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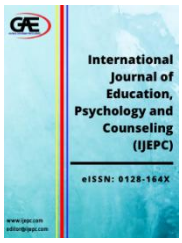

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AI-MEDIATED INTERPRETATION OF CULTURAL SYMBOLS IN VISUAL DESIGN EDUCATION: A CASE STUDY ON CHINESE TIGER IMAGERY

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Abstract:

The integration of Artificial Intelligence (AI) into visual design education is reshaping how students engage with creative practice, cultural meaning, and visual problem-solving. This study investigates how AI functions as a mediating tool in the interpretation and transformation of cultural symbols in visual design education, using Chinese tiger imagery as a case study. Rather than treating AI merely as a generative technology, the study positions it as an interpretive support that can assist students in cultural analysis, symbolic understanding, and reflective decision-making in design. A qualitative case study approach was adopted in an undergraduate visual design course at an application-oriented university in China. Specifically, the dataset consisted of 24 design artefacts, 24 reflective materials, 16 student interviews, 8 teacher interviews, and 3 expert interviews. Data were analyzed using thematic analysis to examine how AI influenced students' interpretations of symbolic meaning, visual reconstructions, and learning experiences within a Project-Based Learning (PBL) context. The findings revealed that AI-supported learning enhanced students' ability to articulate the cultural meanings embedded in Chinese tiger imagery, to expand their visual exploration, and to reflect more critically on the relationship between symbolism and design form. Additionally, the study identified that AI-generated outputs could easily lead to visual homogenization and superficial cultural interpretation when students relied on generic prompts or insufficient

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contextual research. Teacher and expert guidance, therefore, played a crucial role in helping students refine prompts, evaluate cultural appropriateness, and maintain interpretive depth. The study concludes that AI has significant pedagogical value in culturally grounded visual design education when it is used as an interpretive mediator rather than a substitute for human creativity. Its educational effectiveness depends on structured instructional design, reflective practice, and sustained pedagogical guidance.

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Keywords:

Artificial Intelligence (AI) In Education; Chinese Tiger Imagery; Cultural Symbol Interpretation; Interpretive Learning; Project-Based Learning (PBL); Visual Design Education

Introduction

The rapid development of Artificial Intelligence (AI) is reshaping higher education, particularly in disciplines that depend on creativity, visual thinking, and iterative problem-solving. In visual design education, AI-based tools such as conversational systems and image-generation platforms are increasingly being incorporated into teaching and learning. These technologies provide new opportunities for idea generation, visual experimentation, and design iteration. However, current discussions of AI in design education have focused largely on its technical efficiency and generative capacity, while paying less attention to its role in students' interpretive learning and cultural understanding.

Furthermore, visual design education is concerned with producing visually attractive outcomes. It aims to develop students' ability to interpret meaning, engage with cultural context, and translate symbolic ideas into appropriate visual forms. This issue becomes particularly essential when students work with culturally embedded symbols. Although AI can assist visual exploration, it may also encourage superficial interpretation or repetitive visual solutions when used without sufficient cultural inquiry and pedagogical guidance. Therefore, AI should be examined as both a generative tool and a possible interpretive mediator in design learning.

Within Chinese visual culture, tiger imagery offers a meaningful case for such investigation. The tiger has long been associated with protection, authority, courage, and moral symbolism, and it appears widely in traditional art, folk culture, and contemporary visual design. Due to its rich symbolic meanings, tiger imagery provides a useful context for examining how students interpret cultural symbols and how AI may support or complicate that process. Moreover, its

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visual familiarity may lead students to rely on stereotypical representations rather than deeper cultural understanding, making it a relevant subject for educational inquiry.

Although existing studies have explored AI in education, cultural symbolism in design, and Project-Based Learning (PBL), limited research has examined how these dimensions intersect in authentic classroom settings. In particular, few studies have examined how AI influences students' interpretations of culturally specific symbols in visual design education, especially at application-oriented undergraduate institutions. This gap suggests the need for empirical research that focuses on AI-supported interpretive learning rather than on technical performance alone.

In response to this gap, the present study investigates how AI functions in the interpretation and transformation of cultural symbols in visual design education. Rather than positioning AI merely as a tool for image production, this study conceptualizes it as an interpretive mediator that can support cultural understanding, visual analysis, and reflective decision-making in design. Using Chinese tiger imagery as a case study, the research draws on qualitative evidence from 24 design artefacts, 24 reflective materials, 16 student interviews, 8 teacher interviews, and 3 expert interviews.

Notably, the study is guided by three research questions: (1) How does AI mediate students' interpretation of cultural symbols in visual design education? (2) In what ways does AI-supported learning influence students' visual analysis and symbolic reconstruction processes? (3) What pedagogical opportunities and challenges emerge when AI is integrated into culturally grounded visual design instruction? The remainder of this paper is organized as follows. The subsequent section reviews relevant literature, followed by the methodology, findings, discussion, and conclusion.

Literature Review

AI has become an increasingly important topic in higher education, especially in disciplines that involve creativity, experimentation, and visual communication. In design education, AI is commonly discussed for its ability to accelerate ideation, generate visual alternatives, and expand formal possibilities. Many studies have emphasized AI's technical affordances, highlighting its potential to improve efficiency, stimulate creative exploration, and support iterative design workflows. Such perspectives are valuable because they demonstrate how AI can reshape design practice and learning environments. However, they often frame AI primarily as a productivity-oriented or generative tool, giving less attention to its role in meaning-making, interpretation, and reflective learning. This limitation is especially significant in visual design education, where students are expected to produce images, communicate ideas, cultural values, and symbolic meanings through visual form. Classic and foundational work on AI in education and creative practice has already pointed to the transformative potential of intelligent systems in learning. Nevertheless, much of this literature remains more concerned with capability and application than with interpretive pedagogy.

From a pedagogical perspective, visual design education requires students to move between seeing, interpreting, and constructing meaning. This process is closely related to visual literacy, which involves the ability to read images critically, understand visual codes, and produce appropriate visual responses within specific social and cultural contexts. Scholars in art

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education and visual culture have long argued that design learning should go beyond technical skill and stylistic imitation. Students must develop the capacity to analyze visual structures, decode symbolic meanings, and understand how images operate within cultural systems. In this sense, design learning is inherently interpretive. It concerns how learners connect visual elements to ideas, values, and contexts, and how they transform these connections into new design outcomes. Therefore, AI becomes relevant in this context because it can generate images and may mediate the interpretive process by helping students externalize abstract concepts, test symbolic associations, and compare multiple visual possibilities. This interpretive dimension remains underexplored in much of the current discussion on AI-supported design education.

The question of interpretation becomes even more crucial when design education engages with cultural symbols. Cultural symbols are not neutral visual motifs. They are carriers of collective memory, historical experience, belief systems, and identity. In visual communication education, students often work with symbols that are deeply embedded in specific cultural traditions. Notably, their task is to reproduce recognizable imagery while understanding how visual form conveys symbolic significance and how traditional meanings can be translated into contemporary design language. Existing scholarship on representation, visual culture, and symbolic communication suggests that interpreting cultural symbols requires contextual awareness, historical understanding, and conceptual sensitivity. Without these, students may reduce complex symbols to decorative surfaces or stereotypical images. As a result, visual outcomes may appear stylistically rich but conceptually weak. This challenge is especially visible in educational settings where students are still developing the ability to link cultural knowledge with visual decision-making.

Chinese tiger imagery offers a particularly rich example of this issue. Within Chinese visual culture, the tiger is associated with multiple layers of meaning, including protection, power, courage, discipline, and moral order. It appears across traditional painting, folk art, children's clothing, ritual objects, architecture, and contemporary design. Due to this symbolic density, tiger imagery provides significant educational value in design learning. It allows students to examine the relationship between visual representation and cultural meaning, and to explore how traditional symbolic resources can be reinterpreted in contemporary practice. Moreover, the tiger's visual familiarity may encourage oversimplification. Students may focus on obvious features such as stripes, aggressive posture, or visual drama while neglecting the deeper symbolic logic embedded in specific cultural contexts. This tension between rich symbolic potential and the risk of superficial representation makes cultural symbol learning both valuable and difficult. It also suggests that any technology used in such learning environments should be evaluated for what it can produce visually, and for how it shapes students' cultural understanding.

Recent discussions of AI in education have begun to move toward a more interpretive and sociocultural understanding of technology. Instead of treating digital tools as neutral instruments, this perspective sees them as mediating artefacts that influence how learners engage with knowledge, language, symbols, and problem-solving. Within such a framework, AI may function as a cognitive and semiotic mediator. It can help learners ask questions, organize information, visualize conceptual alternatives, and reflect on the relationship between intention and outcome. In design education, this role is potentially significant because AI-generated responses can make otherwise implicit design reasoning more visible. For example, when students use text-based AI to inquire about symbolic meanings or image-generation tools

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to test different visual interpretations, they produce outputs and engage in a process of comparison, evaluation, and reflective adjustment. This behavior suggests that AI may support interpretive learning when it is embedded in structured pedagogical practice. However, this possibility also depends on the learner's critical capacity and the teacher's instructional guidance. Without these, AI may remain at the level of rapid image production rather than becoming a tool for deeper inquiry.

Furthermore, a growing body of literature highlighted several pedagogical risks in AI-supported creative learning. One concern is visual homogenization. Since AI systems often rely on dominant datasets and standardized prompts, their outputs may converge toward similar visual styles or aesthetic patterns. In culturally grounded design tasks, this can be especially problematic, as cultural specificity may be flattened into generalized or visually pleasing but conceptually shallow representations. A second concern is reduced interpretive agency. When students regard AI-generated images as authoritative, they may accept outputs too quickly and disengage from the harder work of analysis, judgment, and revision. This process can weaken the development of visual literacy and critical design thinking. A third concern involves cultural misrepresentation. If students use AI tools without sufficient historical and symbolic knowledge, the outputs may reproduce surface-level signs while distorting their meanings. These concerns indicate that AI integration cannot be evaluated solely based on novelty or efficiency. It must also be examined through the lens of pedagogy, interpretation, and cultural responsibility.

PBL provides an important pedagogical framework for addressing these challenges. PBL is widely used in design education because it aligns with professional practice and emphasizes inquiry, iteration, reflection, and problem-solving. In culturally grounded design projects, PBL encourages students to investigate symbolic meaning, experiment with multiple visual approaches, and refine their work through critique and reflection. It supports the idea that design is not a linear act of production but an iterative process of conceptual and visual development. Specifically, reflective practice is central to this process. Through reflection, students examine why they make certain design decisions, how their visual choices relate to their symbolic intentions, and the limitations of their current solutions. When AI tools are introduced into PBL environments, reflective practice becomes even more essential. Students must decide whether AI-generated outputs align with their cultural intentions, whether the imagery is conceptually appropriate, and how to adapt or challenge machine-generated possibilities. Thus, the educational value of AI in design learning may depend less on the technology itself than on its incorporation into a reflective, inquiry-based pedagogical structure.

Although previous studies have examined AI in education, visual symbolism, and PBL as separate areas, research connecting these dimensions remains limited. In particular, there is still insufficient empirical evidence on how AI mediates students' interpretation of culturally specific symbols in real classroom settings. Much of the existing literature emphasizes technological innovation or design output, while paying less attention to how students construct meaning, negotiate symbolism, and develop interpretive judgment through AI-supported learning. This gap is especially visible in application-oriented undergraduate institutions, where visual design education must respond simultaneously to practical skill development, technological change, and cultural responsibility. Thus, to address this gap, the present study investigates AI-mediated interpretation of Chinese tiger imagery in visual design education

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through a qualitative case study. By focusing on cultural symbol learning within a project-based environment, the study seeks to contribute a more pedagogically grounded and culturally sensitive understanding of AI's role in contemporary design education.

Research Design

This study adopted a qualitative case study design to examine how AI mediated students' interpretation and transformation of cultural symbols in visual design education. A qualitative approach was considered appropriate because the study aimed to explore students' meaning-making processes, interpretive development, and reflective learning experiences rather than to measure predetermined variables. The case study design was particularly suitable as it enabled the research to investigate AI-supported cultural symbol learning within its authentic instructional context, accounting for classroom interaction, project processes, and multiple forms of qualitative evidence. Aligning with the research purpose, the study focused on a bounded case involving an AI-supported visual design learning project centered on Chinese tiger imagery in an undergraduate design course.

Additionally, rather than treating AI as a neutral technical aid, this study conceptualized it as an interpretive mediator that shaped students' cultural inquiry, visual experimentation, and reflective decision-making. The case study design, therefore, enabled the researcher to examine what students produced and how they interpreted symbolic meanings, interacted with AI-generated outputs, and negotiated cultural and visual choices throughout the learning process.

Research Context

The study was conducted at the School of Design and Art, Shandong Huayu University of Technology, an application-oriented undergraduate institution in Shandong Province, China. The institutional context is essential because the university emphasizes practice-based learning, regional cultural engagement, and the cultivation of applied design capabilities. Within this framework, visual design education is expected to develop students' technical competence and strengthen their ability to interpret cultural resources and transform them into contemporary design expressions.

Notably, the selected course was situated within the Visual Communication Design curriculum and focused on symbolic representation and culturally grounded design practice. Chinese tiger imagery was chosen as the central theme of the project because of its long-standing significance in Chinese visual culture. In traditional and contemporary contexts, the tiger carries multiple symbolic meanings, including protection, authority, courage, and moral order. These layered meanings made tiger imagery an appropriate educational case for exploring how students interpret cultural symbols and how AI may support or complicate that process.

The project was delivered through a PBL framework over six weeks. Specifically, during this period, students engaged in cultural inquiry, AI-assisted visual exploration, design experimentation, and critical reflection. AI tools were introduced not as substitutes for design practice, but as resources to support symbolic interpretation, visual testing, and iterative refinement.

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Participants

The study involved three groups of participants comprising students, teachers, and external experts.

The student participants were undergraduate students enrolled in the visual design course. All student participants took part in the project and produced design-related learning materials. The student dataset included 24 design artefacts and 24 reflective materials, representing the full set of project outputs and written reflections collected from the participating students. To gain deeper insight into students' experiences and interpretive processes, 16 students were also selected for semi-structured interviews at the end of the project. The student interviewees were selected purposively to capture a range of engagement levels, design performance, and patterns of AI use.

Additionally, 8 teachers participated in the study. These teachers were involved either in the delivery of the course, critique sessions, or related design instruction within the program. Their participation provided pedagogical perspectives on students' interpretive development, the role of AI in the learning process, and the challenges of integrating AI into culturally grounded design teaching.

To further enrich the analysis, 3 experts were interviewed. These experts had relevant academic or professional backgrounds in design education, cultural symbolism, or AI-assisted creative practice. Their contributions were used to contextualize the findings and to provide more informed perspectives on cultural appropriateness, design interpretation, and the educational implications of AI-supported symbolic learning.

Figure 1 presents the overall research design and analytical procedure of the study. It summarizes the research context, participant groups, instructional stages, and thematic analysis process.

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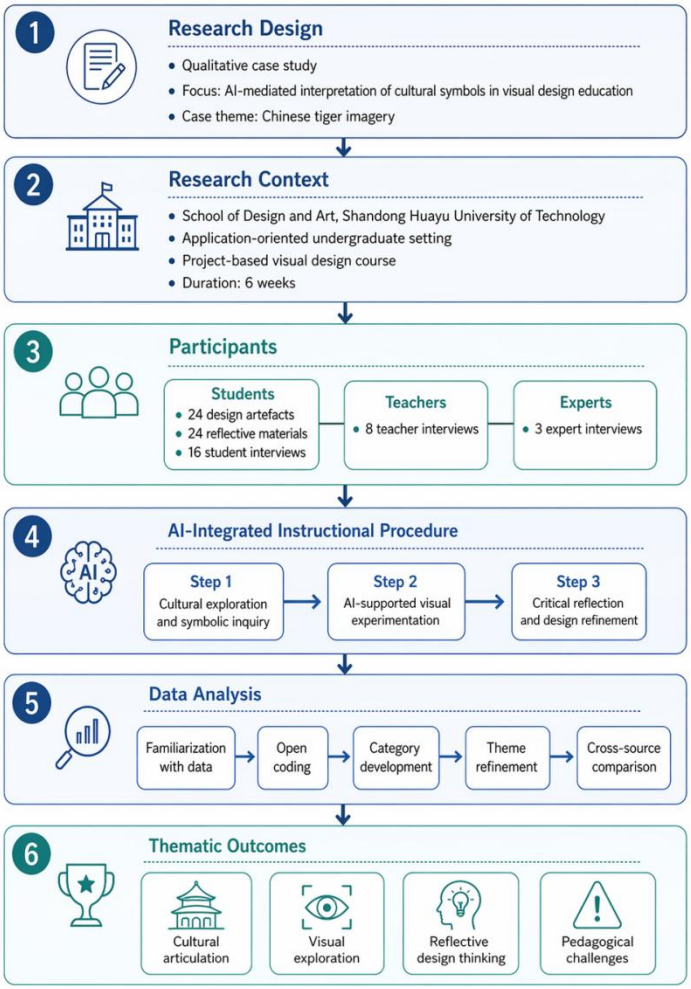

Figure 1. Research Design and Analytical Procedure Of The Study
Source: Developed by the authors based on the research framework of the study.

As illustrated in Figure 1, the study integrated research design, instructional implementation, and qualitative analysis within a single case-based framework. The following subsections elaborate in detail on the participants, data sources, and analytical procedures.

AI-Integrated Instructional Procedure

The instructional design was organized around a PBL process in which AI was positioned as an interpretive support tool rather than an autonomous generator of outcomes. In particular, the teaching process consisted of three interrelated stages.

The first stage was cultural exploration and symbolic inquiry. Students were introduced to the cultural background of Chinese tiger imagery through teacher explanation, visual references, and independent inquiry. They examined examples from traditional painting, folk art, decorative motifs, and contemporary design to identify the symbolic meanings associated with tiger imagery. During this stage, AI-assisted text-based tools were used to help students ask questions about historical meanings, visual symbolism, and contextual associations. This

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process encouraged students to move beyond surface recognition and develop a more conceptually grounded understanding of the symbol.

The second stage was AI-supported visual experimentation. Students used image-generation tools to explore multiple visual possibilities based on different symbolic intentions, such as authority, guardianship, or vitality. They developed prompts, generated visual outputs, compared variations, and evaluated how changes in visual form affected symbolic expression. Notably, these outputs were not treated as final designs but rather as exploratory materials that helped students externalize and test design ideas.

The third stage was critical reflection and design refinement. Students evaluated the cultural relevance, symbolic clarity, and visual coherence of AI-generated outputs and then revised their work through further design development. Moreover, teacher critique and peer discussion were used to help students identify limitations, such as stereotypical representation, visual homogenization, or insufficient symbolic depth. Students were encouraged to refine prompts, adjust visual strategies, and make design decisions that reflected both cultural understanding and personal interpretation.

This three-stage procedure enabled the study to examine how AI-mediated learning occurs across inquiry, experimentation, and reflection, rather than focusing solely on the final image.

Data Sources and Collection

Data were collected from multiple qualitative sources to capture students' interpretive learning from different perspectives and to enhance the study's credibility through triangulation. Table 1 provides an overview of the data sources included in the study and their analytical purposes.

Table 1. Overview Of Data Sources and Analytical Purposes

Data source	Number	Description	Analytical purpose
Design artefacts	24	Final student design outputs produced during the project	Examine how cultural meanings were translated into visual form
Reflective materials	24	Students' written reflections on AI use, symbolism, and design decisions	Identify interpretive development and reflective learning
Student interviews	16	Semi-structured interviews with selected students	Explore experiences of AI use, symbolic understanding, and design reasoning
Teacher interviews	8	Semi-structured interviews with participating teachers	Examine pedagogical observations, instructional support, and challenges
Expert interviews	3	Semi-structured interviews with external experts	Provide informed perspectives on cultural appropriateness and design interpretation

Source: Prepared by the authors based on the study data.

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As indicated in Table 1, each data source served a distinct but complementary role in the analysis. Collectively, these materials enabled a more comprehensive understanding of students' interpretive processes, design development, and pedagogical experiences.

Data were collected from multiple qualitative sources to capture students' interpretive learning from different perspectives and to strengthen the study's credibility through triangulation. The complete dataset consisted of 24 design artefacts, 24 reflective materials, 16 student interviews, 8 teacher interviews, and 3 expert interviews.

The 24 design artefacts included students' final visual design works produced during the project. These artefacts served as evidence of how students translated cultural meanings into visual form and how symbolic interpretation was reflected in compositional choices, style, imagery, and visual emphasis.

Furthermore, the 24 reflective materials consisted of written reflections submitted by students during or after the project. These materials documented students' perceptions of AI-supported learning, their evolving understanding of tiger symbolism, their design reasoning, and their evaluations of the benefits and limitations of AI in the creative process.

The 16 student interviews were semi-structured and conducted after the project was completed. The interviews explored students' experiences with AI, their approaches to interpreting tiger imagery, the challenges they encountered, and how AI influenced their design decisions and reflective thinking.

Additionally, the 8 teacher interviews focused on pedagogical observation, instructional design, and evaluation of student development. Teachers were asked to comment on students' interpretive progress, patterns of AI use, the strengths and weaknesses of the project, and the role of teacher guidance in preventing superficial or homogenized outcomes.

The 3 expert interviews offered external perspectives on the project's cultural and educational dimensions. These interviews focused on the appropriateness of symbolic interpretation, the quality of visual translation, and the broader implications of AI-assisted cultural symbol learning in design education.

Note that all interviews were conducted in a semi-structured format to ensure consistency across participants while still allowing flexibility for elaboration. Consequently, interview data were transcribed for analysis, and all participants were anonymized using role-based codes.

Data Analysis

The data were analyzed using thematic analysis. This method was chosen as it allowed the researcher to identify recurring patterns across different qualitative materials while preserving sensitivity to participants' perspectives and the contextual complexity of the case.

The analysis proceeded through several stages. First, all artefacts, reflective materials, and interview transcripts were reviewed repeatedly to achieve familiarity with the dataset. Initial notes were made on students' cultural interpretation, symbolic reasoning, visual choices, AI use, reflective responses, and pedagogical issues. Second, open coding was conducted across

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the dataset to identify meaningful segments related to the research questions. Codes were generated inductively from the data and informed by the study's conceptual interest in AI mediation, cultural symbol interpretation, and reflective learning.

Third, related codes were grouped into broader categories. These categories were compared across data sources to identify convergences and differences in student, teacher, and expert perspectives. Fourth, categories were refined into overarching themes that captured major patterns in the data. Particular attention was given to how students described symbolic understanding, how visual artefacts reflected interpretive choices, and how teachers and experts evaluated the role of AI in the learning process. Finally, the themes were reviewed against the full dataset to ensure internal coherence and conceptual relevance.

Through this process, the analysis generated themes related to cultural articulation, visual exploration, reflective design thinking, and pedagogical challenges in AI-supported cultural symbol learning.

Trustworthiness

Several strategies were used to enhance the study's trustworthiness. First, data triangulation was employed by comparing multiple sources of evidence, including student artefacts, reflective materials, student interviews, teacher interviews, and expert interviews. This approach helped reduce reliance on a single form of evidence and allowed the findings to be interpreted from multiple perspectives.

Second, methodological transparency was maintained through clear documentation of the research context, instructional process, data sources, and analytical procedures. Third, the study used iterative theme review, in which emerging themes were checked against the full dataset to ensure that interpretations were supported by sufficient evidence and were not based on isolated examples. Fourth, the inclusion of teachers and experts alongside students provided interpretive validation, strengthening the credibility of the thematic findings.

In reporting the data, quotations and examples were selected to represent recurring patterns rather than only exceptional cases. Additionally, to protect anonymity, all quotations were identified using participant role codes rather than personal names.

Ethical Considerations

The study followed general ethical principles for educational research. Participation in interviews and the use of student project materials for research purposes were based on informed consent. Note that participants were informed of the study's purpose, the voluntary nature of their participation, and their right to withdraw. Correspondingly, all data were anonymized during transcription and reporting. Student works, reflections, and interview responses were used solely for academic research and analysis. In the presentation of findings, identifying personal information was removed to protect participant confidentiality.

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Findings

The qualitative analysis generated several interrelated themes concerning AI-mediated cultural symbol learning in visual design education. Specifically, these themes were identified through cross-source comparison of design artefacts, reflective materials, student interviews, teacher interviews, and expert interviews. Table 2 summarizes the major thematic findings and their supporting evidence.

Table 2. Summary Of Thematic Findings and Supporting Evidence

Theme	Main finding	Supporting evidence
Strengthened cultural articulation	Students moved from surface description to a more culturally grounded symbolic interpretation of tiger imagery	Design artefacts; reflective materials; student interviews; teacher interviews
Expansion of visual exploration and symbolic reconstruction	AI-supported experimentation broadened visual possibilities and helped students reconstruct symbolic meanings through form	Design artefacts; reflective materials; student interviews; teacher interviews
Increased reflective design awareness	Students became more deliberate in evaluating the relationship between symbolic intention and visual form	Reflective materials; student interviews; teacher interviews
Persistent risks of superficial interpretation and visual homogenization	Unguided AI use sometimes led to stereotypical imagery, repetitive solutions, and conceptually weak outcomes	Design artefacts; reflective materials; student interviews; teacher interviews; expert interviews
Central role of teacher and expert mediation	Pedagogical guidance was crucial in helping students refine prompts, assess symbolic appropriateness, and deepen interpretation	Teacher interviews; expert interviews; student interviews; reflective materials

Source: Prepared by the authors based on the study findings and qualitative evidence.

As indicated in Table 2, the thematic findings demonstrate that AI-supported cultural articulation, visual exploration, and reflective decision-making also generate risks that require pedagogical mediation. Each of these themes is discussed in detail below.

Consequently, the qualitative analysis of 24 design artefacts, 24 reflective materials, 16 student interviews, 8 teacher interviews, and 3 expert interviews generated four interrelated themes concerning AI-mediated cultural symbol learning in visual design education. These themes were: (1) strengthened cultural articulation, (2) expansion of visual exploration and symbolic reconstruction, (3) increased reflective design awareness, and (4) persistent pedagogical risks requiring instructional mediation. Across the dataset, AI did not function merely as a tool for generating visual outputs. Instead, it acted as a mediating resource that shaped how students searched for meaning, tested visual possibilities, and evaluated the relationship between cultural symbolism and design form. Moreover, the analysis revealed crucial limitations,

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particularly when AI use was not accompanied by adequate cultural inquiry and teacher guidance.

Strengthened Cultural Articulation of Tiger Symbolism

One of the most consistent findings across the dataset was an improvement in students' ability to articulate the cultural meanings of Chinese tiger imagery. In the early stages of the project, students' understanding of the tiger was often limited to broad, visually obvious descriptors such as strength, ferocity, or visual impact. Their initial responses tended to focus on the tiger as an impressive animal image rather than as a culturally embedded symbol. However, as students progressed through AI-supported inquiry and project-based exploration, their reflections and interview responses revealed a more differentiated understanding of tiger symbolism. They increasingly referred to meanings such as guardianship, moral authority, ritual protection, auspiciousness, and heroic energy, indicating movement from surface recognition to culturally grounded interpretation.

Furthermore, this development was evident in the design artefacts themselves. Compared with earlier visual attempts that relied heavily on literal depiction, later works more frequently translated symbolic meaning into compositional and stylistic decisions. For instance, some designs emphasized frontal posture, symmetrical balance, or protective spatial enclosure to convey guardianship. In contrast, others used directional force, angular emphasis, and heightened contrast to communicate authority or martial strength. In such cases, students no longer treated tiger imagery as a mere decorative motif but as a symbolic system that could be interpreted and reconstructed through visual language. This suggests that AI-supported inquiry enhanced students' ability to connect visual elements to cultural significance in a more explicit, conceptually informed manner.

Notably, teacher and expert interviews further reinforced this pattern. Participants consistently observed that students became more capable of explaining why specific visual features were meaningful rather than simply asserting that a design "looked Chinese" or "looked powerful." This shift is pedagogically significant because it indicates a move toward interpretive articulation, a core objective in culturally grounded design education. Rather than reproducing familiar imagery through intuition or imitation alone, students increasingly demonstrated the ability to justify visual choices through symbolic reasoning. Accordingly, AI appeared to support both information access and interpretive verbalization, helping students externalize cultural understanding in both discussion and design practice.

Expansion of Visual Exploration and Symbolic Reconstruction

A second major finding was that AI-supported image generation broadened students' visual exploration and enabled more active experimentation with symbolic reconstruction. Across the reflective materials and interviews, students described AI tools as useful for quickly testing multiple interpretations of tiger imagery and for making abstract ideas more visually discussable. Instead of moving directly from cultural research to a single design outcome, students could compare alternative visual directions, examine stylistic variation, and reconsider how symbolic intention could be translated into form. This process appeared to reduce premature closure in the design process and encouraged broader experimentation before final decisions were made.

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Additionally, the design artefacts demonstrated that AI-supported experimentation helped students move beyond singular or fixed representations of the tiger. Rather than repeatedly relying on a conventional realistic tiger image, students explored variations in posture, gaze, composition, stylization, abstraction, and visual atmosphere. In several cases, the symbolic meaning of the tiger was reconstructed through non-literal strategies, such as fragmented forms, geometric structure, ornamental patterning, or emotionally charged visual fields. These explorations suggested that AI increased the number of images produced and expanded the range of symbolic possibilities students were willing to consider. Students could test whether a tiger should appear direct or implied, static or dynamic, realistic or stylized, sacred or contemporary, and then evaluate which choice better aligned with the intended cultural message.

This finding is essential as it indicates that AI may support symbolic reconstruction rather than only formal variation. In essence, the value of AI was not limited to producing multiple aesthetic options. Its pedagogical contribution lay in allowing students to visualize the consequences of different interpretive choices. Thus, by seeing how altered visual parameters affected the work's symbolic tone, students became more aware of the relationship between meaning and form. Teacher interviews confirmed this point, noting that students were more willing to compare alternatives and discuss why certain visual directions were conceptually stronger than others. As a result, AI-supported visual exploration functioned as a bridge between symbolic intention and design experimentation.

Figure 2 presents representative student design outcomes that illustrate how AI-assisted visual exploration supported the refinement of different symbolic interpretations of Chinese tiger imagery.

Figure 2：Representative Student Design Outcomes / Before-And-After Or Variation Comparison

Source: Developed by the authors based on the research framework of the study.

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As illustrated in Figure 2, AI-assisted exploration enabled students to test multiple compositional, stylistic, and symbolic possibilities before arriving at more coherent design solutions. The refined outcomes suggest that the educational value of AI lies in image generation and in supporting the visual reconstruction of culturally meaningful symbolic forms.

Increased Reflective Awareness in Design Decision-Making

A third theme concerned the development of reflective design awareness. The analysis suggests that AI-supported learning did not simply make design faster. In many cases, it made the students' decision-making process more explicit. Since AI-generated outputs frequently produced multiple, sometimes unexpected, visual interpretations, students were required to compare, evaluate, reject, revise, and refine ideas more consciously than in routine design exercises. This evaluative process was visible in reflective materials, where students increasingly commented on why some visual outcomes were symbolically appropriate while others were visually attractive but conceptually weak. Such reflections indicate growing awareness that successful cultural design depends on both visual novelty and interpretive precision.

Interview data from students suggested that AI-generated outputs often functioned as prompts for reflection rather than as finished solutions. In particular, students described needing to assess whether a generated image corresponded to the symbolic meaning they intended, whether it overemphasized fantasy-style features, or whether it reduced tiger symbolism to a generic expression of aggression. This pattern demonstrates that AI use often places students in a comparative, judgment-oriented position. Instead of passively accepting visual outputs, they had to determine whether the machine-generated image aligned with the project's cultural and conceptual goals. This form of evaluation is a critical dimension of reflective design thinking because it requires students to make their criteria more explicit and to examine the gap between visual appearance and symbolic meaning.

On the other hand, teachers also noted that students became more deliberate in critique sessions, particularly when discussing symbolic intention, composition, and visual emphasis. Rather than focusing only on whether a design was attractive, students were more likely to explain how particular choices reinforced or weakened the intended cultural meaning. Expert perspectives supported this observation by highlighting that the more successful works were not necessarily the most technically elaborate, but those in which the symbolic logic was coherent and visibly integrated into the design structure. Overall, these findings suggested that AI can foster reflective awareness when its outputs were treated as materials for critical examination rather than as authoritative solutions.

Persistent Risks of Superficial Interpretation and Visual Homogenization

Nevertheless, despite these positive developments, the dataset also revealed recurring risks that limited the educational value of AI-supported design learning. The most prominent concern was superficial interpretation. Some students, particularly in earlier phases of the project, relied on generic prompts or broad descriptive language, leading to predictable outputs dominated by stereotypical visual cues, such as exaggerated aggression, glowing eyes, fantasy textures, or commercially familiar "power animal" aesthetics. In such cases, the generated imagery often appeared visually striking but lacked cultural specificity. Instead of deepening students'

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understanding of tiger symbolism, AI use sometimes reinforced a surface-level association between tiger imagery and generic strength or danger.

This superficial approach also contributed to a related issue involving visual homogenization. Since similar prompts tended to produce similar compositional tendencies and stylistic patterns, some student outputs converged toward repetitive solutions. Teacher interviews indicated that without sufficient conceptual differentiation, students could easily become trapped within a narrow range of AI-generated visual conventions. This problem was not merely technical, as it was pedagogical. When students relied too heavily on AI outputs as starting and ending points, they were less likely to question how cultural symbols should be interpreted in context. Hence, the richness of the symbol risked being flattened into a set of visually impressive but conceptually standardized images.

Thus, the expert interviews were especially useful in clarifying this issue. Experts highlighted that not all visually successful works demonstrated strong symbolic interpretation. Some outputs displayed high aesthetic completion yet remained culturally shallow, suggesting a mismatch between formal polish and interpretive depth. This distinction is crucial because it demonstrates that AI-supported design learning cannot be evaluated solely by visual sophistication. The educational challenge lies in ensuring that symbolic learning is not displaced by surface-level visual optimization. These findings, therefore, complicate purely optimistic accounts of AI in design education and indicate that AI's pedagogical value is conditional rather than automatic.

The Central Role of Teacher and Expert Mediation

The final theme concerns the decisive role of pedagogical mediation in shaping the quality of AI-supported learning. Across teacher interviews, expert interviews, reflective materials, and student accounts, effective learning outcomes were consistently associated with structured guidance rather than with unsupported AI use. Hence, teachers played a critical role in helping students refine prompts, question visually attractive but conceptually weak outputs, and reconnect generated images to cultural research. Their intervention was especially important when students relied on overgeneralized symbolism or when AI outputs drifted toward stylistic cliché. In these moments, teachers acted as interpretive mediators, redirecting attention from visual effects to symbolic meaning.

Furthermore, expert input added another layer of evaluative depth by highlighting issues of cultural appropriateness, symbolic coherence, and representational quality. Although students often focused first on visual impact, expert perspectives helped reframe judgment around whether the design meaningfully translated the cultural logic of the tiger symbol. This external interpretive lens was valuable as it reinforced the idea that cultural symbol design involves both responsibility and creativity. The stronger student works were those in which AI-supported experimentation remained embedded in a process of questioning, critique, and conceptual refinement.

Collectively, the evidence indicates that AI did not operate as an independent source of educational improvement. Its effectiveness depended heavily on how it was pedagogically framed and critically supervised. When supported by teacher guidance and informed evaluative criteria, AI helped students deepen cultural articulation, broaden symbolic exploration, and

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strengthen reflective decision-making. When used without adequate mediation, however, it more often generated repetition, simplification, or conceptually weak visual outcomes. Thus, these finding positions pedagogy, rather than technology alone, as the key condition shaping meaningful AI integration in culturally grounded visual design education.

Summary of Findings

Overall, the findings revealed that AI can meaningfully contribute to visual design education when used as an interpretive and exploratory resource rather than as a substitute for cultural understanding or human judgment. Across multiple qualitative sources, students demonstrated stronger cultural articulation, expanded visual experimentation, and more conscious reflective evaluation during the design process. Moreover, the study identified clear limitations, including superficial interpretation, stylistic convergence, and overreliance on machine-generated imagery. The evidence, therefore, suggests that the educational value of AI lies not in automatic creativity enhancement, but in its capacity to support symbolic inquiry when embedded in a structured, critically mediated pedagogical environment.

Discussion

The findings of this study demonstrated that the educational value of AI in visual design education lies not simply in its ability to generate images. Nevertheless, its value lies in its capacity to mediate interpretation, reflection, and symbolic reconstruction when embedded within a structured pedagogical framework. Rather than functioning as a neutral production tool, AI served as an interpretive resource through which students explored cultural meanings, tested visual alternatives, and evaluated the relationship between symbolic intention and design form. This section discusses these findings in relation to existing scholarship on AI-supported learning, visual literacy, cultural symbol interpretation, and project-based design pedagogy.

AI as an Interpretive Mediator Rather Than a Generative Shortcut

A major contribution of this study is its reframing of AI in visual design education from a generative instrument to an interpretive mediator. Existing discussions of AI in creative education often emphasize acceleration, efficiency, and formal novelty. Although these dimensions are undeniably important, the present findings suggest that such a framing is incomplete, especially in culturally grounded design learning. In this study, AI did not merely increase the speed of image production. Notably, it supported students in moving between cultural inquiry, symbolic understanding, visual experimentation, and reflective evaluation. This indicates that AI's educational significance is not confined to output generation but extends to structuring meaning-making processes.

This interpretive function is especially evident in how students used AI-assisted tools to explore the cultural meanings of Chinese tiger imagery. By prompting students to ask questions, compare symbolic possibilities, and visualize different design directions, AI helped externalize ideas that might otherwise have remained vague or intuitive. Accordingly, AI served as a semiotic and cognitive support mechanism, making interpretive reasoning more visible and discussable. Such a finding aligns with sociocultural perspectives that view learning tools as mediating artefacts rather than passive instruments. Therefore, the study extends current

debates on AI in education by suggesting that AI can contribute to cultural and symbolic learning when it is used to scaffold interpretation rather than replace it.

Simultaneously, the findings make clear that AI does not automatically produce deeper interpretation. Its role as a mediator depends on its position within the learning process. When AI was used as a space for comparison, revision, and questioning, it supported learning. When it was treated as a source of ready-made visual solutions, it risked narrowing rather than expanding interpretive thinking. Thus, this distinction is critical because it posits that the pedagogical framing of AI is more consequential than the technology itself. AI becomes educationally meaningful not by virtue of its novelty, but through the quality of the interpretive work it enables.

Cultural Symbol Learning and the Development of Visual Literacy

The findings also contribute to understanding how AI may support visual literacy in culturally grounded design education. Visual literacy in this context involves more than the ability to decode images or manipulate formal elements. Specifically, it includes the ability to relate visual form to cultural meaning, symbolic logic, and contextual appropriateness. The present study exhibits that students' understanding of Chinese tiger imagery became more differentiated over the course of the project. They moved from generalized notions of strength or aggression toward more culturally specific interpretations such as guardianship, authority, and auspiciousness. This development suggests that AI-supported inquiry may help students bridge the gap between symbolic knowledge and visual expression.

Moreover, this is particularly important in design education because students often struggle to translate cultural understanding into coherent visual decisions. A symbol may be familiar in appearance while remaining conceptually underdeveloped in the student's design thinking. The findings indicated that AI helped make symbolic distinctions more explicit by enabling students to compare alternative representations and to observe how changes in posture, composition, stylistic treatment, and visual emphasis affected symbolic meaning. In other words, AI-supported image variation and symbolic discrimination. It gave students a way to see that different visual configurations could carry different cultural and emotional implications.

On the other hand, this suggests that AI may have particular value in design pedagogy when it is used to strengthen symbolic sensitivity rather than merely expand stylistic range. In the case of Chinese tiger imagery, successful outcomes depended on the effective alignment between symbolic meaning and visual structure, rather than on visual detail or aesthetic impact alone. The study, therefore, reinforces the idea that culturally grounded design education should treat visual literacy as an interpretive capacity. AI can support this process, but only when cultural meaning remains central to evaluation.

AI-Supported Reflection and Deliberate Design Judgment

Another important implication of the study concerns reflective practice. The findings indicated that AI-supported learning encouraged students to be more deliberate in evaluating design options, especially when generated images did not fully align with their symbolic intentions. Rather than passively accepting AI outputs, students were often required to compare alternatives, identify conceptual weaknesses, and refine visual strategies. This process made

design judgment more explicit. Reflection was not an additional step added after design work. It became embedded in the act of deciding which visual directions were culturally appropriate and symbolically coherent.

Consequently, this result is consistent with established understandings of design learning as an iterative process of action and reflection. However, the findings suggested that AI introduces a distinctive form of reflective challenge. Since AI can produce multiple images rapidly, students must engage more directly with the question of why one image should be developed and another rejected. This process may intensify the need for criteria-based thinking. Students are generating options while learning to judge them in relation to cultural meaning, conceptual purpose, and visual coherence. Accordingly, AI-supported design environments may strengthen reflective awareness by encouraging evaluation rather than consumption.

The study also indicates that reflective design judgment is closely tied to students' developing sense of interpretive responsibility. As students encountered visually polished but culturally shallow outputs, they became more aware that visual appeal alone could not guarantee conceptual quality. Hence, this distinction between aesthetic completion and symbolic depth is an important educational insight. It demonstrates that AI can make the limitations of surface-level design more visible, thereby encouraging students to refine both form and meaning. Such a process strengthens the argument that AI should be integrated into design pedagogy as a catalyst for reflection, not as a replacement for critical judgment.

The Persistent Risks of Homogenization and Superficial Cultural Interpretation

Although the findings demonstrate the pedagogical value of AI, they also reveal significant risks. One of the most important is visual homogenization. The tendency of AI-generated outputs to converge on familiar aesthetic patterns led to situations in which different students could easily arrive at visually similar solutions, especially when prompts remained generic. This is not a minor technical issue, as it has direct implications for creativity, originality, and cultural specificity. In culturally grounded design education, homogenization is especially problematic as it can flatten the symbolic richness of traditional imagery into a limited set of repeated conventions.

A related risk is superficial interpretation. Some students initially relied on the most immediately recognizable aspects of tiger imagery, such as ferocity, dramatic gaze, or ornamental power, without engaging with the broader symbolic and historical meanings of the tiger in Chinese visual culture. AI sometimes exacerbated this problem by generating images that were aesthetically compelling yet conceptually general. This response suggests that AI systems may privilege visually dominant patterns over culturally nuanced representations, particularly when users do not provide sufficiently precise symbolic direction. As a result, the technology can unintentionally reinforce shallow cultural readings even while appearing to support creativity.

Consequently, these risks complicate celebratory narratives of AI in design education. They suggest that AI should not be understood as inherently culturally sensitive or pedagogically transformative. Rather, its outputs are shaped by the interaction between algorithmic tendencies, user prompts, and educational context. For this reason, the study argues that integrating AI into culturally grounded design learning must be accompanied by critical

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attention to symbolic validity, contextual depth, and interpretive differentiation. The challenge is to use AI more critically, rather than more frequently.

Pedagogical Mediation as the Key Condition of Meaningful AI Integration

A central argument emerging from this study is that pedagogy, rather than technology alone, determines the quality of AI-supported learning. Teacher guidance and expert mediation were crucial in helping students move beyond generic outputs and toward more conceptually grounded design decisions. Teachers did not merely explain how to use AI tools. They shaped the interpretive conditions under which the tools became educationally meaningful. Through questioning, critique, and redirection, they encouraged students to connect visual experimentation with cultural inquiry and to evaluate design choices in relation to symbolic meaning rather than stylistic appeal.

Additionally, this finding has crucial implications for design education in practice. It suggests that AI should not be introduced as an isolated technological add-on, but as part of a carefully designed pedagogical sequence that includes cultural research, prompt refinement, critique, and reflective analysis. In other words, effective AI integration depends on instructional design. The project-based structure used in this study was significant because it created a space for AI to be embedded in inquiry, iteration, and reflection rather than used solely for rapid output generation. This supports the broader educational claim that technology-enhanced learning is most effective when pedagogical goals are clearly defined and critically sustained.

The role of experts is also noteworthy. Their evaluations highlighted that symbolic interpretation requires visual skill and cultural judgment. This underscores the fact that culturally grounded design education involves both responsibility and creativity. Notably, AI can help students explore possibilities, but it cannot, by itself, determine whether a visual translation is culturally meaningful, contextually appropriate, or pedagogically valuable. Those judgments remain fundamentally human and educational.

Implications for Application-Oriented Visual Design Education

The institutional context of this study adds another layer of significance. Conducted in an application-oriented undergraduate setting, the research speaks directly to design programs that must balance practical skill development, technological change, and cultural responsibility. In such contexts, AI is often introduced because of its relevance to contemporary creative industries. However, the findings suggest that its educational role should not be limited to employability or production efficiency. AI can also support students in developing interpretive competence, symbolic sensitivity, and reflective design thinking—capacities that remain essential even in technology-rich professional environments.

For visual design curricula, this means integrating AI into both technical training and courses on cultural symbols, visual communication, and design meaning. The study indicated that AI-mediated pedagogy may be especially valuable when students are asked to reinterpret traditional cultural resources for contemporary contexts. Such tasks require more than software proficiency because students must also negotiate continuity and transformation, as well as cultural inheritance and visual innovation. The present findings, therefore, suggest a pathway for integrating AI into design education without reducing design learning to automated image

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production. Instead, AI can be used to expand interpretive inquiry while keeping cultural responsibility and human judgment at the center.

Theoretical Contribution

Theoretically, this study contributes to the literature by proposing a shift from a production-centered view of AI in design education to an interpretation-centered perspective. Much existing research emphasizes what AI can make. This study instead highlights what AI can help students think through. By examining AI-mediated interpretation of Chinese tiger imagery, the research exhibits that AI can function as a pedagogical mediator in cultural symbol learning when embedded in reflective, guided design processes. This expands discussions of AI in education beyond efficiency, novelty, and technical assistance toward meaning-making, symbolic reasoning, and cultural literacy.

Moreover, the study also contributes to the field of culturally grounded design pedagogy by demonstrating that AI use does not necessarily weaken cultural learning. Under appropriate conditions, it can be deepened. Nonetheless, this deepening is not automatic. It depends on how the learning environment structures inquiry, comparison, critique, and revision. Thus, the study offers a more conditional and pedagogically grounded account of AI integration, recognizing both its interpretive potential and its risks.

Limitations and Future Directions

Several limitations should be acknowledged. First, the study was conducted within a single institutional and cultural context, and the findings are therefore not intended to be generalized across all design education settings. Second, as a qualitative case study, the research prioritizes depth of interpretation over broad representativeness. Third, the study focuses on a single cultural symbol system, Chinese tiger imagery, which is rich and pedagogically valuable, but does not represent the full range of cultural-symbol design practices.

Future research could build on this study in several ways. Comparative studies could examine whether similar patterns emerge with other cultural symbols or in other national and disciplinary contexts. Furthermore, longitudinal research could investigate how repeated engagement with AI-mediated cultural design learning influences students' visual literacy, interpretive judgment, and professional identity over time. Additional research might also compare AI-supported and non-AI-supported learning environments to clarify more precisely which kinds of interpretive development are uniquely enabled or constrained by AI. Such work would further strengthen the emerging field of research on AI, culture, and visual design pedagogy.

Conclusion

This study investigated how AI mediates the interpretation and transformation of cultural symbols in visual design education, using a qualitative case study centered on Chinese tiger imagery. Drawing on 24 design artefacts, 24 reflective materials, 16 student interviews, 8 teacher interviews, and 3 expert interviews, the research examined how AI supported students' cultural understanding, visual exploration, and reflective design decision-making within a PBL environment. Instead of treating AI as a purely generative or efficiency-oriented technology,

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the study conceptualized it as an interpretive mediator that could shape how students engage with symbolic meaning in the design process.

The findings demonstrated that AI supported students in several important ways. It helped them move beyond surface-level recognition of tiger imagery toward more differentiated cultural interpretations, expanded the range of visual and symbolic possibilities they were willing to explore, and encouraged more reflective evaluation of the relationship between meaning and form. Concurrently, the study also identified significant limitations. When used without sufficient cultural inquiry and pedagogical guidance, AI could lead to visual homogenization, stereotypical representation, and conceptually weak outcomes. These findings indicated that the educational value of AI does not lie in automatic creativity enhancement, but in its capacity to support symbolic inquiry when framed within a structured and critically guided pedagogical process.

The study, therefore, argues that meaningful AI integration in visual design education depends on pedagogy rather than on technology alone. Specifically, teacher guidance, expert evaluation, and reflective practice were central in helping students refine prompts, assess cultural appropriateness, and align visual decisions with symbolic intention. In this respect, AI should not be understood as a substitute for human creativity, cultural judgment, or educational mediation. Instead, it should be positioned as a tool that expands interpretive exploration while keeping human criticality and cultural responsibility at the center of design learning.

Moreover, from a broader perspective, this research contributes to ongoing debates on AI in education by shifting attention from production to interpretation. It suggests that the future of AI in visual design education should not be defined only by faster workflows or more abundant imagery, but by whether AI can help students think more carefully, interpret more deeply, and design more responsibly. For application-oriented design programs in particular, this perspective offers a way to integrate technological innovation without sacrificing cultural depth or pedagogical integrity.

Although the study is limited to a single case and a specific symbolic tradition, it provides evidence that AI can play a constructive role in culturally grounded design education when used within an intentional and reflective instructional framework. Hence, future research may further test this proposition across different cultural symbols, institutional contexts, and comparative teaching conditions. Nevertheless, the present study emphasizes that AI's greatest educational promise in design learning may lie not in replacing interpretation, but in making interpretation more visible, more discussable, and more critically engaged.

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