fourth, the study contributes empirical evidence from the context of Kazakhstan's art and art-pedagogical education, which remains insufficiently represented in international research. Finally, the use of PLS-SEM allows testing both direct and moderating relationships within a complex educational model, providing a more comprehensive understanding of the pedagogical role of cultural heritage in modern art education.

2 Theoretical foundations

2.1 Cultural heritage as a pedagogical resource in modern art education

Cultural heritage in modern art education is considered as a set of tangible and intangible cultural values, artistic traditions,

visual symbols, craft practices, architectural forms, ornamental systems and historical and cultural images that reflect the experience, worldview and aesthetic ideas of society. In the educational context, cultural heritage is not only an object of study, but also an important pedagogical resource that contributes to the formation of artistic perception, interpretive thinking and creative activity of students (Ahmed et al., 2026).

Historically, art education has focused primarily on mastering image techniques, studying composition, color, form, and art history. However, in the conditions of modern society, its tasks are significantly expanded. Today, art education should not only transfer knowledge about artistic styles and traditions, but also form students' ability to understand cultural meanings, see the connection between art, history, identity and modern social processes. From this perspective, cultural heritage becomes a basis for a deeper understanding of art as part of the cultural memory and spiritual experience of the people.

The integration of cultural heritage into the educational process allows students to perceive works of art not as isolated aesthetic objects, but as carriers of historical experience, national values, symbolic codes and collective identity (Zhou et al., 2022). Through the study of traditional art, folk crafts, ornaments, architecture, decorative and applied art and visual images of the past, students have the opportunity to comprehend the continuity of cultural forms and their significance for modern artistic thinking. This approach helps to develop the ability to analyze an artistic image, reveal its semantic structure and relate it to a broader cultural context.

Cultural heritage is particularly important in the context of globalization and digital transformation, when young people are faced with a large amount of visual information and a variety of cultural influences. In this situation, turning to heritage helps not only to maintain a connection with national culture, but also to form a stable artistic and cultural identity (Kwon, 2024; Nurbekova et al., 2025). At the same time, it is important that the heritage is not perceived by students as an unchanging set of traditional forms intended only for reproduction. On the contrary, it should be considered as an open source for interpretation, creative reinterpretation and creation of new artistic solutions.

The use of cultural heritage in modern art education reflects a broader shift from a reproductive model of learning to a semantic, research-based, and creatively oriented model. Within the framework of this model, students do not just get acquainted with the works and traditions of the past, but learn to see in them cultural meanings, artistic ideas and opportunities for their own creative expression. This creates the basis for the further application of transdisciplinary approaches that combine artistic practice with historical, cultural, philosophical, pedagogical and technological knowledge.

2.2 Artistic perception, interpretation and creative thinking in the context of cultural heritage

The study of the influence of cultural heritage on art education is characterized by a certain theoretical ambiguity. On the one hand, cultural heritage is traditionally regarded as the most important source of preserving national identity, historical memory and artistic traditions. Its inclusion in the educational process allows students to get acquainted with samples of traditional art, symbols, ornaments, craft practices and cultural codes that form the basis of the artistic worldview.

On the other hand, with an insufficiently thought-out pedagogical organization, work with cultural heritage can be limited only to the reproductive development of ready-made samples. In this case, students mechanically copy traditional forms, but they do not always understand their symbolic meaning, historical context, and the possibilities of modern creative reinterpretation. This situation reduces the developing potential of the heritage and does not fully contribute to the formation of independent artistic thinking.

This contradiction can be explained through the peculiarities of artistic perception and the interpretative process. Artistic perception is not a simple visual observation of a work of art. It includes the ability to see the composition, color, shape, rhythm, symbolism, emotional expressiveness, and cultural meaning of an artistic image (Sánchez, 2023). Therefore, the perception of cultural heritage requires not only visual attention, but also the inclusion of historical, cultural and personal experience of the student (Langley et al., 2022).

Interpretation, in turn, represents a deeper level of interaction with the artistic material. It is associated with understanding the meaning of an artistic image, identifying its cultural codes, comparing traditional and modern art forms, as well as forming a personal position of the student (Campos et al., 2024). If perception answers the question "what do I see?", then interpretation allows us to answer the question "what does it mean and why is it important?". That is why interpretive activity is a key mechanism for turning cultural heritage from an object of study into a source of creative development.

Within the framework of modern art education, the connection between the interpretation of heritage and the development of creative thinking is of particular importance. Creative thinking is manifested in the ability of students to create original artistic ideas, transform traditional motifs, find new visual solutions and combine the cultural experience of the past with modern forms of artistic expression (Runco, 2022). At the same time, cultural heritage becomes not only a material for study, but also a basis for creative experiment.

The transdisciplinary approach enhances this process, as it allows us to consider cultural heritage not within a single academic discipline, but as a complex cultural phenomenon combining art, history, ethnography, philosophy, pedagogy, design and digital technologies (Horvath et al., 2025). This gives students the opportunity to analyze an artistic object from different perspectives: aesthetic, historical, symbolic, social, and practical-creative. This multidimensional consideration contributes to a deeper understanding of the artistic material and expands the possibilities of its creative interpretation.

Therefore, it can be assumed that cultural heritage has a positive impact on the artistic perception of students when it is presented not as a set of static traditional forms, but as a semantic and visual resource that requires analysis, comparison and personal understanding.

H1: The integration of cultural heritage into art education is positively associated with the development of students' artistic perception.

In addition to artistic perception, the interpretation of cultural heritage is an essential outcome of students' interaction with artistic material. In this study, interpretation of cultural heritage refers to students' ability to understand symbolic meanings, explain the historical and cultural context of artistic images, relate traditional forms to contemporary artistic practices, and formulate their own reasoned artistic judgments. When cultural heritage is presented in a fragmented way and disconnected from students' creative practice, it may remain a formal object of study. However, when it is integrated through transdisciplinary learning, students are better able to connect artistic, historical, cultural, philosophical, and practical dimensions of heritage. This broader interpretive process strengthens their understanding of cultural meanings and supports the creative use of heritage in modern art education.

Based on this, the transdisciplinary organization of education can contribute to the fact that cultural heritage becomes more understandable, meaningful and creatively applicable for students.

H2: The integration of cultural heritage into art education is positively associated with students' interpretation of cultural heritage.

Based on this, it can also be argued that the combination of cultural heritage and a transdisciplinary approach create conditions for the development of creative thinking. When students not only study heritage, but also interpret it through different disciplinary contexts, they gain the opportunity to create new artistic ideas based on cultural memory, personal experience, and modern forms of visual expression.

H3: The transdisciplinary approach positively influences the development of students' creative thinking.

H4: Students' interpretation of cultural heritage positively influences their creative thinking.

2.3 Moderation logic: the role of cultural awareness and educational experience

The contradictions in the research of art education show that the influence of cultural heritage and transdisciplinary approaches on artistic perception, interpretation and creative thinking is not the same for all students. The effectiveness of such approaches may depend on individual characteristics, among which cultural awareness and educational experience of students are of particular importance.

Cultural awareness in this study is understood as the degree to which students become familiar with national artistic traditions, symbols, historical and cultural images, craft practices, and cultural heritage values (Minsih et al., 2025). A high level of cultural awareness makes it easier for students to recognize the semantic codes of an artistic image, understand its historical context, and establish a link between traditional art and modern artistic practice. In this case, cultural heritage is perceived not as external or abstract material, but as a significant source of artistic understanding and creative interpretation.

On the contrary, a low level of cultural awareness can make it difficult to perceive and interpret artistic material. If the student is not familiar enough with cultural symbols, historical contexts, and traditional art forms, working with heritage can be perceived as complex, fragmented, or formal. As a result, the depth of artistic perception decreases, the interpretation of cultural heritage becomes weaker, and the possibility of creative reinterpretation of heritage is limited.

From this point of view, cultural awareness can act as an important moderator of the relationship between the integration of cultural heritage and the results of art education. The higher the level of cultural awareness of students, the stronger the positive impact of heritage-oriented learning on artistic perception, interpretation and creative thinking.

Another significant factor is the educational experience of the students. In the context of art education, educational experience includes the level of training, previous acquaintance with artistic disciplines, experience analyzing works of art, participation in creative projects, as well as possession of basic artistic and research skills. Students with more developed educational experience tend to perceive complex artistic and cultural materials more easily, can conduct inter-contextual analysis and apply different methods of interpretation.

A transdisciplinary approach requires students to be able to combine knowledge from different fields: art, history, cultural studies, philosophy, design, pedagogy, and digital technology. Therefore, its effectiveness largely depends on how willing students are to work with multi-layered content and see the connections between different disciplinary fields. With sufficient educational experience, trans disciplinarity helps to deepen analysis, expand artistic thinking and create original creative solutions.

However, with insufficient educational experience, transdisciplinary organization of learning can cause difficulties. If the student does not yet have the necessary analytical and artistic skills, many cultural, historical and theoretical connections may be perceived as overloaded content. In this case, the positive effect of the transdisciplinary approach may decrease, since it is difficult for the student to independently combine different types of knowledge and apply them in creative practice.

Consequently, educational experience can enhance or weaken the influence of transdisciplinary approaches on the results of art education. More prepared students can use the transdisciplinary environment more effectively to develop interpretation and creative thinking, while less prepared students need additional pedagogical support, step-by-step guidance, and a more structured organization of educational material.

H5: Cultural awareness moderates the relationship between cultural heritage integration and interpretation of cultural heritage; this relationship is stronger among students with higher cultural awareness.

H6: Educational experience moderates the relationship between the transdisciplinary approach and creative thinking;

this relationship is stronger among students with higher educational experience.

2.4 Conceptual synthesis of the research model

In general, the presented theoretical provisions form a system of interrelated relationships explaining the influence of cultural heritage and transdisciplinary approaches on the results of modern art education. As shown in Figure 1, in this model, the integration of cultural heritage and the application of a transdisciplinary approach act as the main independent variables of the study.

It is assumed that cultural heritage, represented through traditional artistic forms, symbols, ornamental systems, historical and cultural images and craft practices, has a direct impact on the artistic perception of students. At the same time, a transdisciplinary approach combining art, history, cultural studies, philosophy, pedagogy, design and digital technologies promotes a deeper interpretation of cultural material and the development of creative thinking (Morison et al., 2022).

The dependent variables in the model are three key outcomes of art education: artistic perception, interpretation of cultural heritage, and creative thinking of students. Artistic perception reflects students' ability to see the visual structure, symbolism, emotional expressiveness, and cultural context of an artistic image. Interpretation characterizes the ability to reveal the meanings of cultural heritage, connect artistic forms with historical and modern contexts, and form one's own artistic judgments. Creative thinking is manifested in the ability of students to create original artistic ideas, transform traditional motifs and apply cultural experience in modern artistic practice.

At the same time, the research model does not consider students as a homogeneous group. It is assumed that the influence of cultural heritage and a transdisciplinary approach may vary depending on the individual characteristics of students. Cultural awareness and educational experience are highlighted as moderators in the model. Cultural awareness can enhance the positive impact of heritage-based learning, as a deeper knowledge of cultural symbols and traditions facilitates the perception and interpretation of artistic material. Educational experience, in turn, can enhance the influence of a transdisciplinary approach, as better prepared students are able to combine knowledge from different fields more effectively and apply it in creative activities.

The straight arrows in Figure 1 reflect the expected main effects of cultural heritage and a transdisciplinary approach on artistic perception, interpretation, and creative thinking. The perpendicular arrows show the moderating effects of cultural awareness and educational experience, that is, their ability to strengthen or weaken the basic connections between independent and dependent variables.

Figure 1 presents the conceptual structure of the study and illustrates the expected relationships between cultural heritage integration, the transdisciplinary approach, artistic perception, interpretation of cultural heritage, and creative thinking. The model is based on the assumption that cultural heritage functions not only as educational content, but also as a pedagogical mechanism that enhances students' ability to perceive artistic

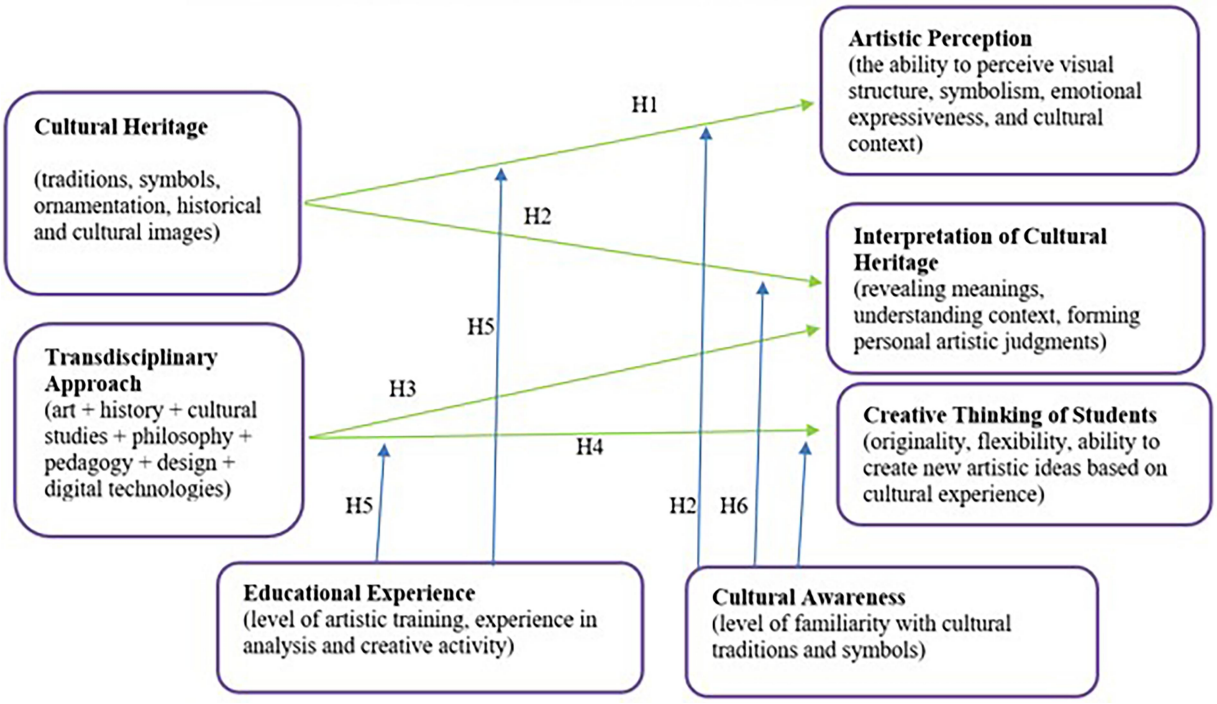

FIGURE 1
Conceptual model showing the hypothesized relationships between cultural heritage integration, transdisciplinary approach, artistic perception, interpretation of cultural heritage, creative thinking, and the moderating roles of cultural awareness and educational experience.

symbols, visual structures, and cultural meanings. Therefore, cultural heritage is expected to directly influence both artistic perception and the interpretation of cultural material.

The transdisciplinary approach is included in the model as a complementary educational strategy that expands students' analytical and creative capacities through the integration of artistic, historical, cultural, philosophical, pedagogical, and technological perspectives. Unlike traditional discipline-based instruction, transdisciplinary learning encourages students to connect different forms of knowledge and apply them in creative contexts. For this reason, the model assumes that the transdisciplinary approach has a direct positive effect on creative thinking.

3 Materials and methods

3.1 Research design and ethical aspects

Quantitative research design was used to study the impact of cultural heritage and transdisciplinary approaches on artistic perception, interpretation of cultural heritage and the development of creative thinking among students. This design allows us to identify the relationships between the main research variables and assess the extent to which heritage-oriented learning and transdisciplinary organization of the educational process are related to the results of art education.

The integration of cultural heritage into the educational process and the application of a transdisciplinary approach were considered as independent variables. The dependent variables were artistic perception, interpretation of cultural heritage, and creative thinking of the students. Additionally, the research model included cultural awareness and educational experience of students as moderating variables that can enhance or weaken the influence of the main factors.

The research was conducted in the form of a survey of students studying the disciplines of art and art-pedagogical direction. The questionnaire was aimed at identifying how students perceive the use of cultural heritage in the educational process, how well they understand its artistic and symbolic meanings, as well as how transdisciplinary methods contribute to the development of their creative thinking. This approach is appropriate because it allows us to obtain empirical data on the perception, interpretation and creative activity of students in the context of modern art education.

The study involved human participants, namely 200 students enrolled in art and art-pedagogical educational programs. The research was conducted in accordance with institutional ethical requirements and generally accepted principles for studies involving human respondents. Before participation, all students were informed about the purpose of the study, the voluntary nature of participation, the anonymity of responses, and the confidentiality of the collected data. Written informed consent was obtained from all participants prior to data collection. The collected data were used only in aggregated form and exclusively for scientific purposes. Ethical approval for the study was obtained from the Ethics Committee of Abai Kazakh National Pedagogical University, approval No. 5 dated December 5, 2025.

3.2 Participants and selection

The study involved 200 students enrolled in art and art-pedagogical educational programs at Abai Kazakh National Pedagogical University, Kazakhstan. The respondents were selected using a convenience sampling technique, as participation was limited to students who were accessible to the researchers and met the inclusion criteria. Therefore, the sample should not be interpreted as a probability sample.

Data were collected during the 2025–2026 academic year after ethical approval had been obtained. The inclusion criteria were: enrollment in art, design, fine arts, decorative and applied arts, or art-pedagogical programs; previous experience of studying disciplines related to art, culture, or creative practice; and voluntary consent to participate. Students who were not related to art education or who did not complete the questionnaire in full were excluded from the final sample.

The data collection procedure was carried out in several stages. First, students were informed about the purpose of the study, voluntary participation, anonymity, confidentiality, and their right to withdraw. Second, eligible students received the same questionnaire and explanatory instructions. Third, participants completed the questionnaire individually. Finally, incomplete responses were checked and excluded before statistical analysis. The final dataset included 200 valid responses.

To reduce possible bias and increase the internal consistency of the research, the basic characteristics of the participants were clarified at the initial stage: the level of study, course, field of study, experience in participating in art projects and the degree of familiarity with cultural heritage. This made it possible to compare the responses of the students and more correctly interpret the influence of the studied factors on artistic perception, interpretation and creative thinking.

The formed sample corresponds to the purpose of the study and allows us to analyze how the integration of cultural heritage and transdisciplinary approaches is related to the results of modern art education.

The ANOVA results showed no statistically significant differences in educational experience across the three levels of cultural awareness, $F(2, 197) = 2.11$, $p = 0.124$. This indicates that students with low, medium, and high cultural awareness did not differ significantly in their educational experience. Therefore, these two variables can be treated as conceptually distinct moderators in the structural model rather than as overlapping indicators. The non-significant ANOVA result also reduces the likelihood that the moderation effects observed later are caused by systematic differences in educational experience across cultural awareness groups.

3.3 Materials and research procedure

A specially developed curriculum dedicated to cultural heritage and its transdisciplinary interpretation in modern art education was used as the main research material. The content of the program was aimed at studying traditional art forms, national visual symbols, ornamental systems, decorative and applied arts, historical and cultural images and the possibilities of their modern creative interpretation.

This material was chosen because cultural heritage makes it possible to assess not only the level of artistic perception of students, but also their ability to interpret artistic meanings, establish connections between the past and the present, and create new creative ideas based on cultural experience. The educational material was built in stages: from a general introduction to the concept of cultural heritage to the analysis of specific artistic images, symbols and traditional motifs, and then to their creative reinterpretation in modern art and design practices.

The research procedure included several successive stages. At the first stage, the participants were provided with brief introductory information about the objectives of the study and the rules for completing the questionnaire. At the second stage, students became acquainted with the educational material, including visual examples of cultural heritage, explanatory texts and tasks for the analysis of artistic images. At the third stage, the participants completed questionnaire sections and analytical activities aimed at identifying the level of artistic perception, interpretation of cultural heritage and creative thinking. At the final stage, students filled out a questionnaire, where they assessed the clarity of the material, the importance of cultural heritage for art education and the role of a transdisciplinary approach in the development of creative abilities.

The content of the assignments was organized in such a way that students could not only reproduce information about cultural heritage but also express their own understanding of artistic images. For example, the tasks included analysing the visual structure of an ornament, determining the symbolic meaning of an artistic element, comparing a traditional motif with modern artistic practice, as well as offering your own creative idea based on the studied cultural material (Dong et al., 2025).

The transdisciplinary component of the research was implemented through the combination of artistic analysis with elements of history, cultural studies, pedagogy, philosophy, design and digital technologies. This approach allowed us to consider cultural heritage not only as an object of the past, but also as a resource for modern art education and creative design.

To ensure equal conditions, all participants received the same materials and instructions. The time for completing tasks was not strictly limited so that students could carefully familiarize themselves with the visual materials, comprehend their content and give detailed answers. This made it possible to reduce the influence of random factors and focus research on key variables: artistic perception, interpretation of cultural heritage, and the development of creative thinking.

3.4 Research tools and validation

Before the start of the main stage of the study, a pilot test was conducted with the participation of 25 students. The purpose of the pilot stage was to check the clarity of the wording of the questionnaire items, the logical structure of the instrument, the relevance of the tasks to the topic of cultural heritage and transdisciplinary art education, as well as the availability of materials for participants with different levels of artistic training.

The following tools were used in the study:

a) Artistic perception

This dependent variable was evaluated using a set of tasks aimed at identifying students' ability to perceive the visual structure of an artistic image, composition, colour, shape, rhythm, symbolism, and emotional expressiveness. The participants were offered visual materials related to cultural heritage, after which they answered questions reflecting the level of their artistic perception.

b) Interpretation of cultural heritage

This dependent variable was measured using a scale that included statements about the understanding of symbolic meaning, historical and cultural context, and the modern meaning of artistic images. The answers were recorded on a 5-point Likert scale: from 1 - "totally disagree" to 5 - "totally agree".

c) Creative thinking

Creative thinking was assessed through tasks and questionnaires reflecting the originality of ideas, flexibility of thinking, the ability to transform traditional motifs and create new artistic solutions based on cultural heritage. This block allowed us to determine to what extent students can use heritage not only as an object of study, but also as a source of their own creative expression.

d) Cultural awareness

Cultural awareness was considered as a moderation variable. It was measured using questions aimed at identifying the level of students' familiarity with national artistic traditions, ornamental systems, craft practices, historical and cultural symbols and works of cultural heritage.

e) Educational experience

Educational experience was also considered as a moderation variable. It was determined based on the level of study, course, field of study, participation in art projects, and previous experience analysing works of art. These data allowed us to assess whether the level of artistic and educational training can enhance the influence of a transdisciplinary approach on interpretation and creative thinking.

To verify the substantive validity, the tools were reviewed by experts in the field of art education, art pedagogy, and cultural studies. The experts assessed the compliance of the points with the objectives of the study, the clarity of the wording and the suitability of the tasks for measuring the stated variables. According to the results of the pilot testing, individual formulations were clarified, after which the questionnaire was used in the main study (Table 1).

All questionnaire items were measured using a five-point Likert scale ranging from 1 = "strongly disagree" to 5 = "strongly agree". The full questionnaire included items for each construct of the research model: artistic perception, interpretation of cultural heritage, creative thinking, cultural awareness,

TABLE 1 Variance analysis (ANOVA) of educational experience by levels of cultural awareness.

Source of variation	Sum of squares	df	The average square	*F*	*p*
Between groups	18.46	2	9.23	2.11	0.124
Within groups	861.54	197	4.37		
General	880.00	199			

educational experience, and transdisciplinary approach. Sample items are presented in Table 2 to demonstrate the content and relevance of the instrument. The full questionnaire is available from the corresponding author upon reasonable request.

4 Results

4.1 Sample description

The study sample was formed using a convenience sampling approach and included 200 students ($n = 200$) enrolled in art and art-pedagogical educational programs. This sample size is sufficient to conduct a descriptive and comparative analysis of the main variables of the study: artistic perception, interpretation of cultural heritage and creative thinking.

By gender, the sample was presented as follows: women made up 66.0% ($n = 132$), men - 34.0% ($n = 68$). According to the level of education, most participants studied undergraduate studies - 75.0% ($n = 150$), while undergraduates accounted for 25.0% ($n = 50$). The distribution of courses was relatively uniform: 1st year - 24.0% ($n = 48$), 2nd year - 26.0% ($n = 52$), 3rd year - 25.0% ($n = 50$), 4th year - 25.0% ($n = 50$).

In the field of education, the largest share was made up of students enrolled in the Art Education program - 41.0% ($n = 82$). This was followed by the areas of "Fine arts" - 27.0% ($n = 54$), "Design" - 22.0% ($n = 44$) and "Decorative and applied arts"- 10.0% ($n = 20$). 59.0% of the participants ($n = 118$) had experience of participating in creative projects, while 41.0% ($n = 82$) had no such experience.

For the moderation variable "cultural awareness", participants were divided into three groups: low level - 21.0% ($n = 42$), medium level - 51.5% ($n = 103$), high level - 27.5% ($n = 55$). This distribution allowed us to assess how the degree of familiarity with cultural heritage can affect the artistic perception, interpretation and creative thinking of students.

4.2 Data analysis

To test the hypotheses put forward, structural equation modeling using the partial least squares (PLS—SEM) method was used in the SmartPLS 4 program. The choice of this method is due to the fact that the study is aimed not only at describing individual indicators, but also at testing a comprehensive model of the relationship between the integration of cultural heritage, a transdisciplinary approach, artistic perception, interpretation of cultural heritage and students' creative thinking (Rakhmetov et al., 2025).

TABLE 2 Questionnaire constructs and sample items.

Construct	Code	Sample item
Artistic perception	HP1	I can identify visual structure, composition, rhythm, and symbolic elements in works related to cultural heritage.
Artistic perception	HP2	Cultural heritage materials help me better understand the emotional expressiveness of artistic images.
Interpretation of cultural heritage	IKH1	I can explain the symbolic meaning of traditional artistic forms and ornaments.
Interpretation of cultural heritage	IKH2	I can connect cultural heritage images with their historical and cultural context.
Creative thinking	TM1	Cultural heritage inspires me to create original artistic ideas.
Creative thinking	TM2	I can transform traditional motifs into new artistic or design solutions.
Cultural awareness	KO1	I am familiar with national artistic traditions, symbols, and cultural heritage values.
Cultural awareness	KO2	I understand the importance of cultural heritage for modern art education.
Transdisciplinary approach	TP1	Combining art with history, culture, philosophy, design, and digital technologies helps me understand artistic material more deeply.
Transdisciplinary approach	TP2	A transdisciplinary approach helps me generate more creative interpretations of cultural heritage.

The use of PLS-SEM is justified for several reasons. First, this method allows you to simultaneously evaluate the measurement model and the structural model. This is important because variables such as artistic perception, interpretation of cultural heritage, creative thinking, cultural awareness, and perception of a transdisciplinary approach are latent constructs and are measured through multiple questionnaire items. Secondly, PLS-SEM is suitable for analyzing complex models involving direct and moderation effects. Thirdly, the method does not require strict adherence to the normal distribution of data, which is especially important when working with indicators obtained on the Likert scale.

The analysis was carried out in two stages. At the first stage, the measurement model was evaluated. For this purpose, the reliability of indicators, internal consistency of scales, convergent and discriminant validity were checked. The reliability of individual indicators was assessed by factor loadings, where values above 0.708 were considered acceptable. Internal consistency was determined using the Cronbach's Alpha and Composite Reliability coefficients, the values of which should exceed 0.70. Convergent validity was assessed using the AVE indicator, where a value above 0.50 indicates a sufficient explained variance of the construct. Discriminant validity was tested using the HTMT criterion, in which values below 0.85 indicate the distinguishability of latent variables.

At the second stage, the structural model was evaluated. First, the direct effects of the integration of cultural heritage and a transdisciplinary approach on artistic perception, interpretation of cultural heritage, and creative thinking of students were analyzed. For this purpose, path coefficients β were considered, reflecting the strength and direction of the relationships between variables. The positive and statistically significant coefficient β was interpreted as confirmation of a positive association of the corresponding factor on the result of art education.

The moderation effects of cultural awareness and educational experience were then tested. Cultural awareness was considered as a variable that could enhance the influence of cultural heritage on artistic perception and interpretation. Educational experience was considered as a factor associated with stronger relationships between the influence of a transdisciplinary approach on the interpretation of cultural heritage and the development of creative thinking. To evaluate moderation, interactive variables were included in the model, formed based on the product of standardized values of independent variables and the corresponding moderators.

To check the statistical significance of all coefficients, the bootstrapping procedure was used with 5,000 repeated samples. This procedure allowed us to obtain stable significance estimates, *p*-values, and confidence intervals for direct and moderation effects. This approach provided a more reliable verification of the research model and allowed us to assess which factors are most significantly related to artistic perception, interpretation of cultural heritage and creative thinking of students.

Because all data were collected using self-report questionnaires, common method bias was assessed using Harman's single-factor test and full collinearity VIF. The unrotated exploratory factor analysis showed that the first factor explained 34.7% of the total variance, which is below the 50% threshold. In addition, all full collinearity VIF values were below 3.3. These results suggest that common method bias was not a serious concern in the study.

TABLE 3 Sample distribution.

Characteristic	Category	Frequency (*n*)	Percent (%)
Gender	Men	68	34.0%
	Women	132	66.0%
The level of education	Bachelor course	150	75.0%
	Master's degree	50	25.0%
The direction of training	Art education	82	41.0%
	Visual art	54	27.0%
	Design	44	22.0%
	Decorative and applied arts	20	10.0%
Experience of participating in creative projects	Yes	118	59.0%
	No	82	41.0%
The level of cultural awareness	Low	42	21.0%
	Average	103	51.5%
	High	55	27.5%
Course of study	1st course	48	24.0%
	2nd year	52	26.0%
	3rd year	50	25.0%
	4th year	50	25.0%
Age	The average value	21.84	
	Standard deviation	2.96	
	Minimum	18	
	Maximum	29	

4.3 Validity and reliability

The validity and reliability of latent constructs were evaluated in accordance with the standard PLS-SEM procedures. The following constructs were included in the analysis: artistic perception, interpretation of cultural heritage, creative thinking, cultural awareness, and a transdisciplinary approach.

First, the multicollinearity of the indicators was tested using the VIF indicator. All VIF values were below the 5.0 threshold, which indicates that there is no problem of collinearity between the questionnaire items. This confirms that each indicator makes an independent contribution to the measurement of the corresponding construct.

The reliability of the scales was assessed using Cronbach's Alpha and Composite Reliability coefficients. As shown in Table 3, all constructs demonstrated an acceptable or high level of internal consistency. Cronbach's Alpha values exceeded the recommended threshold of 0.70, and Composite Reliability indicators were also above the minimum value of 0.70. This indicates that the developed scales are sufficiently reliable.

Convergent validity was assessed using the AVE indicator. For all constructs, AVE values exceeded 0.50, which confirms the ability of indicators to explain a sufficient proportion of the variance of the corresponding latent variables. The highest rates were recorded for the constructs "creative thinking" and "interpretation of cultural heritage", which indicates a good consistency of points within these scales.

Discriminant validity was checked using the HTMT criterion. The obtained HTMT values between latent constructs were below the threshold value of 0.85, which confirms the empirical distinctness of the studied variables. Consequently, artistic perception, interpretation of cultural heritage, creative thinking, cultural awareness and a transdisciplinary approach can be considered as independent constructs of the research model.

4.4 Results of the structural model

After confirming the validity and reliability of the measurement model (Table 4), the structural model was evaluated using PLS-SEM. The purpose of this stage was to test the alleged links between the integration of cultural heritage, transdisciplinary approach, artistic perception, interpretation of cultural heritage and creative thinking of students. The moderation effects of cultural awareness and educational experience were also analyzed.

TABLE 4 Validity and reliability of reflexive constructs.

The construct	The indicator	Load	Alpha	CR	AVE
Artistic perception	HP1	0.842	0.884	0.914	0.681
	HP2	0.861			
	HP3	0.817			
	HP4	0.798			
	HP5	0.805			
Interpretation of cultural heritage	IKH1	0.876	0.902	0.928	0.721
	IKH2	0.853			
	IKH3	0.831			
	IKH4	0.862			
Creative thinking	TM1	0.889	0.913	0.936	0.746
	TM2	0.871			
	TM3	0.858			
	TM4	0.836			
Cultural awareness	KO1	0.801	0.846	0.891	0.672
	KO2	0.829			
	KO3	0.815			
A transdisciplinary approach	TP1	0.864	0.895	0.923	0.706
	TP2	0.846			
	TP3	0.832			
	TP4	0.819			

Alpha, Cronbach's alpha; CR, composite reliability; AVE, average variance extracted. Alpha and CR values above 0.70, and AVE values above 0.50 confirm the reliability and convergent validity of the scales.

The statistical significance of the coefficients was determined using the bootstrapping procedure with 5,000 repeated samples. Path coefficients β, *p*-values, coefficients of determination R2, predictive relevance Q2, and effect size f2 were evaluated. The results of the structural model are presented in Table 5.

The integration of cultural heritage was positively associated with students' artistic perception ($\beta = 0.412$, $p < 0.001$). This finding suggests that heritage-based learning strengthens students' ability to recognize visual structure, symbolic content, and emotional expressiveness in artistic works.

The positive influence of cultural heritage on the interpretation of artistic material was also revealed ($\beta = 0.365$, $p < 0.001$). This confirms that working with cultural heritage helps students discover the meanings of artistic images, understand their cultural context, and form their own artistic judgments.

The transdisciplinary approach showed the most pronounced influence on the students' creative thinking ($\beta = 0.438$, $p < 0.001$). This shows that combining art, history, cultural studies, philosophy, pedagogy, design and digital technologies expands the opportunities for students to create original artistic ideas and creatively rethink cultural heritage.

Additionally, it was found that the interpretation of cultural heritage is positively associated with creative thinking ($\beta = 0.327$, $p < 0.001$). Consequently, the more deeply students understand the cultural meanings of artistic images, the higher their ability to transform these images into new creative solutions.

Moderation analysis showed that cultural awareness had a statistically significant but small moderating association in the relationship between cultural heritage integration and interpretation of cultural heritage ($\beta = 0.154$, $p = 0.016$, $f^2 = 0.036$). This suggests that students with higher cultural awareness tended to interpret cultural heritage somewhat better when cultural heritage was integrated into learning. However, because the effect size was small, this moderation should be interpreted cautiously and should not be considered a strong effect.

Educational experience was positively associated with the strength of the relationship between the transdisciplinary approach and creative thinking ($\beta = 0.171$, $p = 0.007$). This shows that students with a higher level of artistic training and experience in creative activity are more effective at using a transdisciplinary educational environment to develop original artistic ideas.

In general, the structural model confirms that cultural heritage and transdisciplinary approaches are significant factors in the development of artistic perception, interpretation and creative thinking of students (Tables 6, 7).

The R^2 values indicate that the model explained 31.8% of the variance in artistic perception, 37.2% of the variance in interpretation of cultural heritage, and 42.6% of the variance in creative thinking. These values suggest moderate explanatory power of the proposed model (Table 8).

TABLE 5 VIF values.

Construct/item	VIF
HP1	1.84
HP2	1.91
HP3	1.76
HP4	1.68
HP5	1.72
IKH1	1.95
IKH2	1.87
IKH3	1.79
IKH4	1.83
TM1	2.04
TM2	1.96
TM3	1.88
TM4	1.82
KO1	1.65
KO2	1.71
KO3	1.69
TP1	1.93
TP2	1.86
TP3	1.81
TP4	1.74

All VIF values were below the recommended threshold of 5.0, indicating that multicollinearity was not a serious concern in the measurement model.

TABLE 6 HTMT values.

Construct	AP	ICH	CT	CA	TA
AP	–				
ICH	0.641	–			
CT	0.583	0.672	–		
CA	0.521	0.614	0.548	–	
TA	0.566	0.638	0.695	0.572	–

All HTMT values were below the recommended threshold of 0.85, confirming discriminant validity among the latent constructs.

4.5 Evaluation of the structural model

The Stone-Geisser Q^2, Goodness of Fit (GoF), and Standardized Root Mean Square Residual (SRMR) indicators were analysed to assess the predictive relevance and overall consistency of the structural model. The results are presented in Table 9.

The blindfolding procedure was used to assess predictive relevance. The obtained Q2 values for all dependent variables turned out to be positive: for artistic perception, Q2 = 0.218, for cultural heritage interpretation, Q2 = 0.246, and for creative thinking, Q2 = 0.271. This indicates that the model has sufficient predictive ability and can explain changes in key outcomes of art education.

The GoF value of the model was 0.356. This value exceeds the threshold of 0.25, which makes it possible to interpret the model as having an average or high level of compliance with empirical data.

The SRMR score was 0.064. Since this value is below the recommended threshold of 0.08, it can be concluded that the structural model demonstrates good overall compliance with the data.

The evaluation results confirm that the proposed model is statistically acceptable and can be used to explain the influence of cultural heritage and transdisciplinary approaches on artistic perception, interpretation of cultural heritage and the development of creative thinking of students.

5 Discussion

The findings highlight the pedagogical value of combining cultural heritage with transdisciplinary learning in modern art education. Cultural heritage may support students' artistic perception because it provides visually rich, symbolically meaningful, and historically grounded material for artistic analysis. Traditional ornaments, craft practices, national symbols, and historical-cultural images help students move beyond surface-level observation and develop a deeper sensitivity to composition, form, rhythm, symbolism, and emotional expression.

The findings are consistent with previous studies emphasizing the educational value of cultural heritage and visual culture in art education. For example, Smith et al. (2024) argued that heritage

TABLE 7 Results of the structural model.

Hypothesis	Path	β	t	p	95% CI	f^2	Result
H1	Cultural heritage → Artistic perception	0.412	6.284	<0.001	[0.283, 0.536]	0.186	Supported
H2	Cultural heritage → Interpretation of cultural heritage	0.365	5.731	<0.001	[0.241, 0.492]	0.142	Supported
H3	Transdisciplinary approach → Creative thinking	0.438	7.102	<0.001	[0.317, 0.558]	0.214	Supported
H4	Interpretation of cultural heritage → Creative thinking	0.327	4.986	<0.001	[0.198, 0.451]	0.119	Supported
H5	Cultural awareness × Cultural heritage → Interpretation	0.154	2.412	0.016	[0.031, 0.276]	0.036	Partially supported
H6	Educational experience × Transdisciplinary approach → Creative thinking	0.171	2.684	0.007	[0.047, 0.294]	0.041	Supported

TABLE 8 Coefficient of determination.

Endogenous construct	R^2	Interpretation
Artistic perception	0.318	Moderate explanatory power
Interpretation of cultural heritage	0.372	Moderate explanatory power
Creative thinking	0.426	Moderate explanatory power

TABLE 9 Quality indicators of the structural model.

Indicator	Meaning	Interpretation
Q^2: Artistic perception	0.218	Sufficient predictive relevance
Q^2: Interpretation of cultural heritage	0.246	Sufficient predictive relevance
Q^2: Creative thinking	0.271	Good predictive relevance
GoF	0.356	Medium/high enough level of compliance with the model
SRMR	0.064	Good matching of the model to the data

should be understood not only as a preserved historical resource but also as a socially and culturally meaningful practice. Similarly, Saribas et al. (2023) showed that visual culture in art teacher education helps students interpret artistic images within broader cultural and social contexts. The present study extends these findings by demonstrating, through a structural model, that cultural heritage integration is positively associated not only with students' artistic perception but also with their interpretation of cultural-symbolic material.

The positive relationship between cultural heritage integration and interpretation can be explained by the fact that heritage-based learning encourages students to connect artistic images with cultural memory, identity, historical context, and contemporary artistic practice. In this sense, cultural heritage becomes not only educational content, but also a meaningful interpretive framework through which students learn to explain visual forms and cultural symbols more consciously.

The transdisciplinary approach showed a particularly important relationship with creative thinking because it expands the boundaries of artistic learning. When art is connected with history, cultural studies, philosophy, design, pedagogy, and digital technologies, students receive more opportunities to compare perspectives, combine ideas, and transform traditional motifs into new creative solutions. This explains why transdisciplinary learning may be especially valuable for developing originality, flexibility, and creative reinterpretation in art education.

The results also support earlier research highlighting the importance of integrated and transdisciplinary approaches in arts education. Sanz-Camarero et al. (2025) emphasized that the arts become more pedagogically meaningful when they are connected with other fields of knowledge, while Horvath et al. (2025) showed that arts-based and transdisciplinary practices can support deeper reflection and creative engagement. The present study contributes to this line of research by showing that the transdisciplinary approach is positively associated with creative thinking among students in Kazakhstan's art-pedagogical context.

Educational experience may strengthen this relationship because students with stronger prior training are usually better prepared to work with complex, multi-layered artistic and cultural material. They can more easily connect theory with practice, interpret symbols, compare cultural contexts, and apply different artistic strategies in creative tasks. Therefore, educational experience should be understood as a supportive condition that helps students benefit more fully from transdisciplinary learning (Burns, 2024).

Although cultural awareness significantly moderated the relationship between cultural heritage integration and interpretation, the small effect size indicates that this role was limited rather than strong. Therefore, cultural awareness should be viewed as one supportive factor among several possible conditions influencing students' interpretation of cultural heritage.

The relationship between the transdisciplinary approach and creative thinking was particularly important. Combining art, history, cultural studies, philosophy, design, pedagogy, and digital technologies expands students' opportunities for creative search. This approach allows cultural heritage to be considered not as a closed system of traditional patterns, but as an open source for reinterpretation, artistic experimentation, and the creation of new visual solutions (Sanz-Camarero et al., 2025).

The structural model demonstrated an acceptable level of predictive ability. The Q^2 values for all dependent variables were positive, confirming the model's ability to explain artistic perception, interpretation of cultural heritage, and creative thinking. The GoF = 0.356 indicates good overall suitability of the model, while the SRMR = 0.064 is below the recommended threshold of 0.08, confirming good model fit.

Overall, the reliability and validity results support the adequacy of the measurement and structural models. The factor loadings, Cronbach's Alpha, Composite Reliability, and AVE values indicate that the constructs were measured consistently and demonstrated acceptable convergent validity. In addition, the path coefficients, t-values, *p*-values, f^2 values, Q^2 values, and SRMR suggest that the proposed model has acceptable explanatory and predictive relevance. However, these indicators should be interpreted as evidence of model adequacy rather than proof of causal relationships.

Thus, the contribution of this study lies in connecting previous theoretical claims about cultural heritage and transdisciplinary art education with empirical evidence from a PLS-SEM model, showing how heritage integration, interpretation, creative thinking, cultural awareness, and educational experience are interrelated within one research framework.

Figure 2 shows that the positive relationship between the transdisciplinary approach and creative thinking is more pronounced among students with higher educational experience. This means that students who already have experience analyzing works of art, participating in creative projects, and working with art materials are more effective at using a transdisciplinary educational environment to create original ideas (Sun et al., 2022).

At the same time, this effect is less pronounced among students with low educational experience. This does not mean that a transdisciplinary approach is ineffective for them. Rather, such

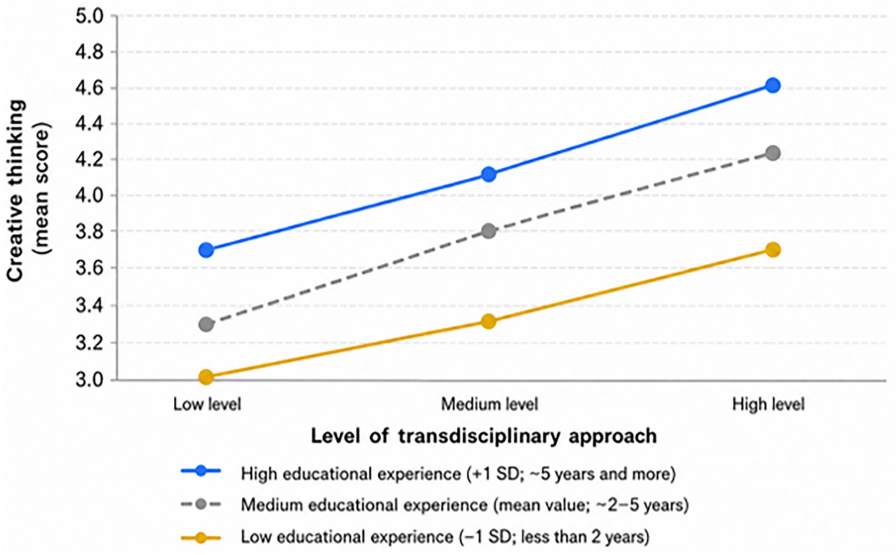

FIGURE 2
Moderating influence of educational experience on the relationship between transdisciplinary approach and creative thinking.

students need clearer pedagogical support, a step-by-step explanation of cultural meanings and a structured organization of creative tasks.

The results of the study confirm that cultural heritage and transdisciplinary approaches are significant factors in the development of modern art education. However, their effectiveness depends not only on the content of the educational material, but also on the level of cultural awareness and educational experience of students.

6 Conclusion

The study contributes to the existing literature by integrating cultural heritage, transdisciplinary learning, and creative thinking into a unified structural model within the context of Kazakhstan's art education system.

This study provides empirical evidence that cultural heritage and transdisciplinary approaches are significant factors in the development of modern art education. The results obtained confirm that the integration of cultural heritage into the educational process contributes to the development of artistic perception of students, deepens the interpretation of artistic images and stimulates the formation of creative thinking.

Beyond preserving historical and cultural memory, heritage served as a pedagogical resource that supported perception, interpretation, and creative transformation. The appeal to traditional art forms, symbols, ornaments and cultural images helps students to perceive the visual structure of works of art more deeply, to understand their semantic content and to establish a connection between tradition and modern artistic practices.

A transdisciplinary approach has gained particular importance in the research. The results showed that combining art, history, cultural studies, philosophy, pedagogy, design and digital technologies creates more favorable conditions for the development of students' creative thinking. A transdisciplinary educational environment contributes to the formation of the ability to analyze artistic phenomena from different perspectives, interpret cultural meanings and create new artistic ideas based on cultural experience.

The moderation analysis showed that cultural awareness and educational experience have an impact on the effectiveness of art education. A higher level of familiarity with cultural heritage contributes to a deeper interpretation of artistic images, while a developed educational experience enhances the positive impact of a transdisciplinary approach on the creative thinking of students. However, the size of these effects was moderate, which indicates the need for further research with more diverse samples and an expanded set of variables.

The practical significance of the research lies in the fact that its results can be used in the development of modern educational programs in the field of art and art pedagogical education. The integration of cultural heritage and transdisciplinary teaching methods can contribute to the formation of a more meaningful, interpretive, and creatively oriented model of art education that meets the conditions of the modern cultural and educational environment.

Despite the results, the study has a number of limitations. Firstly, the sample was formed on the basis of an accessible selection and included students mainly in artistic fields of study. Secondly, the study was based on participants' self-assessment, which may affect the subjectivity of responses. Overall, the study demonstrates that heritage-oriented and transdisciplinary learning can support more reflective, interpretive, and creatively oriented forms of modern art education. These findings may contribute to the further development of culturally responsive and interdisciplinary educational practices in art and art-pedagogical programs.

6.1 Practical significance of the study

The findings demonstrate that heritage-oriented and transdisciplinary learning can strengthen key outcomes of art

education, particularly artistic perception, interpretation, and creative thinking. The use of heritage-oriented tasks helps students not only to study traditional art forms, but also to realize their importance in the modern cultural space. This is especially important for the formation of artistic identity, the development of independent artistic thinking and the ability to creatively rethink cultural experience.

The results also indicate that a transdisciplinary approach creates more favorable conditions for the creative development of students. Combining art with history, cultural studies, philosophy, design and digital technologies allows us to expand the ways of perception and analysis of artistic material. Thanks to this, students can consider cultural heritage not only as an object of study, but also as a source of new artistic ideas and creative solutions.

For art educators, the study points to the need to move beyond reproductive methods and design tasks that combine analysis, interpretation, and creative transformation. Working with cultural heritage should include not only familiarization with historical material, but also an analysis of symbols, a discussion of cultural meanings, a comparison of traditional and modern art forms, as well as the creation of their own creative projects based on heritage.

For developers of educational programs and training courses, the results of the study indicate the importance of including transdisciplinary modules that combine artistic disciplines with cultural, historical and digital components. Special attention should be paid to creating an educational environment that promotes the development of artistic perception, critical understanding of cultural heritage and the ability of students to independently interpret creatively.

In addition, the results of the study show that the effectiveness of art education depends on the level of cultural awareness and educational experience of students. In this regard, teachers are recommended to use a step-by-step organization of the educational material, additional visual and analytical supports, as well as adapt assignments depending on the level of training of students. This approach can contribute to a deeper involvement of students in the artistic and creative process and improve the quality of interpretation of cultural heritage.

6.2 Limitations and directions of future research

This study has several limitations that must be considered when interpreting the results obtained. Firstly, the sample was limited to 200 students of art and art-pedagogical fields, so the conclusions cannot be automatically extended to all levels and profiles of art education.

Secondly, the study was based primarily on students' personal data and self-assessment. This may include the subjectivity of responses, socially desirable reactions, and differences in personal perception of one's own creative experience.

Thirdly, cultural awareness and educational experience were considered as moderating variables, but their relationship may depend on broader factors: the quality of teaching, the content of the curriculum, the level of digital training, the ethno-cultural environment and the individual artistic motivation of students.

Fourth, the study did not include an in-depth qualitative analysis of students' creative work. Therefore, future research can complement quantitative interview data, expert assessment of art projects, observation of the educational process, and analysis of students' portfolios.

Promising areas of further research include studying the relationship of cultural heritage on the long-term development of creative thinking, comparing different models of transdisciplinary art education, analyzing the role of digital technologies in interpreting heritage, as well as exploring differences between students with different levels of cultural awareness, artistic training, and creative experience (Sutrisno and Nasucha, 2022).

Since the study used a cross-sectional survey design, the findings should be interpreted as statistically modeled relationships rather than direct causal effects. Although PLS-SEM allows testing the strength and significance of relationships between constructs, it does not by itself prove causality. Therefore, the terms "effect" and "influence" in this study refer to associations within the proposed structural model. Future research may use longitudinal, experimental, or mixed-method designs to provide stronger evidence of causal mechanisms.

Data availability statement

The original contributions presented in the study are included in the article/Supplementary Material, further inquiries can be directed to the corresponding author.

Author contributions

LK: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing. AS: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing. SB: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing. KI: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing. NK: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing. MY: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing. AK: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology,

Project administration, Resources, Software, Supervision, Validation, Visualization, Writing – original draft.

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Conflict of interest

The author(s) declared that this work was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Generative AI statement

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References

Ahmed, Q., Behlol, M. G., Jabeen, F., and Hussain, K. M. (2026). Use of museums as an interactive resource in learning history: a constructive approach. *Crit. Rev. Soc. Sci. Stud.* 4 (1), 106–117. doi: 10.59075/g881gb12

Burns, H. (2024). Imagining imagination: towards cognitive and metacognitive models. *Pedagogy Cult. Soc.* 32 (2), 515–534. doi: 10.1080/14681366.2022.2059547

Campos, F., Nguyen, H., Ahn, J., and Jackson, K. (2024). Leveraging cultural forms in human-centred learning analytics design. *Br. J. Educ. Technol.* 55 (3), 769–784. doi: 10.1111/bjet.13384

Dong, Z., Hao, W., Wang, J. C., Zhang, P., and Polak, P. (2025). Every image listens, every image dances: Music-driven image animation. *arXiv preprint arXiv*:2501.18801. doi: 10.48550/arXiv.2501.18801

Di Dio, S., Russo, D., Monterosso, F., and Inzerillo, B. (2024). "Designing the future: a manifesto for design education," in *Intelligent Human Systems Integration: Integrating People and Intelligent Systems*, 725–735. doi: 10.54941/ahfe1004537

Horvath, S. M., Payerhofer, U., Wals, A., and Gratzer, G. (2025). The art of arts-based interventions in transdisciplinary sustainability research. *Sustain. Sci.* 20 (2), 547–563. doi: 10.1007/s11625-024-01614-2

Kwon, H. (2024). Mixed-Methods research toward the K–16 curricular connection in art education. *Stud. Art Educ.* 65 (3), 284–305. doi: 10.1080/00393541.2024.2355070

Langley, C., Cîrstea, B. I., Cuzzolin, F., and Sahakian, B. J. (2022). Theory of mind in humans and in machines. *Front. Artif. Intell.* 5, 917565. doi: 10.3389/frai.2022.917565

Minsih, M., Mujahid, I., Mukminin, A., and Helzi, H. (2025). The integratiion of culture literacy in strengthening the profile of pancasila students in science learning for elementary schools. *Jur. Ilmh. Ilm. Ter. Un. Ja.* 9 (2), 609–618. doi: 10.22437/jiituj.v9i2.41764

Morison, L., Simonds, L., and Stewart, S. J. F. (2022). Effectiveness of creative arts-based interventions for treating children and adolescents exposed to traumatic events: a systematic review of the quantitative evidence and meta-analysis. *Art. Health* 14 (3), 237–262. doi: 10.1080/17533015.2021.2009529

Nurbekova, G., Orazbayeva, B., Dildabek, A., and Zhilmagambetova, R. (2025). The use of information technology in preparation for international educational research. *Int. J. Inf. Educ. Technol.* 15 (8), 1743–1751. doi: 10.18178/ijiet.2025.15.8.2375

Rakhmetov, M., Abdykerimova, E., Alzhanov, G., Orazbayeva, B., and Kuanbayeva, B. (2026). Methodological framework for designing AI-based distance learning platforms. *Int. J. Inf. Educ. Technol.* 16 (1), 117–125. doi: 10.18178/ijiet.2026.16.1.2488

Rakhmetov, M., Sadvakassova, A., Saltanova, G., Kuanbayeva, B., and Zhusupkalieva, G. (2025). Evaluation of an AI-based feedback system for enhancing self-regulated learning in digital education platforms. *Electron. J. e-Learn.* 23, 126–141. doi: 10.34190/ejel.23.4.4150

Runco, M. A. (2022). "Uncertainty makes creativity possible," in *Uncertainty: A Catalyst for Creativity, Learning and Development. Creativity Theory and Action in Education, vol 6*, eds. R.A. Beghetto, and G.J. Jaeger (Cham: Springer), 23–36. doi: 10.1007/978-3-030-98729-9_3

Saribas, S., Coskun, N., and Mamur, N. (2023). Teaching visual culture in the context of visual arts teacher education. *Pedagogies* 18 (2), 221–248. doi: 10.1080/1554480X.2021.1975543

Sanz-Camarero, R., Ortiz-Revilla, J., and Greca, I. M. (2025). The place of the arts within integrated education. *Arts Educ. Policy Rev.* 126 (1), 38–49. doi: 10.1080/10632913.2023.2260917

Sánchez, F. (2023). "Research as an experience: a reflective exploration of art-based research and poetry for researching experiences," eds. J. Huisman, and M. Tight (Leeds: Emerald Publishing Limited), 63–83. doi: 10.1108/S2056-375220230000009004

Sutrisno, S., and Nasucha, J. A. (2022). Islamic religious education project-based learning model to improve student creativity. *At-Tadzkir Islam. Educ. J.* 1 (1), 13–22. doi: 10.59373/attadzkir.v1i1.3

Sun, M., Wang, M., Wegerif, R., and Peng, J. (2022). How do students generate ideas together in scientific creativity tasks through computer-based mind mapping? *Comput. Educ.* 176, 104359. doi: 10.1016/j.compedu.2021.104359

Smith, L., Whitehead, C., Campbell, G., and Bozoğlu, G. (2024). "The politics of heritage," in *The Routledge International Handbook of Heritage and Politics*, eds. G. Bozoğlu, G. Campbell, L. Smith, and C. Whitehead (Abingdon, OX: Routledge), 3–18. doi: 10.4324/9781003300984-1

Zhou, Y., Chen, J., and Wang, M. (2022). A meta-analytic review on incorporating virtual and augmented reality in museum learning. *Educ. Res. Rev.* 36, 100454. doi: 10.1016/j.edurev.2022.100454

Zulpykhar, Z., Serikbayeva, A., Spirina, Y., Janabayev, D., and Sirojiddinova, I. (2025). Practical approaches to network technology education: a study within secondary institutions in Kazakhstan. *Front. Educ.* 10, 1557946. doi: 10.3389/feduc.2025.1557946

Zulpykhar, Z., Rakhmetov, M., Jugembayeva, B., Kapanova, D., and Zhilmagambetova, R. (2026). Assessment using artificial intelligence in higher education: innovations and ethical challenges in the Ibero-American and Kazakh contexts-a mini-review. *Front. Educ.* 11, 1798126. doi: 10.3389/feduc.2026.1798126