

Aesthetic Perception in Art and Design Education among Primary Initial Teacher Education Students: A Universal Design for Learning Perspective

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Abstract

This research addresses the limitations of traditional teaching methods in cultivating aesthetic perception among students in primary initial teacher education programs. Universal Design for Learning (UDL) was employed as the theoretical foundation for examining its relationship with students' aesthetic development in art and design education. The research focused on how the three core principles of UDL—multiple means of representation, multiple means of action and expression, and multiple means of engagement—relate to students' aesthetic perception during art and design learning. A mixed-methods approach combined questionnaire surveys and semi-structured interviews. Survey participants comprised 200 undergraduate students enrolled in Primary Initial Teacher Education (PITE) programs in Northwest China, and six students participated in interviews. Aesthetic perception was measured across perceptual sensitivity, emotional responsiveness, and creative understanding, alongside students' perceptions of UDL implementation. Integrating quantitative statistical analysis with qualitative interpretation clarified the pathways through which inclusive instructional strategies may support aesthetic perception and informed recommendations for optimizing art and design curricula. The findings contribute theoretical and contextual insights for curriculum reform in teacher education while responding to educational equity, inclusion, and high-quality teacher preparation.

Keywords: Universal Design for Learning, Aesthetic Perception, Art and Design Education, Primary Initial Teacher Education, Mixed-Methods Research

Introduction

Art and design education plays a vital role in Primary Initial Teacher Education (PITE). It not only provides skill training but also fosters future teachers' aesthetic perception, creative expression, cultural understanding, and teaching adaptability. Through interdisciplinary integration and practical activities, art and design education offers teacher candidates opportunities to explore materials, tools, forms, and artistic expressions, thereby enhancing artistic comprehension and instructional competence (Østern et al., 2023). With ongoing

reforms in teacher education, its value has expanded beyond technical skill development to helping future educators understand the relationships among artistic practice, craft activities, and sociocultural meaning (Fauske, 2022). Aesthetic perception, a key objective of art and craft education, encompasses perceptual sensitivity, emotional responsiveness, and creative understanding. Stronger aesthetic perception is associated with creativity, critical thinking, and the quality of students' artistic learning (Chen & Mustaffa Halabi, 2023). For PITE students, developing this capacity is important not only for personal artistic literacy but also for their future ability to guide children's artistic observation, aesthetic experience, and creative expression (Heimer, 2023). However, art and design curricula may continue to rely heavily on teacher demonstrations, standardized tasks, uniform products, and outcome-focused assessment. Such practices can overlook differences in prior experience, cultural background, skill, interest, and preferred modes of expression. Research on classroom teachers' art and aesthetic competence and on teacher education in design, art, and crafts likewise points to the need for stronger aesthetic preparation and more responsive curriculum design (Aslantaş, 2023; Fauske, 2022). A flexible and inclusive approach is therefore needed to reduce avoidable barriers and broaden students' opportunities to perceive, interpret, and express aesthetic meaning (CAST, 2018).

Universal Design for Learning (UDL) offers a systematic framework for responding to learner variability at the point of curriculum design. It seeks to reduce barriers and improve access, participation, and meaningful learning through multiple means of engagement, representation, and action and expression (Rose & Meyer, 2002; Rusconi & Squillaci, 2023). In teacher education, UDL can strengthen classroom engagement, social interaction, and inclusive instructional decision-making (Mackey et al., 2023; Sukasih et al., 2024). Its value is especially relevant to initial teacher education because teacher candidates learn both through UDL-informed course experiences and through explicit preparation to design inclusive learning for their future pupils (Cressey, 2020; Curneen, 2024). The practical, sensory, and creative nature of art and design education is compatible with multiple pathways for accessing ideas, producing work, and sustaining engagement. Recent evidence from creative arts education also suggests that UDL can support flexible resources, varied forms of expression, and broader participation (Okyerere et al., 2024). Nevertheless, research has more often examined UDL in special education, online learning, or general classroom settings than in art and design teacher education, and the relationship between its three principles and distinct dimensions of aesthetic perception remains insufficiently tested (de la Fuente-González et al., 2025; Griful-Freixenet et al., 2020). This research addresses that gap by treating the three UDL principles as independent variables, the three dimensions of aesthetic perception as dependent variables, and gender as a control variable within PITE art and design courses.

Research Objectives

The research pursued the following objectives:

- Assess the overall level and dimensional profile of PITE students' aesthetic perception in art and design courses.
- Examine the relationships and predictive associations between students' perceived implementation of the three UDL principles and aesthetic perception while controlling for gender.
- Explore students' aesthetic experiences, engagement, and modes of expression and use

the integrated findings to formulate UDL-informed curriculum recommendations.

Literature Review

UDL provides the theoretical basis for the independent variables in this research. Its central premise is that learner variability should be anticipated during curriculum design rather than addressed only after barriers emerge. The framework therefore calls for multiple means of engagement, representation, and action and expression (CAST, 2018; Rose & Meyer, 2002). Reviews and teacher-education studies indicate that UDL can strengthen equitable participation, instructional adaptability, and teachers' capacity to plan for diverse learners (Cressey, 2020; de la Fuente-González et al., 2025; Rusconi & Squillaci, 2023). In online special educator preparation and collaborative teacher education, UDL has also been used to connect inclusive principles with course design and professional learning (Flanagan et al., 2022; Mackey et al., 2023).

The teacher-education literature nevertheless identifies uneven knowledge and implementation. Applying UDL within a teacher residency can help teacher candidates analyze instructional barriers and redesign pedagogy, but sustained preparation and institutional support remain necessary (Fornauf et al., 2021). A systematic review of the relationship between UDL and differentiated instruction similarly shows substantial conceptual compatibility while noting the need for clearer implementation evidence (Griful-Freixenet et al., 2020). Research in STEAM and initial teacher education further demonstrates the framework's potential to support active participation, collaboration, and inclusive planning (Curneen, 2024; Thoma et al., 2023). Particularly relevant to this research, work in creative arts education reports that multiple resources, flexible task pathways, and varied forms of expression can widen participation in arts learning (Okyere et al., 2024), while UDL-informed teacher education can strengthen students' social interaction (Sukasih et al., 2024). Aesthetic perception forms the theoretical basis for the dependent variable. Contemporary accounts treat aesthetic experience as a multidimensional process that combines perceptual processing, cognitive appraisal, emotion, meaning-making, and interpretation rather than as the passive recognition of beauty (Consoli, 2015; Dolese & Kozbelt, 2020; Leder et al., 2004; Silvia, 2005). In art and teacher education, aesthetic learning can be cultivated through close observation, material exploration, embodied activity, creative practice, dialogue, and reflection. Empirical and practice-based studies describe how these processes develop in teacher education, design education, classroom practice, and children's encounters with artworks (Aslantaş, 2023; Heimer, 2023; Møller-Skau, 2024; Østern et al., 2023; Probosiwi & Setyaningrum, 2022; Sidabrienė, 2024). Emotional and interpretive dimensions are also central to artistic activity and aesthetic presence (Klimenko & Beskrovnaya, 2022; Sajjani et al., 2020).

The intersection of these literatures suggests a plausible but under-tested relationship. Art and design education depends on the ways learners gain access to visual and material information, act on ideas, express interpretations, and remain emotionally engaged. Studies of emotional teaching value and technology-supported aesthetic learning indicate that instruction can shape students' aesthetic responses and meaning-making (Cao, 2024; Chen & Mustaffa Halabi, 2023), while research on artistic valuation shows that aesthetic meaning is also socially and culturally situated (Kompatsiaris & Chrysagis, 2020). UDL therefore offers more than an accessibility checklist in this context: it provides a curriculum-design lens

through which perceptual, emotional, and creative dimensions of aesthetic learning can be examined together. However, existing research has not adequately tested how each of the three UDL principles relates to perceptual sensitivity, emotional responsiveness, and creative understanding among PITE students.

Based on the aforementioned literature, three major shortcomings in existing research remain evident. First, although the UDL theory and aesthetic perception theory have established relatively mature research foundations, there is still a lack of empirical studies integrating these two frameworks—particularly regarding how UDL teaching strategies influence students' aesthetic perception development within PITE art and design education. Second, current UDL research primarily focuses on special education, online learning, general classroom management, or core subject instruction, while attention to practical, sensory, and creative disciplines such as art and design and craft education remains limited. Meanwhile, although aesthetic perception research emphasizes artistic experience and creative development, it rarely explains its formation mechanisms from the perspectives of universal learning design and inclusive teaching. Third, existing literature lacks clear mechanistic explanations and empirical evidence regarding how the three UDL principles individually or collectively influence perceptual sensitivity, emotional responsiveness, and creative understanding. Therefore, this research establishes the three UDL principles as independent variables, defines the three dimensions of aesthetic perception as dependent variables, and employs the PITE art and design curriculum as the specific research context. Specifically, multiple means of representation is recognized as enhancing perceptual sensitivity through enriched visual, material, and symbolic inputs; multiple means of action and expression foster creative understanding via diverse creative works and meaning articulation; while multiple means of engagement strengthen emotional responsiveness through interest stimulation, collaborative learning, and connections with personal experiences. Building on this theoretical framework, the subsequent section will elaborate on the methodological design of this research, including the mixed-method research design, subjects and sampling methods, questionnaire and interview instruments, data collection procedures, as well as quantitative and qualitative data analysis approaches.

Methodology

Research Design and Data Collection

This research employs a mixed-method research design, primarily using a quantitative questionnaire survey supplemented by semi-structured interviews. This design addresses the research objectives by measuring students' aesthetic perception, examining its statistical associations with perceived UDL implementation, and using qualitative evidence to interpret students' aesthetic experiences, engagement, and modes of expression (Creswell & Plano Clark, 2018). The three UDL principles—multiple means of representation, multiple means of action and expression, and multiple means of engagement—are designated as independent variables. Aesthetic perception is the dependent variable and comprises perceptual sensitivity, emotional responsiveness, and creative understanding. Gender is included as a control variable to assess whether the observed associations remain after accounting for sample differences. The research framework is illustrated in Figure 1.

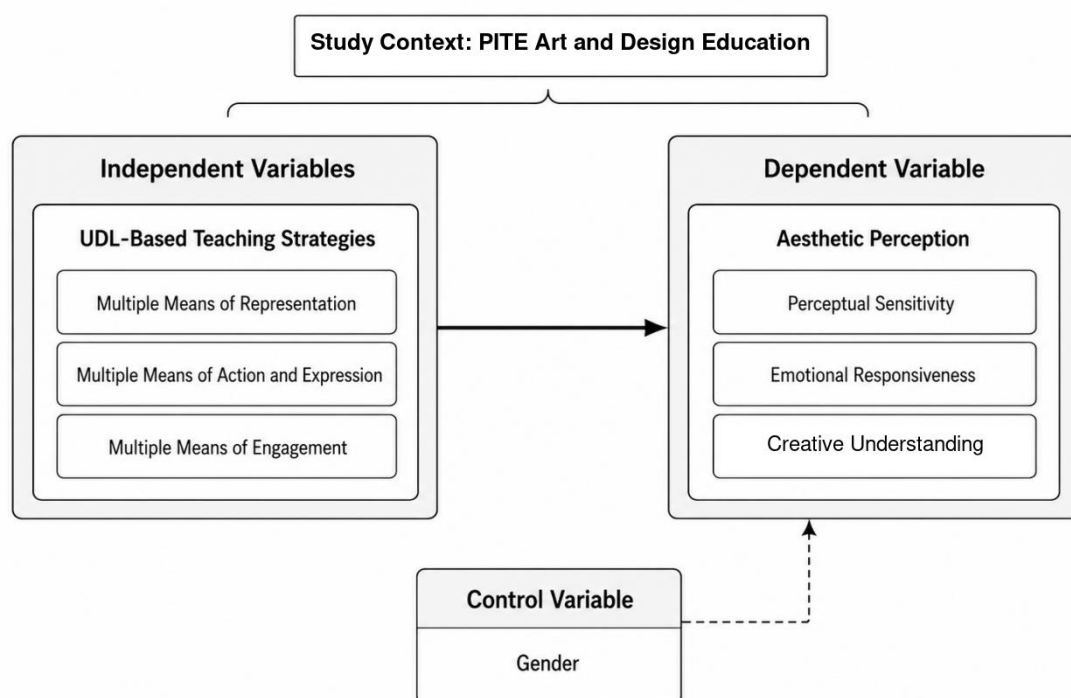


Figure-1

The research subjects were undergraduate students majoring in Primary Initial Teacher Education (PITE) at three teacher-training universities in Northwest China, namely Northwest Normal University, Tianshui Normal University, and Longnan Normal University. All participants were required to have taken at least one course related to art and design, craft education, or art appreciation to ensure they possessed fundamental artistic learning experience and could provide valid responses to the questions regarding course experiences and aesthetic perception in the questionnaire. The research employed a combination of random sampling and purposive sampling: random sampling was used to ensure representativeness across different grade levels and classes, while purposive sampling ensured that participants had relevant course learning experiences related to the research topic. A total of 290 questionnaires were distributed during the formal survey, and after data screening, 200 valid questionnaires were retained. The valid sample included students from the second, third, and fourth grades, comprising 166 females (83.0%) and 34 males (17.0%). This sample structure largely reflected the actual gender distribution and grade composition of PITE majors, providing a stable data foundation for subsequent statistical analysis.

To facilitate a comprehensive analysis of the research objectives, the questionnaire comprises three sections. The first collects background information, including gender, grade level, and prior enrollment in art and design courses. The second evaluates aesthetic perception through nine items covering perceptual sensitivity, emotional responsiveness, and creative understanding. The third measures students' perceptions of UDL implementation through nine items covering multiple means of representation, multiple means of action and expression, and multiple means of engagement. All core items use a five-point Likert scale ranging from "strongly disagree" to "strongly agree." Item development and adaptation followed established scale-development principles (DeVellis, 2017). The aesthetic-perception items were informed by research on aesthetic processing, appraisal, and emotion and were adapted to the art-education context (Leder et al., 2004; Silvia, 2005). UDL items were aligned

with the UDL Guidelines and prior UDL lesson-planning research (CAST, 2018; Courey et al., 2013). Before data collection, participants were informed of the research's purpose, voluntary nature, right to withdraw, and intended data use. Questionnaires were anonymous and contained no names, student identification numbers, telephone numbers, or other direct identifiers; interview records used participant codes and were used only for academic analysis.

Qualitative Analysis

The qualitative component of this research analysis employed semi-structured interviews aimed at supplementing and interpreting the questionnaire findings, thereby enhancing our understanding of students' authentic learning experiences, aesthetic responses, and subjective perceptions of UDL teaching strategies in art and design courses. Interview participants were selected through purposive sampling from those who completed valid questionnaires and agreed to subsequent interviews. Selection criteria included: completion of a valid questionnaire; enrollment in at least one art and design or aesthetics-related course; and possession of representative scores on aesthetic perception scales (e.g., high or low score groups). Ultimately, six students were selected for interviews to obtain more insightful data reflecting diverse levels of aesthetic perception and learning experiences.

The interview framework addressed three areas. First, students described their aesthetic experiences in art and design courses, including how they observed details, perceived material qualities, formed emotional connections, and developed personal interpretations. Second, they discussed the implementation of Universal Design for Learning, including whether instructors used texts, images, videos, physical objects, and demonstrations; whether students could express learning through drawing, making, oral presentation, digital display, or group projects; and whether the course stimulated interest, collaboration, and sustained engagement. Third, students proposed improvements to teaching resources, communication, assessment, and classroom interaction. Interview data were analyzed thematically through familiarization, initial coding, theme development, review, and interpretation (Braun & Clarke, 2006). The analysis retained interview records and coding decisions and used researcher review, comparison with questionnaire results, and participant confirmation where appropriate to strengthen credibility and transparency (Lincoln & Guba, 1985).

Quantitative Analysis

The quantitative analysis used data from 200 valid questionnaires. Before analysis, responses were screened for severe incompleteness, implausibly short completion times, invariant response patterns, and inconsistencies concerning prior art and design course experience. Formal analysis was conducted in SPSS 27.0 using descriptive statistics, reliability analysis, independent-samples t tests, Pearson correlation analysis, and multiple linear regression. Descriptive statistics summarized sample characteristics and the overall and dimensional profiles of aesthetic perception. Independent-samples t tests examined gender differences. Pearson correlations assessed bivariate relationships between the three UDL principles and aesthetic-perception outcomes. Multiple linear regression then examined whether multiple means of representation, action and expression, and engagement were associated with overall aesthetic perception after controlling for gender.

In variable processing, perceptual sensitivity is calculated as the mean from p1 to p3; emotional responsiveness as the mean from p4 to p6; creative understanding as the mean from p7 to p9; overall aesthetic perception as the mean from p1 to p9; multiple means of representation as the mean from p10 to p12; multiple means of action and expression as the mean from p13 to p15; multiple means of engagement as the mean from p16 to p18; and overall UDL perception as the mean from p10 to p18. This approach ensures consistency among questionnaire items, theoretical dimensions, and statistical variables, preventing a disconnect between variable interpretation and measurement tools. The significance level was set at $\alpha = 0.05$. Since this research utilized cross-sectional self-report questionnaire data, the regression results are primarily interpreted as statistical associations or significant predictive relationships rather than direct causal relationships.

Validation Results and Conclusions of the Research Design

To ensure the reliability of the research tools and analytical results, this research conducted validation across four dimensions: data screening, reliability testing, content validity, and qualitative credibility. Data screening revealed that 200 valid samples were retained after questionnaire refinement; no extreme outliers requiring removal were identified for continuous variables, and both the skewness and kurtosis of the overall aesthetic perception variable and its three dimensions remained within acceptable ranges, supporting subsequent parameter testing. In the multiple regression model, all predictor variables exhibited VIF values below common thresholds, indicating no significant multicollinearity issues.

Regarding reliability testing, the overall Cronbach's α for the Aesthetic Perception Scale was 0.872, while that for the UDL Perception Scale was 0.859; all sub-scale alpha values exceeded 0.70, indicating strong internal consistency and suitability for subsequent statistical analysis (Cronbach, 1951; Nunnally & Bernstein, 1994). In terms of content validity, the three dimensions of the Aesthetic Perception Scale align with the theoretical constructs of perceptual sensitivity, emotional responsiveness, and creative understanding, whereas those of the UDL Perception Scale correspond to multiple means of representation, multiple means of action and expression, and multiple means of engagement, demonstrating robust alignment between the measurement tools and the theoretical framework. For qualitative credibility, this research enhanced interpretative reliability through triangulation involving interview data, questionnaire results, and the theoretical framework; interview records and coding processes were retained, and participant confirmation was sought for certain interpretations when necessary to improve transparency and credibility in the qualitative analysis.

In summary, the methodological design of this research effectively serves its research objectives. Quantitative questionnaires were employed to assess students' aesthetic perception levels and examine the statistical relationship between UDL teaching strategies and aesthetic perception; qualitative interviews were used to interpret the learning experiences, emotional responses, and engagement mechanisms underlying the questionnaire results. These two approaches complement each other, enabling the research to address not only the fundamental question of "what constitutes students' aesthetic perception" but also provide deeper insights into its underlying mechanisms.

Results

A total of 290 questionnaires were distributed in this research, with 200 valid responses retained after data screening, yielding a response rate of 68.97%. The sample comprised students enrolled in the second, third, and fourth years of the Primary Initial Teacher Education (PITE) program: 69 second-year students (34.5%), 76 third-year students (38.0%), and 55 fourth-year students (27.5%). Gender distribution showed 166 female participants (83.0%) and 34 male participants (17.0%), reflecting the gender predominance observed among PITE program students. All valid samples had prior exposure to courses related to art and design, craft education, or art appreciation, enabling accurate responses to questions regarding aesthetic perception and UDL curriculum experiences. During screening, questionnaires with completion times below 180 seconds, over 10% missing key items, consistent pattern-based answers, or inconsistent course-related responses were excluded. Standardization tests for continuous variables revealed no significant outliers requiring removal; overall aesthetic perception scores and their three dimensions exhibited acceptable skewness and kurtosis values. VIF values for all predictors in the regression model ranged from 1.09 to 1.41, indicating no severe multicollinearity issues.

Descriptive statistics indicate that PITE students demonstrate a relatively high overall level of aesthetic perception in art and design courses. The mean overall aesthetic perception score was 4.512 with a standard deviation of 0.428, indicating that the sample falls within the upper-middle range and supports Hypothesis H1. By dimension, creative understanding scored highest at 4.617; emotional responsiveness came second at 4.601; while perceptual sensitivity was relatively lower at 4.318. This suggests that students readily develop emotional experiences, aesthetic resonance, imaginative associations, and creative interpretations in art and design courses, but there remains room for improvement in areas such as detailed observation, material perception, formal discrimination, and structural analysis, as detailed in Table 1.

Table 1

Descriptive Statistics of Aesthetic Perception and Its Dimensions

Variable	Mean	SD	Min	Max	Skewness	Kurtosis
AP Overall	4.512	0.428	3.07	5.00	-0.512	0.341
Perceptual Sensitivity (PS)	4.318	0.617	2.36	5.00	-0.478	-0.129
Emotional Responsiveness (ER)	4.601	0.509	3.07	5.00	-0.689	-0.129
Creative Understanding (CU)	4.617	0.491	3.08	5.00	-0.604	0.273

Reliability analysis indicated that Cronbach's α was 0.872 for the overall Aesthetic Perception Scale and 0.859 for the overall UDL Perception Scale; all subscale α values exceeded 0.70, demonstrating acceptable to strong internal consistency. Specifically, α values for perceptual sensitivity, emotional responsiveness, and creative understanding were 0.814, 0.836, and 0.791, respectively. Values for representation, action and expression, and engagement were 0.802, 0.825, and 0.778, respectively. These findings indicate that the items consistently measured the constructs defined in this research, as detailed in Table 2.

Table 2

Reliability Analysis of Scales

Scale Name	Dimension	Number of Items	Cronbach's α
Aesthetic Perception Scale	Overall	9	0.872
Aesthetic Perception Scale	Perceptual Sensitivity (PS)	3	0.814
Aesthetic Perception Scale	Emotional Responsiveness (ER)	3	0.836
Aesthetic Perception Scale	Creative Understanding (CU)	3	0.791
UDL Perception Scale	Overall	9	0.859
UDL Perception Scale	Representation (MMR)	3	0.802
UDL Perception Scale	Action & Expression (MAE)	3	0.825
UDL Perception Scale	Engagement (MME)	3	0.778

The independent samples t-test further revealed that female participants scored significantly higher than male participants in overall aesthetic perception and perceptual sensitivity. The mean score for overall aesthetic perception was 4.538 ± 0.401 for females versus 4.378 ± 0.512 for males, with a statistically significant difference ($p = 0.032$); the mean score for perceptual sensitivity was 4.362 ± 0.589 for females versus 4.112 ± 0.712 for males, also showing a significant difference ($p = 0.021$). In contrast, gender differences were not significant for emotional responsiveness ($p = 0.141$) or creative understanding ($p = 0.277$). These findings indicate that gender differences primarily manifest in visual detail recognition, formal discrimination, and material perception, rather than in overall emotional experience or creative understanding, as detailed in Table 3.

Table 3

Gender Differences in Aesthetic Perception

Variable	Female (n = 166) M $\pm$ SD	Male (n = 34) M $\pm$ SD	Result
Overall Aesthetic Perception	4.538 ± 0.401	4.378 ± 0.512	Significant, $p = 0.032$
Perceptual Sensitivity (PS)	4.362 ± 0.589	4.112 ± 0.712	Significant, $p = 0.021$
Emotional Responsiveness (ER)	4.628 ± 0.492	4.489 ± 0.578	Not significant, $p = 0.141$
Creative Understanding (CU)	4.625 ± 0.476	4.533 ± 0.561	Not significant, $p = 0.277$

Pearson correlation analysis revealed that overall UDL perception and all three UDL dimensions were significantly and positively correlated with overall aesthetic perception and its three subdimensions. The correlation between overall UDL perception and overall aesthetic perception was the strongest ($r = 0.678$, $p < 0.01$), indicating that stronger perceived UDL support was associated with higher aesthetic perception. At the subdimension level, multiple means of representation was correlated with perceptual sensitivity ($r = 0.458$, $p < 0.01$); multiple means of action and expression was correlated with emotional responsiveness ($r = 0.514$, $p < 0.01$); and multiple means of engagement was correlated with creative

understanding ($r = 0.531$, $p < 0.01$). Thus, all three UDL dimensions were related to aesthetic perception, although their patterns of association differed, as shown in Table 4.

Table 4

Correlations between UDL Perception and Aesthetic Perception

UDL Variables	PS	ER	CU	AP Overall
Representation (MMR)	0.458**	0.391**	0.426**	0.512**
Action & Expression (MAE)	0.402**	0.514**	0.467**	0.548**
Engagement (MME)	0.376**	0.489**	0.531**	0.569**
UDL Overall	0.521**	0.583**	0.602**	0.678**

Note. ** $p < 0.01$.

Multiple linear regression analysis further validated the predictive effect of the UDL teaching strategy on aesthetic perception. With overall aesthetic perception as the dependent variable and multiple means of representation, multiple means of action and expression, and multiple means of engagement as the independent variables, after controlling for gender, the model was statistically significant ($F = 54.12$, $p < 0.001$), with an adjusted R^2 of 0.516, indicating that the model accounts for 51.6% of the variance in overall aesthetic perception. All three dimensions of UDL exhibited significant positive predictive effects on overall aesthetic perception: multiple means of engagement had the highest standardized regression coefficient ($\beta = 0.314$, $p < 0.001$), followed by multiple means of action and expression ($\beta = 0.281$, $p < 0.001$); multiple means of representation also showed a significant predictive effect ($\beta = 0.238$, $p < 0.001$). The gender variable remained significant after controlling for all three UDL dimensions ($\beta = 0.112$, $p = 0.031$), though its explanatory power was lower than that of the UDL-related variables. These results demonstrate a significant positive relationship between the UDL teaching strategy and students' level of aesthetic perception, as detailed in Table 5.

Table 5

Multiple Linear Regression Results

Variable	B	SE	β	t	p	VIF
Constant	2.184	0.218	—	10.02	<0.001	—
MMR	0.214	0.048	0.238	4.458	<0.001	1.32
MAE	0.267	0.051	0.281	5.235	<0.001	1.41
MME	0.298	0.049	0.314	6.082	<0.001	1.28
Female	0.126	0.058	0.112	2.172	0.031	1.09

Overall, the results indicate that PITE students already possess a solid foundation in aesthetic perception within art and design courses, though their internal development is uneven. Students demonstrate strong performance in emotional responsiveness and creative understanding, whereas their perceptual sensitivity remains relatively weak. All three dimensions of UDL significantly predict aesthetic perception, with multiple means of engagement proving the most influential factor. Analysis of questionnaire items and interview outlines reveals that multiple means of representation enhances students' ability to observe details through visual, tactile, and process-oriented cues; multiple means of action and expression foster emotional engagement with artworks and course activities via diverse

opportunities for expression; while multiple means of engagement promotes creative understanding and holistic aesthetic perception development through interest stimulation, collaboration, discussion, and sustained engagement.

Discussion

The research findings indicate that PITE students demonstrate an above-average level of overall aesthetic perception in art and design courses, indicating they possess certain capabilities in aesthetic judgment, emotional engagement, and creative understanding. This outcome holds significant implications for future elementary school teachers, as educators serve not only as knowledge transmitters but also as guides for children's aesthetic experiences and artistic expression. The more comprehensive the PITE students' aesthetic perception, the more effectively they will be able to organize activities such as artistic observation, material exploration, creative expression, and aesthetic discussions in classroom settings. However, the results reveal uneven development across different aesthetic dimensions: relatively low scores in perceptual sensitivity suggest areas requiring improvement in recognizing color variations, structural details, formal composition, material characteristics, and technical craftsmanship; conversely, higher scores in emotional responsiveness and creative understanding highlight how art and design courses effectively stimulate emotional engagement, aesthetic resonance, imaginative association, and personalized interpretation. In other words, while students have established a foundation of "willingness to perceive" and "ability to associate," critical skills like "precise observation" and "accurate identification of forms and materials" remain key areas requiring focused enhancement in curriculum design.

The gender differences further demonstrate that the development of aesthetic perception cannot be simply attributed to individual student interests or innate disparities. Female students scored significantly higher than male students in overall aesthetic perception and perceptual sensitivity, but no significant differences were observed in emotional responsiveness or creative understanding. This indicates that gender differences primarily manifest in aspects such as visual detail awareness, formal observation, and material discrimination, rather than in aesthetic emotion or creative understanding itself. Therefore, educators should avoid attributing variations in aesthetic performance solely to gender or artistic foundation when designing curricula; instead, they should provide equitable learning support through more targeted observation tasks, case comparisons, material exploration, breakdown of production processes, and guided questioning. These findings also underscore that art and design education should shift from evaluating final products to fostering process-oriented competencies, particularly by enhancing students' perceptual training regarding materials, structure, form, and technical details.

Both correlation and regression analyses demonstrate a stable, significant positive relationship between students' perception of UDL implementation and their aesthetic perception. Multiple means of representation, multiple means of action and expression, and multiple means of engagement all significantly predict overall aesthetic perception, indicating that aesthetic perception is not a static trait solely dependent on students' pre-existing artistic abilities, but rather a capability gradually cultivated within an inclusive, diverse, and participatory learning environment. Multiple means of representation provides students with additional observational cues through texts, images, videos, physical displays, live

demonstrations, and tactile materials, enabling them to engage with aesthetic objects through aspects such as color, structure, materials, and production processes—therefore exhibiting strong correlations with perceptual sensitivity. Multiple means of action and expression allow students to articulate their understanding based on individual strengths through painting, writing, hands-on creation, verbal explanations, tool selection, and artwork presentation, facilitating the transformation of aesthetic experiences into emotional responses, interpretive works, and personalized expressions. Multiple means of engagement demonstrates the strongest predictive power, highlighting that interest stimulation, task selection, collaborative discussions, peer interaction, and sustained engagement serve as key mechanisms for fostering creative understanding and holistic aesthetic perception.

Theoretically, this research integrates the UDL framework into the PITE art and design curriculum context, expanding its application scope from general learning support and barrier reduction to inclusive classroom design and aesthetic ability development. The findings demonstrate that UDL not only enhances students' comprehension of course content but also fosters aesthetic perception through diversified presentation, varied actions and expressions, and multiple means of engagement. Furthermore, the research operationalizes aesthetic perception into three dimensions—perceptual sensitivity, emotional responsiveness, and creative understanding—transforming the abstract concept of "aesthetic ability" into a measurable, analyzable, and interpretable structure. Based on correlation and regression analyses, the research establishes a multi-path explanatory framework: diversified presentation may enhance perceptual sensitivity via multisensory engagement; varied actions and expressions may deepen emotional responses through expressive choices; and multiple means of engagement may promote creative understanding and holistic aesthetic perception through interest stimulation, motivation, and collaborative experiences. This framework provides a new theoretical framework for investigating aesthetic education from an inclusive teaching perspective.

From a practical curriculum perspective, these findings suggest that educators should systematically integrate UDL principles into art and design course design. First, addressing the relatively weaker perceptual sensitivity among students, courses should incorporate "details observation" exercises—including color contrast analysis, material texture exploration, structural decomposition of works, process observation, and comparative analysis of exemplary works—to shift students from passive appreciation to active observation. Second, regarding diversified presentation methods, instructors should move beyond verbal explanations or textual materials by utilizing visual aids, short videos, physical demonstrations, live demonstrations, tactile materials, and step-by-step diagrams to facilitate multi-sensory understanding of art and design concepts through visual, auditory, and tactile channels. Third, for diverse implementation and expression approaches, teachers should allow students to showcase learning outcomes through various means such as design sketches, oral presentations, reflective writing, collage projects, hands-on creations, and work interpretations, thereby reducing limitations associated with single-ended assessment. Finally, in terms of participatory engagement, courses should enhance student interest, motivation, collaborative experience, and sustained focus through thematic selection, contextual tasks, group collaboration, peer evaluation, story-sharing sessions, and periodic feedback mechanisms.

Limitation

This research also demonstrates that the evaluation of art and design courses should shift from single-outcome assessment to a process-oriented, multi-dimensional approach. Evaluation criteria should not only focus on the completeness or aesthetic quality of final works but also assess whether students can observe material and formal details, engage emotionally, provide creative interpretations, select appropriate expression methods based on individual strengths, and maintain active participation in collaborative discussions. Such an evaluation framework better aligns with the practical nature of art and design education and embodies the inclusive educational philosophy emphasized by Universal Design for Learning (UDL). Although this research yields clear findings, several limitations remain: First, the sample primarily originates from specific regions and institutions, making generalizations to other areas or teacher education settings cautious. Second, while the quantitative analysis relied mainly on cross-sectional self-report questionnaires—capable of identifying significant correlations but unable to establish causal relationships—the UDL-aesthetic perception relationship should be interpreted as a positive predictive or statistical association rather than absolute causality. Third, questionnaire data may be influenced by social expectations, self-assessment biases, and common method bias; future research should integrate multi-source data such as classroom observations, work evaluations, teacher ratings, and learning process records to enhance robustness. Fourth, interview data were primarily used to interpret survey results and supplement learning experiences; future studies could provide more detailed interview transcripts, thematic analyses, and representative quotes to deepen mixed-method research insights.

Future Work

Based on the above findings, this research recommends optimizing the PITE art and design curriculum in three key areas for future research. First, incorporate observation training, material exploration, and form comparison tasks to address students' relative deficiencies in perceptual sensitivity. Second, redesign classroom activities according to the three principles of Universal Design for Learning (UDL): employ diverse presentation methods to enhance understanding of art and design concepts; utilize varied actions and expressions to support knowledge demonstration; and promote active participation to strengthen learning motivation and sustained engagement. Third, establish a more inclusive assessment framework that encompasses perceptual observation, emotional experience, creative interpretation, expressive choices, and collaborative participation. Overall, this research demonstrates a positive correlation between UDL teaching strategies and students' aesthetic perception in PITE programs, providing empirical evidence for transitioning art and design curricula from skill-oriented approaches toward aesthetics-oriented, inclusivity-focused, and development-oriented models.

Conclusion

This research examined the relationship between Universal Design for Learning (UDL) instructional strategies and students' aesthetic perception in the art and design curriculum of Primary Initial Teacher Education (PITE). PITE students demonstrated a generally high level of aesthetic perception, with stronger emotional responsiveness and creative understanding but comparatively weaker perceptual sensitivity. Perceived implementation of multiple means of representation, multiple means of action and expression, and multiple means of engagement was positively associated with aesthetic perception, and all three dimensions remained

significant predictors after gender was controlled. These findings indicate that flexible, inclusive, and participatory curriculum design can support aesthetic observation, emotional engagement, and creative expression. Future research should use broader samples, classroom observation, artwork assessment, and longitudinal or experimental designs to test how these relationships develop over time.

Theoretical and Contextual Contributions

Theoretically, this research extends UDL scholarship by connecting its three curriculum-design principles with a multidimensional model of aesthetic perception rather than treating UDL solely as a framework for access or accommodation. Operationalizing perceptual sensitivity, emotional responsiveness, and creative understanding and examining their differentiated associations with multiple means of representation, multiple means of action and expression, and multiple means of engagement provides a testable explanatory structure for future inclusive art-education research; given the cross-sectional design, the contribution concerns theoretically meaningful associations rather than causal proof. Contextually, evidence from PITE programs at three universities in Northwest China addresses a setting that remains underrepresented in both UDL and aesthetic-education research. The findings show how multisensory resources, flexible forms of expression, and sustained collaborative engagement can be translated into curriculum and assessment choices for teacher candidates with varied artistic backgrounds. This is significant because these candidates will later shape primary pupils' access to aesthetic observation, cultural interpretation, and creative participation; strengthening their preparation therefore links local curriculum improvement with the broader goals of inclusive education, educational equity, and higher-quality primary teacher development.

References

- Aslantaş, S. (2023). A review of classroom teachers' perceptions of art and aesthetic field competency with respect to different variables in their classroom practices. *Türk Akademik Yayınlar Dergisi*, 7(4), 1046–1069. <https://doi.org/10.29329/tayjournal.2023.610.14>
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77–101. <https://doi.org/10.1191/1478088706qp0630a>
- Cao, M. H. H. (2024). Applying artificial intelligence (AI) technology to enhance aesthetic perception in fine art education. *Vinh University Journal of Science*, 53(Special Issue 2), 259–266. <https://doi.org/10.56824/vujs.2024.htkhgd192>
- CAST. (2018). Universal Design for Learning Guidelines version 2.2. <https://udlguidelines.cast.org/static/udlg2.2-text-a11y.pdf>
- Chen, H., & Mustaffa Halabi, K. N. (2023). Cultivating of emotional teaching value to art design undergraduate students' aesthetic ability in China. *International Journal of Academic Research in Progressive Education and Development*, 12(1), 1048–1057. <https://doi.org/10.6007/IJARPED/v12-i1/16324>
- Consoli, G. (2015). From beauty to knowledge: A new frame for the neuropsychological approach to aesthetics. *Frontiers in Human Neuroscience*, 9, Article 290. <https://doi.org/10.3389/fnhum.2015.00290>
- Courey, S. J., Tappe, P., Siker, J., & LePage, P. (2013). Improved lesson planning with Universal Design for Learning (UDL). *Teacher Education and Special Education*, 36(1), 7–27. <https://doi.org/10.1177/0888406412446178>

- Cressey, J. M. (2020). Universal Design for Learning: Culturally responsive UDL in teacher education. In M. T. Grasseti & J. Zoino-Jeannetti (Eds.), *Next generation digital tools and applications for teaching and learning enhancement* (pp. 137–158). IGI Global. <https://doi.org/10.4018/978-1-7998-1770-3.ch008>
- Creswell, J. W., & Plano Clark, V. L. (2018). *Designing and conducting mixed methods research* (3rd ed.). SAGE Publications.
- Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika*, 16(3), 297–334. <https://doi.org/10.1007/BF02310555>
- Curneen, A. (2024). Universal Design for Learning as a two-pronged approach to inclusive practice in initial teacher education in Ireland. *All Ireland Journal of Higher Education*, 16(2). <https://doi.org/10.62707/aishej.v16i2.853>
- de la Fuente-González, S., Menéndez Álvarez-Hevia, D., & Rodríguez-Martín, A. (2025). Universal Design for Learning: A systematic review of its role in teacher education. *Alteridad*, 20(1), 113–128. <https://doi.org/10.17163/alt.v20n1.2025.09>
- DeVellis, R. F. (2017). *Scale development: Theory and applications* (4th ed.). SAGE Publications.
- Dolese, M. J., & Kozbelt, A. (2020). Communication and meaning-making are central to understanding aesthetic response in any context. *Frontiers in Psychology*, 11, Article 473. <https://doi.org/10.3389/fpsyg.2020.00473>
- Fauske, L. B. (2022). Approaching the concept of research in the 5-year teacher education programme in design, art, and crafts. *Techne serien – Forskning i slöjdpedagogik och slöjdvetskap*, 29(2), 17–28. <https://doi.org/10.7577/technea.4720>
- Flanagan, S. M., Howorth, S. H., Rooks-Ellis, D. L., & Taylor, J. P. (2022). Use of Universal Design for Learning in online special educator preparation. *Journal of Special Education Preparation*, 2(1), 20–27. <https://doi.org/10.33043/josep.2.1.20-27>
- Fornauf, B. S., Higginbotham, T., Mascio, B., McCurdy, K., & Reagan, E. M. (2021). Analyzing barriers, innovating pedagogy: Applying Universal Design for Learning in a teacher residency. *The Teacher Educator*, 56(2), 153–170. <https://doi.org/10.1080/08878730.2020.1828520>
- Griful-Freixenet, J., Struyven, K., Vantieghem, W., & Gheysens, E. (2020). Exploring the interrelationship between Universal Design for Learning (UDL) and differentiated instruction (DI): A systematic review. *Educational Research Review*, 29, Article 100306. <https://doi.org/10.1016/j.edurev.2019.100306>
- Heimer, A. M. (2023). The role of aesthetics in design education. *Techne serien – Forskning i slöjdpedagogik och slöjdvetskap*, 30(1), 31–45. <https://doi.org/10.7577/technea.5259>
- Klimenko, A. V., & Beskrovnaya, O. V. (2022). Emotional and aesthetic experience as a component of artistic activity among college students. *Psychological-Pedagogical Journal GAUDEAMUS*, 21(3), 66–73. <https://doi.org/10.20310/1810-231x-2022-21-3-66-73>
- Kompatsiaris, P., & Chrysagis, E. (2020). Crafting values: Economies, ethics and aesthetics of artistic valuation. *Journal of Cultural Economy*, 13(6), 663–671. <https://doi.org/10.1080/17530350.2020.1798803>
- Leder, H., Belke, B., Oeberst, A., & Augustin, D. (2004). A model of aesthetic appreciation and aesthetic judgments. *British Journal of Psychology*, 95(4), 489–508. <https://doi.org/10.1348/0007126042369811>
- Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry*. SAGE Publications.

- Mackey, M., Drew, S. V., Nicoll-Senft, J., & Jacobson, L. (2023). Advancing a theory of change in a collaborative teacher education program innovation through Universal Design for Learning. *Social Sciences & Humanities Open*, 7(1), Article 100468. <https://doi.org/10.1016/j.ssaho.2023.100468>
- Møller-Skau, M. (2024). Exploring student teachers' aesthetic learning processes. *Teaching Education*, 35(3), 277–292. <https://doi.org/10.1080/10476210.2023.2278802>
- Nunnally, J. C., & Bernstein, I. H. (1994). *Psychometric theory* (3rd ed.). McGraw-Hill.
- Okyere, A. A., Adom, D., Kquofi, S., Sampene, A. A. B., & Buami, E. K. (2024). Integration of Universal Design for Learning in creative arts education: Perspectives from basic schools in Suame Municipality, Ashanti Region, Ghana. *Studies in Learning and Teaching*, 5(3), 665–687. <https://doi.org/10.46627/silet.v5i3.530>
- Østern, T. P., Bakken, A.-L., Lund, A., Sørsum, A. G., Myhre, C., & Nesse, C. W. (2023). Arts, crafts, and dance—Developing aesthetic learning processes in arts and crafts through a general teacher education and higher dance education collaboration. *Dance Articulated*, 9(1), 80–98. <https://doi.org/10.5324/da.v9i1.5061>
- Probosiwi, & Setyaningrum, F. (2022). Creative process of elementary school teacher education students in making ecoprint: Aesthetic habitus studies. *Taman Cendekia: Jurnal Pendidikan Ke-SD-an*, 6(2), 23–34. <https://doi.org/10.30738/tc.v6i2.13699>
- Rose, D. H., & Meyer, A. (2002). *Teaching every student in the digital age: Universal Design for Learning*. Association for Supervision and Curriculum Development.
- Rusconi, L., & Squillaci, M. (2023). Effects of a Universal Design for Learning (UDL) training course on the development of teachers' competences: A systematic review. *Education Sciences*, 13(5), Article 466. <https://doi.org/10.3390/educsci13050466>
- Sajnani, N., Mayor, C., & Tillberg-Webb, H. (2020). Aesthetic presence: The role of the arts in the education of creative arts therapists in the classroom and online. *The Arts in Psychotherapy*, 69, Article 101668. <https://doi.org/10.1016/j.aip.2020.101668>
- Sidabrienė, J. (2024). Development of aesthetic perception in 4–8-year-old children using the method of observing artworks. *Acta Paedagogica Vilnensia*, 52, 73–92. <https://doi.org/10.15388/actpaed.2024.52.5>
- Silvia, P. J. (2005). Emotional responses to art: From collation and arousal to cognition and emotion. *Review of General Psychology*, 9(4), 342–357. <https://doi.org/10.1037/1089-2680.9.4.342>
- Sukasih, S., Wulandari, D., Tyas, D. N., & Andrijati, N. (2024). Universal Design for Learning to improve students' social interaction in elementary school teacher education. *Salud, Ciencia y Tecnología*, 4, Article 1352. <https://doi.org/10.56294/saludcyt2024.1352>
- Thoma, R., Farassopoulos, N., & Lousta, C. (2023). Teaching STEAM through Universal Design for Learning in early years of primary education: Plugged-in and unplugged activities with emphasis on connectivism learning theory. *Teaching and Teacher Education*, 132, Article 104210. <https://doi.org/10.1016/j.tate.2023.104210>