

AI-Enhanced Visual Design Education: A Case Study of Chinese Tiger Symbolism

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ABSTRACT

This study examines how generative artificial intelligence (AI) can be integrated into visual design education through a heritage-based learning project focused on Chinese tiger symbolism. Rather than treating AI as a simple image-generation tool, the study investigates its pedagogical role in supporting students' creative exploration, cultural interpretation, and critical reflection during the design process.

A qualitative case study was conducted in a university-level visual design course involving 24 undergraduate students. During a practice-based project, students used generative AI tools, including MidJourney, Stable Diffusion, and ChatGPT, to explore, generate, and refine visual representations of Chinese tiger symbolism. Data were collected through reflective journals, focus group discussions, design artefacts, and classroom observations, and were analyzed thematically.

The findings show that AI functioned primarily as a creative catalyst rather than a final author. It expanded students' ideation, encouraged iterative experimentation, and prompted them to evaluate and revise generated outputs critically. At the same time, students' engagement with tiger imagery gradually shifted from attention to surface-level visual features toward a deeper concern with symbolic meaning, cultural appropriateness, and interpretive responsibility.

This study contributes to current discussions on AI-enhanced design pedagogy by showing that generative AI can support culturally grounded creative learning when embedded in structured interpretive activities. However, the findings should be understood within the limits of a small-scale qualitative case based on a single course context. Future research may benefit from comparative designs and broader samples to further clarify the distinctive contribution of AI-supported learning environments.

Keywords: Generative artificial intelligence; Visual design education; Cultural heritage; Chinese tiger symbolism; Design pedagogy

INTRODUCTION

The rapid expansion of generative artificial intelligence (AI) is reshaping teaching and learning across higher education, particularly in creative and practice-based disciplines such as visual design. Tools such as MidJourney, Stable Diffusion, and ChatGPT have made it possible for students to generate, test, and revise visual ideas with unprecedented speed. In design education, however, the significance of AI does not lie only in technical efficiency. More importantly, it raises pedagogical questions about how students develop creative judgment, interpret meaning, and balance technological assistance with human decision-making.

These questions become even more important when design learning involves cultural content. Traditional cultural symbols are not merely visual resources; they are embedded in historical memory, social values, and shared symbolic meanings. In digital environments, such symbols can easily be simplified into decorative motifs or visually attractive but culturally shallow images. For this reason, the educational challenge is not only how to use AI in design classrooms, but how to use it in ways that support informed interpretation rather than superficial generation.

This issue is particularly relevant to Chinese tiger symbolism. In Chinese cultural traditions, the tiger is associated with protection, authority, auspiciousness, courage, and spiritual force. It appears in a wide range of visual forms, including folk art, festival objects, children's clothing, decorative patterns, and zodiac-related imagery. Yet in contemporary visual communication, tiger imagery is often detached from these deeper symbolic associations and reduced to generalized expressions of power or exotic style. This makes Chinese tiger symbolism a meaningful case for exploring how heritage-based content can be reinterpreted in design education through contemporary digital tools.

Recent studies have shown that generative AI can support ideation, experimentation, and creative exploration in design-related learning contexts. At the same time, scholars have also noted that AI-generated outputs may encourage surface-level acceptance if students are not guided to evaluate relevance, meaning, and representational appropriateness critically. While existing research has offered valuable insights into AI adoption, creativity support, and human–AI collaboration, less attention has been given to how students use AI to engage with culturally significant symbols in actual classroom settings. Similarly, heritage-based pedagogy has emphasized interpretation, transmission, and contextual understanding, but there remains limited empirical research on how these aims are reshaped when generative AI becomes part of the design process.

To address this gap, the present study investigates an AI-enhanced visual design project centered on the reinterpretation of Chinese tiger symbolism in higher education. It examines how students used generative AI tools during visual exploration and refinement, how they engaged with the cultural meanings embedded in tiger symbolism, and what pedagogical value emerged from this heritage-based design process.

Specifically, this study addresses the following research questions:

RQ1: How do students use generative AI tools to reinterpret Chinese tiger symbolism in visual design education?

RQ2: In what ways does AI-assisted design practice influence students' creative development and cultural understanding?

RQ3: What pedagogical value emerges from integrating traditional cultural symbolism into AI-enhanced visual design learning?

This study contributes to the literature in three ways. First, it extends current discussions of AI in design education by showing that generative tools may support not only visual production, but also cultural interpretation and reflective judgment. Second, it contributes to heritage-based design pedagogy by examining how a traditional symbol can be reactivated through AI-assisted creative practice in a classroom context. Third, it provides a qualitative account of how students negotiate creativity, technology, and cultural meaning during a practice-based design project.

At the same time, the scope of the study should be clearly acknowledged. The research is based on a small qualitative sample of 24 students within a single course context, and the findings are therefore intended to provide in-depth pedagogical insight rather than broad generalization. Seen in this way, the value of the study lies in its close examination of process, interpretation, and learning experience within an emerging area of design education.

LITERATURE REVIEW

Artificial Intelligence in Visual Design Education

The integration of artificial intelligence (AI) into higher education has expanded rapidly, particularly in disciplines that depend on creativity, experimentation, and iterative problem-solving. In visual design education, generative AI tools such as MidJourney, Stable Diffusion, and ChatGPT are increasingly used to support idea generation, visual prototyping, and conceptual exploration. Recent studies suggest that these tools can broaden students' exploratory range, accelerate early-stage ideation, and expose learners to diverse visual possibilities within a short period of time.

A growing body of research indicates that AI can enrich design learning by supporting experimentation and reflective comparison. In design- and studio-based contexts, generative tools have been shown to help students test stylistic alternatives, expand conceptual options, and refine ideas through iteration rather than one-time production. In this sense, AI is often understood less as a replacement for the designer than as a co-exploratory resource that stimulates judgment and comparison.

At the same time, current scholarship does not treat AI as an unqualified educational benefit. Studies on AI literacy, creative learning, and design pedagogy suggest that the value of AI depends strongly on pedagogical framing. Without guidance, students may rely too quickly on visually polished outputs and accept them at a superficial level. As a result, the use of AI in design education changes not only what students can produce, but also what they must learn to evaluate. This makes critical judgment, rather than technical use alone, an increasingly important dimension of design learning with AI. This focus is already present in your original review, but it was previously discussed in a more repetitive way.

Cultural Heritage and Design Pedagogy

Cultural heritage, especially intangible cultural heritage, plays an important role in sustaining collective memory, cultural identity, and symbolic continuity. UNESCO defines intangible cultural heritage as the practices, knowledge, skills, and expressions that communities recognize as part of their cultural heritage and transmit across generations. Importantly, this perspective views heritage not as a static archive, but as a living and evolving resource that is continually reinterpreted in response to changing contexts.

In educational settings, this understanding carries important pedagogical implications. Heritage can serve not only as content to be learned, but also as a context through which students develop interpretive awareness, cultural responsibility, and deeper engagement with meaning. Recent studies have shown that integrating cultural heritage into education can strengthen contextualized learning, support cultural identity, and make teaching more relevant to local or traditional knowledge systems.

For design education, this is particularly significant because design is not only concerned with visual form, but also with how form communicates meanings, values, and identities. Heritage-based design pedagogy allows students to engage with symbols, motifs, and narratives as living cultural resources rather than as static decorative references. In such contexts, students must balance innovation with respect for cultural meaning. Accordingly, heritage-based design learning is most effective when it encourages students to ask not only what a symbol looks like, but also what it signifies and how it can be reinterpreted responsibly in contemporary visual practice. This is consistent with the heritage-and-pedagogy line already established in your current manuscript.

AI-Assisted Cultural Interpretation in Design Learning

Although generative AI offers new possibilities for visual exploration, its use in culturally grounded design tasks requires particular caution. Traditional cultural symbols are not neutral visual elements; they are shaped by historical meanings, social practices, and shared systems of interpretation. When students use AI to reinterpret such symbols, the task extends beyond generating visually attractive outputs. It involves cultural interpretation: understanding what a symbol represents, how meaning is visually encoded, and which aspects may be transformed without losing cultural significance.

Recent studies on AI-supported design learning suggest that generative tools can stimulate imagination and provide diverse alternatives, but that human judgment remains central. Students must compare outputs, assess conceptual fit, and decide which generated images are meaningful or appropriate for the task. In culturally grounded projects, this evaluative process becomes even more important, because AI may produce imagery that is visually impressive yet symbolically weak, culturally displaced, or overly stylized.

For this reason, AI-assisted cultural interpretation should not be understood simply as faster visual production. Its educational value lies in making the interpretive demands of design more visible. When students encounter outputs that are attractive but culturally inaccurate, they are required to identify the difference between visual quality and symbolic appropriateness. In this way, AI can become a useful pedagogical trigger for reflection, comparison, and responsible design judgment, rather than a shortcut that replaces interpretive work. This point directly condenses the argument that appears across your original Sections 2.1 and 2.3.

Chinese Tiger Symbolism as a Heritage-Based Design Resource

Chinese tiger symbolism provides a rich context for examining the relationship among AI, design learning, and cultural interpretation. In Chinese cultural traditions, the tiger is associated with protection, courage, authority, auspiciousness, and spiritual force. It appears in a wide range of visual and material forms, including folk art, decorative practices, ritual objects, festival culture, and zodiac-related imagery. This makes the tiger both visually recognizable and culturally layered.

From a pedagogical perspective, tiger symbolism is valuable because it requires students to connect formal design decisions with symbolic meaning. A tiger image is not defined only by visible features such as body form, stripes, posture, or color. These visual choices also shape how the image is culturally read. In this sense, Chinese tiger symbolism functions as more than a design motif; it is a meaning-bearing resource that can help students explore how cultural values are translated into visual language.

At the same time, the reinterpretation of tiger symbolism in contemporary design is not straightforward. Once detached from context, tiger imagery can easily become decorative, commercialized, or culturally diluted. The challenge becomes more pronounced when AI is introduced, because algorithmic generation may privilege spectacle, fantasy, or stylistic novelty over symbolic depth. For that reason, Chinese tiger symbolism is especially suitable for this study: it creates a pedagogically demanding situation in which students must negotiate between visual innovation and cultural authenticity. This is already one of the strongest parts of your original review, so here I mainly tightened the phrasing rather than changing the argument.

Research Gap

The literature points to three broad insights. First, AI is becoming increasingly influential in design education, particularly in ideation, experimentation, and iterative refinement. Second, heritage-based pedagogy highlights the educational value of cultural symbols in strengthening contextual understanding, interpretive engagement, and cultural awareness. Third, recent work on AI-supported creativity suggests that the value of generative tools depends less on automation itself than on learners' ability to evaluate and refine outputs critically.

However, these strands have not yet been sufficiently connected in empirical research. Existing studies on AI in design education tend to focus on adoption, creativity support, scaffolding, or attitudes toward AI, while fewer studies examine how AI is used in culturally grounded design tasks. Likewise, heritage-based education research emphasizes transmission, reinterpretation, and contextual learning, but has not yet fully explained how generative AI reshapes these processes in studio-based design settings. There remains a particular shortage of qualitative studies exploring how students use AI to interpret traditional symbols, how they judge cultural appropriateness in generated imagery, and what pedagogical value emerges from that interpretive process.

To address this gap, the present study investigates an AI-enhanced visual design project centered on Chinese tiger symbolism in higher education. It examines how students used generative AI tools during design exploration and refinement, how they engaged with cultural meaning in the process of visual reinterpretation,

and what pedagogical value emerged from this heritage-based learning experience. In doing so, the study foregrounds cultural interpretation as a central dimension of AI-assisted design learning.

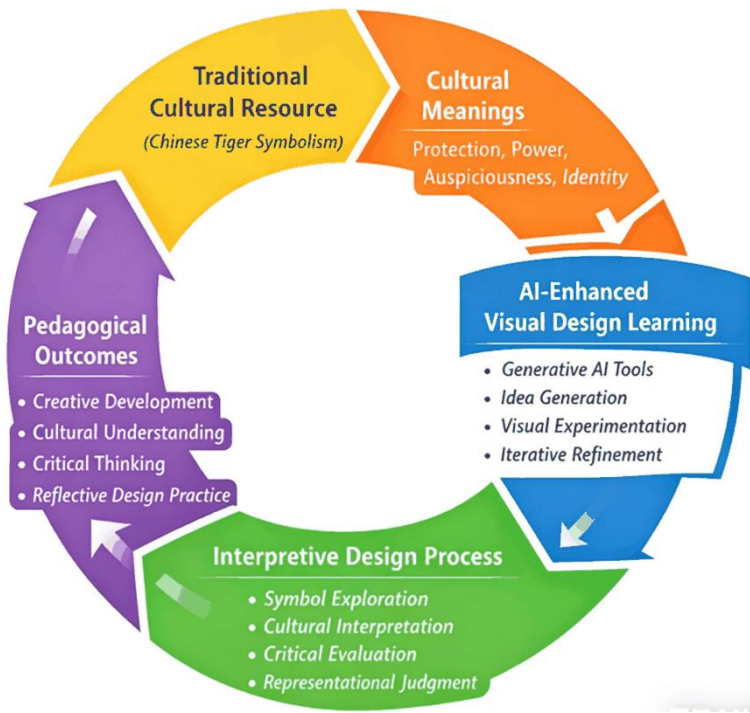


Figure 1. Conceptual framework of AI-enhanced heritage-based visual design learning.

Based on the reviewed literature, Figure 1 presents the conceptual framework guiding this study. It illustrates how Chinese tiger symbolism, as a heritage-based cultural resource, is engaged through AI-assisted visual design processes, leading to interpretive engagement and pedagogical outcomes. The framework provides the theoretical basis for examining how students negotiated creativity, cultural meaning, and design judgment in the present study.

METHODOLOGY

Research Design

This study adopted a qualitative case study design to examine how generative artificial intelligence (AI) was integrated into visual design education through a heritage-based learning project. A qualitative case study was considered appropriate because the purpose of the research was to explore students' learning experiences, interpretive processes, and design decision-making in depth within a specific classroom context. Rather than testing causal relationships or measuring outcomes statistically, the study sought to understand how students interacted with AI tools, how they interpreted Chinese tiger symbolism, and how creative and cultural learning developed during the project.

The case was situated in a university-level visual design course in which students were introduced to AI-assisted creative methods and asked to reinterpret Chinese tiger symbolism as a culturally significant visual resource. The project was conducted over six weeks and allowed students to move through stages of cultural exploration, AI-assisted experimentation, design refinement, and reflective review. This bounded case made it possible to investigate the interaction among technology use, symbolic interpretation, and pedagogy in a natural instructional setting.

The study should therefore be understood as an in-depth exploration of process rather than an attempt to produce broadly generalizable findings. This positioning is especially important given the relatively small sample size

and the single-course context. The strength of the design lies in its ability to provide detailed insight into how students experienced and negotiated AI-assisted heritage-based design learning.

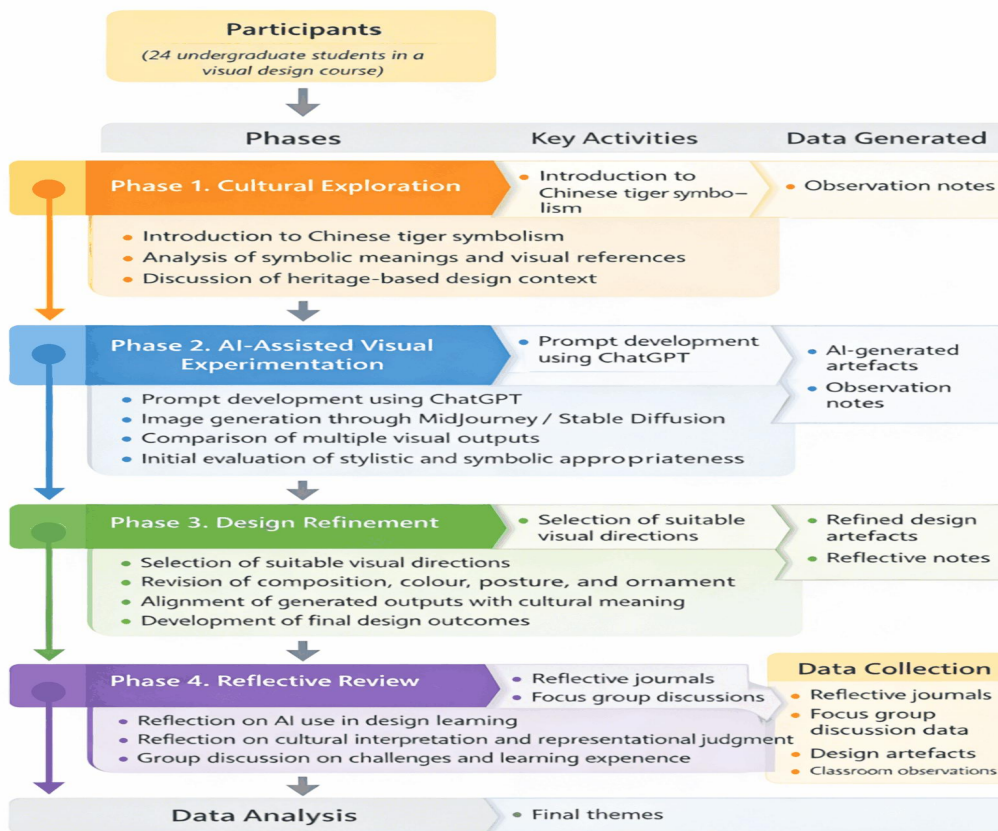


Figure 2. Research Procedure and Data Generation Process

As shown in Figure 2, the study was organized into four main phases: cultural exploration, AI-assisted visual experimentation, design refinement, and reflective review. Each phase involved specific learning activities and generated different forms of qualitative data, including classroom observations, design artefacts, reflective journals, and focus group discussions. This process-oriented design allowed the study to examine not only the final visual outcomes but also the students’ interpretive and creative development throughout the project.

Research Context and Participants

The study was conducted in a higher education visual design course involving 24 undergraduate students enrolled in a practice-based design project. Participants were recruited through course enrollment and took part in the project as part of their regular learning activities. The students were from the Visual Communication Design programme and had varying levels of prior experience in digital design. However, most had limited formal experience in using generative AI tools for culturally grounded design tasks before the study.

The instructional context centered on a heritage-based design project in which students explored Chinese tiger symbolism as a source of visual inspiration and cultural meaning. The tiger was selected because of its rich symbolic associations in Chinese culture, including protection, power, auspiciousness, and identity, as well as its strong potential for contemporary visual reinterpretation. Within this context, students were not asked simply to produce visually attractive images, but to engage critically with the cultural meanings embedded in the motif and translate these meanings into design outcomes.

The lecturer served as the course facilitator and researcher. In the teaching role, the lecturer guided students through cultural background discussion, AI tool use, design experimentation, and reflective analysis. In the research role, the lecturer documented classroom processes and collected qualitative data for analysis. Because the dual role of teacher-researcher may introduce interpretive bias, several procedures were used to enhance

analytic rigor, including data triangulation, iterative coding, peer review of the coding framework, and cross-checking across different data sources.

Project Procedure

The project was organized into four interrelated phases: cultural exploration, AI-assisted visual experimentation, design refinement, and reflective review.

Cultural Exploration

In the first phase, students were introduced to the historical and symbolic meanings of Chinese tiger imagery. This phase included classroom discussion, visual reference analysis, and guided exploration of how tiger symbolism appears in traditional cultural contexts such as folk art, festival objects, decorative motifs, and symbolic visual culture. Students examined the tiger not only as a formal image but also as a carrier of cultural meaning. This stage was intended to establish an interpretive foundation for later design work by encouraging students to identify symbolic associations such as guardianship, vitality, authority, ritual function, and auspicious meaning.

AI-Assisted Visual Experimentation

In the second phase, students used generative AI tools, including MidJourney, Stable Diffusion, and ChatGPT, to explore visual reinterpretations of Chinese tiger symbolism. AI was used to support prompt development, idea generation, stylistic experimentation, and rapid visualization. Students produced multiple rounds of generated images and compared outputs in relation to symbolic meaning, stylistic suitability, and visual coherence.

At this stage, AI was framed as a creative support tool rather than an autonomous producer of final design outcomes. Students were encouraged to test different prompt structures, reflect on how AI interpreted symbolic descriptions, and identify where generated outputs aligned with or diverged from intended cultural meanings.

Design Refinement

In the third phase, students selected, revised, and refined AI-generated outputs through design judgment and manual intervention. Rather than accepting generated images as final outcomes, students evaluated their representational appropriateness and adjusted elements such as composition, color, ornament, posture, and emotional tone to better align with cultural interpretation and design intent.

This phase was important because it positioned students as critical interpreters rather than passive users of AI tools. It also highlighted the role of human judgment in deciding which generated outputs were culturally meaningful, visually effective, and pedagogically valuable.

Reflective Review

In the final phase, students reflected on their experiences of using AI in a heritage-based design task. Reflection focused on how AI influenced their ideation, how their understanding of tiger symbolism evolved during the project, and what challenges they encountered in balancing creativity, cultural meaning, and technological assistance. This phase generated rich qualitative data on students' perceptions, interpretive development, and critical awareness.

Data Collection

Data were collected from four sources in order to develop a rich, process-oriented understanding of students' learning and to strengthen the credibility of the study through triangulation.

First, 24 student reflective journals were collected at the end of the project, with one journal submitted by each participant. Each journal contained approximately 500 to 800 words and documented students' experiences with

AI tools, their changing understanding of Chinese tiger symbolism, and their reflections on the overall design process.

Second, four focus group discussions were conducted after the completion of the project, with approximately six students in each group. Each session lasted about 60 minutes. The discussions explored how students interpreted cultural meanings, responded to AI-generated outputs, and negotiated design decisions during the project. Focus groups provided interactive and more elaborated accounts that complemented the written journals.

Third, design artefacts were collected and examined as part of the data set. These included sets of AI-generated visual experiments, revised compositions, and final design outcomes produced by the 24 participants. The artefacts were treated not only as products but also as evidence of students' creative choices, revisions, and interpretive development across the project stages.

Fourth, classroom observations were conducted across six project sessions to record how students interacted with AI tools, responded to generated imagery, discussed symbolic meaning, and modified their designs during the learning process. Observation notes were recorded by the lecturer-researcher immediately after each class session using a structured field-note format focused on participation patterns, design decision points, and notable interpretive or evaluative moments.

To protect anonymity, all quotations are identified by data source and participant code, for example, (Reflective Journal, S03) or (Focus Group, S08). Together, these four data sources made it possible to examine not only what students said about the project, but also what they produced and how their learning unfolded in practice. This four-source structure is already present in your draft, but here it is made more explicit and audit-friendly.

Data Analysis

The data were analyzed using thematic analysis because this method is well suited to identifying recurring patterns across multiple forms of qualitative evidence while remaining sensitive to participants' experiences and meaning-making processes. The analysis was conducted iteratively and involved six stages.

First, all reflective journals, focus group transcripts, classroom observation notes, and artefact-related records were organized and read repeatedly to achieve familiarity with the data. During this stage, the researcher wrote preliminary analytic memos to capture recurring ideas, notable contrasts, and emerging patterns related to AI use, visual experimentation, symbolic interpretation, and design judgment.

Second, initial open coding was carried out line by line on the textual data. Meaningful segments were coded using short descriptive labels that reflected participants' actions, perceptions, and interpretations, such as "AI expands options," "surface-level tiger image," "prompt revision," "cultural mismatch," and "manual refinement." Observation notes and comments related to artefacts were coded using the same procedure so that patterns could be traced across data types.

Third, the initial codes were compared, merged, and grouped into broader categories through constant comparison. At this stage, conceptually similar codes were clustered into provisional analytic categories, such as AI as ideation support, movement from appearance to symbolism, evaluative judgment of cultural appropriateness, and reflective awareness of human responsibility.

Fourth, these provisional categories were reviewed across the full data set and refined into higher-level themes. The researcher examined whether each developing theme was supported by evidence from multiple data sources and whether the themes were internally coherent yet meaningfully distinct from one another. Categories that overlapped too strongly were merged, while categories that lacked sufficient evidence were discarded or absorbed into broader themes.

Fifth, the emerging themes were reviewed in relation to the research questions. This stage ensured that the final thematic structure did not remain only descriptive, but addressed the study's central concerns: how students used AI tools, how they interpreted Chinese tiger symbolism, and what forms of learning emerged from the process.

Sixth, a final stage of interpretive writing was undertaken in which the themes were defined, named, and supported with evidence from journals, focus groups, observations, and artefacts. Design artefacts were analyzed alongside verbal data rather than in isolation. Specifically, artefacts were used to identify visible patterns of experimentation, revision, simplification, ornamentation, and symbolic emphasis, which were then interpreted together with students' written and spoken explanations. This strengthened the connection between process and product in the analysis.

The coding process was conducted using NVivo together with manual review. A preliminary codebook was developed after the first round of coding and was revised during later stages as definitions became clearer and category boundaries were refined. To enhance dependability, a second academic reviewer with experience in qualitative educational research independently reviewed a subset of coded data, including selected journals, excerpts from focus group transcripts, and observation notes. Differences in interpretation were discussed and used to refine code definitions and thematic boundaries. The purpose of this review was not to produce a statistical inter-rater coefficient, but to strengthen analytic clarity, consistency, and transparency. This directly addresses the editor's request for clearer explanation of coding and reliability procedures and builds on your existing thematic-analysis description.

Trustworthiness

Several strategies were employed to enhance the trustworthiness of the study.

First, data triangulation was established through the use of four qualitative sources: reflective journals, focus group discussions, design artefacts, and classroom observations. This allowed findings to be supported by converging forms of evidence rather than by self-reported reflections alone.

Second, methodological transparency was strengthened by using a documented multi-stage coding process, analytic memo writing, codebook refinement, and repeated comparison across data sources. These steps supported dependability by making the analysis more systematic and traceable.

Third, peer debriefing was incorporated during the analytic process. A second academic reviewer examined a portion of the coded material and commented on the developing code structure and thematic interpretations. This process helped challenge premature assumptions and refine the analytic framework.

Fourth, negative or less consistent cases were not excluded from analysis. Attention was given not only to moments where AI appeared to support learning, but also to moments where generated outputs were culturally inappropriate, visually misleading, or difficult for students to refine. Including such cases helped avoid an overly positive interpretation of the data.

Fifth, the analysis was conducted with ongoing reflexive awareness of the researcher's dual role as lecturer and analyst. Because classroom observations were recorded by the lecturer-researcher, particular care was taken to cross-check observational interpretations against students' journals, focus group statements, and artefact evidence. This helped reduce the risk that classroom impressions alone would shape the findings.

Taken together, these procedures enhanced the credibility, dependability, and interpretive rigor of the study. Your original manuscript already included triangulation and iterative refinement; here those ideas are expanded into a clearer trustworthiness framework.

Ethical Considerations

The study was conducted in accordance with the institutional ethical requirements for educational research at Shandong Huayu University of Technology. Ethical approval was granted at the institutional level before the commencement of data collection. As the institution did not issue a separate approval reference number for this study, the research proceeded under the university's standard ethical review and approval procedures.

Students were informed of the purpose of the study and provided informed consent for the use of their reflections, discussion responses, and design artefacts for research purposes. Participation in the research component was voluntary, and students were informed that their decision to participate or not participate would not affect course

assessment. All reported data were anonymized through the use of participant codes, and identifying personal information was removed from the data set before analysis.

Because the study involved classroom-based data collection conducted by the course lecturer, special attention was given to minimizing pressure and protecting participant autonomy. Students were informed clearly that the research focused on learning processes rather than personal evaluation, and all quotations and artefacts used in reporting were presented in anonymized form.

In addition, because the study involved the reinterpretation of a traditional cultural symbol, care was taken to approach Chinese tiger symbolism respectfully and analytically. Students were guided to consider symbolic meaning, cultural context, and representational appropriateness throughout the project. The study therefore treated cultural symbols not as neutral decorative resources, but as heritage-based materials requiring informed interpretation and critical engagement.

FINDINGS

The analysis of reflective journals, focus group discussions, classroom observations, and design artefacts revealed four interrelated themes that characterized students' experiences in the AI-enhanced heritage-based design project. Overall, the findings suggest that students' engagement with Chinese tiger symbolism did not remain at the level of image production alone. Instead, their learning developed through a process of experimentation, interpretation, evaluation, and revision, in which AI functioned as both a generative resource and a source of critical tension. At the same time, this development was not uniform across all participants. Some students demonstrated substantial growth in cultural interpretation and reflective judgment, whereas others remained more dependent on surface-level visual preferences or on the apparent sophistication of AI-generated images. This overall pattern is already visible in your current findings, especially across 4.1–4.4, but here it is reorganized into a more explicitly analytical structure.

AI as a Creative Catalyst Rather Than a Final Author

One of the clearest findings was that students gradually came to view AI not as a substitute for design thinking, but as a catalyst that expanded early-stage ideation. Across reflective journals and focus group discussions, students repeatedly described generative AI tools as useful for producing unexpected visual directions, testing stylistic possibilities, and accelerating exploratory thinking. In particular, AI-supported image generation allowed many students to move beyond familiar or habitual design solutions and to consider a broader range of compositional, stylistic, and symbolic alternatives than they would normally have explored within the same time frame.

Several students explicitly framed AI as a source of visual provocation rather than a provider of finished answers. As one participant noted, "AI helped me see many possibilities very quickly. Some of them were strange, but that was useful because it pushed me to think beyond the first idea in my mind" (Focus Group, S04). Another student similarly wrote, "I did not treat the generated image as the final answer. I treated it as something to react to, like a visual suggestion that I still needed to judge and improve" (Reflective Journal, S09). These accounts suggest that, for many students, AI became valuable because it widened the field of possible ideas and made comparison an active part of the design process. This pattern is consistent with the evidence already presented in your draft under Theme 4.1.

However, the findings also show that this critical use of AI did not emerge immediately for all students. Classroom observations indicated that a small number of participants initially placed too much trust in generated outputs, especially when the images appeared polished, dramatic, or technically sophisticated. In these cases, students tended to equate visual impressiveness with design quality. One journal entry captured this tension directly: "The AI image looked impressive at first, but when I looked again, I felt it had no real cultural meaning. It was visually strong, but it did not yet express the kind of tiger I wanted" (Reflective Journal, S03). This suggests that the move from passive acceptance to evaluative use was itself a learned process rather than an automatic outcome of AI exposure.

Design artefacts also supported this interpretation. In many cases, early generated images showed high visual complexity but weak conceptual direction, while later versions demonstrated more selective use of AI outputs and more intentional refinement by students. Rather than accepting AI-generated images as complete solutions, students increasingly used them as provisional prompts to test, reject, revise, and rework. In this sense, the role of AI in the project was not that of final author, but of creative catalyst. Yet the findings also indicate that this shift toward critical use remained uneven across the cohort, with some students demonstrating stronger evaluative control than others. The end of your original 4.1 already points toward this unevenness, and it is worth making that variation more visible in the final version.

From Surface Imagery to Symbolic Interpretation

A second major finding was that students' understanding of Chinese tiger symbolism developed from an initial focus on visible form toward a more layered awareness of symbolic meaning. At the beginning of the project, many participants approached the tiger primarily as a striking visual motif. Their attention centered on formal characteristics such as stripes, facial expression, posture, body shape, and decorative effect. Early design decisions were often driven by visual intensity and stylistic novelty rather than by cultural intent.

As the project progressed, however, students began to articulate a stronger connection between visual representation and symbolic meaning. Through reference analysis, classroom discussion, iterative comparison, and feedback, they became more aware that the tiger in Chinese culture carries associations such as protection, authority, auspiciousness, vitality, and ritual significance. This shift influenced the way they evaluated design choices. Students increasingly recognized that changes in posture, gaze direction, ornamentation, or color palette could alter not only how the tiger looked, but also how it was culturally read.

One student reflected, "At first, I was mainly thinking about how to make the tiger look powerful. Later, I started thinking about what kind of power it should represent—protection, dignity, or aggression—because these are not the same" (Reflective Journal, S12). Another participant stated, "Before this project, I thought tiger imagery was mostly decorative. After reading and discussing the references, I realized that even small visual elements can carry cultural meaning" (Focus Group, S06). These responses suggest that the project encouraged students to move beyond formal borrowing and toward more interpretive engagement with the symbol. This development is one of the strongest points in your existing Theme 4.2 and is worth preserving as a central learning shift.

At the same time, this movement from surface imagery to symbolic interpretation did not occur to the same extent for all students. Some participants demonstrated relatively sophisticated reflections on symbolic meaning, whereas others continued to rely on broad notions such as "traditional feeling," "power," or "strong cultural style" without clearly distinguishing among different symbolic nuances. In some artefacts, visual refinement advanced more quickly than conceptual refinement, suggesting that aesthetic improvement did not always correspond to deeper cultural understanding.

This unevenness is important because it shows that interpretive growth was significant but not automatic. Heritage-based design learning required ongoing pedagogical support, especially for students who found it easier to modify formal elements than to explain the cultural implications of those choices. Even so, the overall pattern across the data indicates that the project helped many students understand that using a traditional symbol responsibly involves deciding what aspects of meaning should be preserved, transformed, or emphasized in contemporary design practice.

Negotiating Cultural Appropriateness Through Iteration and Judgment

A third finding concerns the difficulty students faced in aligning AI-generated images with culturally meaningful representation. Although AI produced abundant visual possibilities, many outputs were not regarded as culturally suitable. Students frequently reported that generated images were overly fantastical, excessively ornamental, cartoonized, or influenced by visual conventions that did not match the intended cultural context of Chinese tiger symbolism. Rather than simply treating these mismatches as technical errors, students had to interpret why certain images felt culturally inappropriate and how they might be revised.

This challenge became a central feature of the learning process. Students often compared multiple generated versions, adjusted prompt wording, removed decorative excess, simplified compositional elements, or manually revised images after generation. In other words, design refinement became a site of cultural judgment rather than mere visual polishing. One participant explained, “Some of the images were beautiful, but they felt too Western fantasy, not like the cultural feeling we were trying to express. We had to keep adjusting the prompts and also change the design ourselves” (Focus Group, S08). Another student similarly noted, “The problem was not whether the image looked good. The problem was whether it still made sense as a Chinese tiger symbol” (Reflective Journal, S05). These remarks directly support the argument already present in your current 4.3.

Figure 3 presents an example of how an initial AI-generated tiger image was progressively refined through visual adjustment and cultural interpretation.



Figure 3. From AI-Generated Output to Refined Culturally Informed Design

As shown in Figure 3, the initial AI-generated output provided a visually rich starting point but contained excessive decorative and symbolic elements. Through iterative refinement, the design was adjusted in terms of composition, ornamentation, and expressive tone to achieve a more balanced and culturally informed representation. This example illustrates how students moved beyond accepting AI outputs at face value and instead engaged in evaluative and interpretive design decision-making.

The collected artefacts further showed that students were often negotiating between visual attractiveness and symbolic appropriateness. Some AI-generated images were aesthetically impressive but did not communicate the intended cultural qualities of the tiger. In such cases, students had to decide whether to preserve visual intensity, reduce dramatic embellishment, adjust emotional tone, or simplify the design to recover symbolic clarity. As one student wrote, “I removed several details because the more decorative the tiger became, the less meaningful it felt. I wanted the image to communicate character, not only style” (Reflective Journal, S14).

Figure 4 compares several AI-generated tiger images and demonstrates how students evaluated different outputs in terms of symbolic clarity, stylistic appropriateness, and cultural relevance.

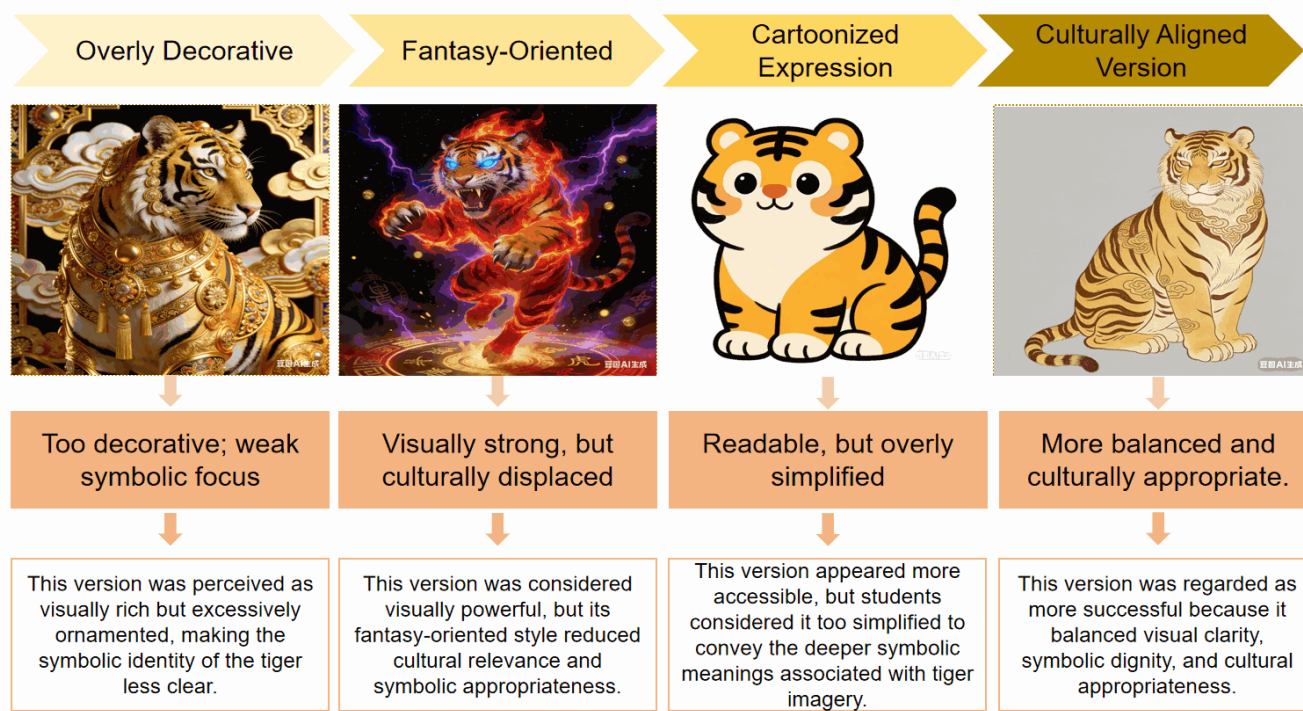


Figure 4. Comparison of AI-Generated Tiger Images and Students' Evaluation of Cultural Appropriateness

As shown in Figure 4, students did not evaluate AI-generated tiger imagery solely on the basis of visual attractiveness. Instead, they distinguished between decorative excess, fantasy-oriented distortion, cartoonized simplification, and more culturally aligned representations. This comparative judgment process helped students develop a more critical understanding of how symbolic meaning should be preserved in AI-assisted design.

Importantly, not all students resolved these tensions successfully. A few participants continued to struggle even after multiple rounds of revision, especially when attempting to reduce fantasy-style influence without losing visual impact. In some cases, revised images became more culturally restrained but also less visually confident, suggesting that the balance between innovation and authenticity remained difficult to achieve. These less successful cases are important because they demonstrate that cultural appropriateness was not a straightforward outcome of iteration. Instead, it required repeated acts of comparison, judgment, and compromise. This makes the learning process more credible and less overly positive than a purely success-oriented account. The tension between “visually strong” and “culturally aligned” is already present in your current findings and should remain explicit.

Reflective Design Learning and the Development of Critical Awareness

The final major finding was that the project supported reflective design learning by making students more conscious of the relationship among creativity, technology, and cultural responsibility. Students' reflections indicate that AI use was not experienced merely as a technical shortcut. Instead, many participants described the project as requiring them to think more carefully about what design communicates, how symbols are interpreted, and why human judgment remains necessary even when image generation becomes faster and easier.

This reflective learning appeared in several related ways. First, students became more aware that efficient image production does not automatically result in meaningful design. Second, they recognized that working with culturally significant symbols demands sensitivity to context and interpretation. Third, they began to see design practice as a process of selective decision-making shaped by both experimentation and responsibility. One student reflected, “Before, I thought using AI meant saving time. After this project, I feel it actually made me think more, because I had to question every result and decide what kind of meaning I wanted to keep” (Reflective Journal, S02). Another wrote, “This experience showed me that technology can support creativity, but it cannot replace responsibility. The final design still depends on the designer's judgment” (Reflective Journal, S10).

These reflections strongly support the interpretation that students were not simply learning to use AI, but learning to evaluate it.

A related pattern was that students' confidence in AI became more selective over time. Rather than becoming more dependent on AI outputs, many students appeared to develop a more cautious and critical stance toward them. A focus group participant summarized this shift clearly: "At the beginning, I trusted the AI too much because the results looked professional. Later, I understood that looking professional is not the same as being culturally correct" (Focus Group, S13). This suggests that the project moved students from tool-centered confidence toward more judgment-centered use.

Nevertheless, reflective depth varied across the cohort. While some participants articulated strong awareness of interpretive responsibility and cultural care, others framed their learning in more instrumental terms, emphasizing efficiency, convenience, or idea generation more than symbolic understanding. This unevenness indicates that reflective growth was meaningful but not uniform. Even so, the data suggest that the project as a whole fostered a shift from simply using AI to questioning, filtering, and repositioning AI within a broader design process. Your original 4.4 already contains this insight; the main improvement here is making the variation across students more visible rather than presenting reflection as equally deep for everyone.

Summary of Findings

Taken together, the findings show that the integration of AI into heritage-based visual design education shaped students' learning in several interconnected ways. First, AI expanded ideation and supported exploratory experimentation, but did not replace human interpretation. Second, many students moved from treating the tiger as a decorative motif to understanding it as a culturally layered symbol. Third, the iterative revision of AI outputs helped students develop stronger awareness of cultural appropriateness and representational judgment, although this development was uneven and sometimes difficult. Finally, the project supported reflective learning by encouraging students to reconsider the relationship among technology, creativity, and cultural meaning.

Overall, the findings suggest that AI-enhanced visual design learning becomes pedagogically meaningful when it is grounded in cultural inquiry rather than limited to image generation alone. In this study, Chinese tiger symbolism functioned not only as design content, but also as a medium through which students learned to interpret, evaluate, and redesign cultural meaning in the context of emerging technology. This concluding synthesis is aligned with your current 4.5, but made slightly tighter and more analytical.

DISCUSSION

The findings of this study suggest that the integration of generative artificial intelligence into heritage-based visual design education can support a more interpretive and reflective form of learning than is often assumed in discussions of AI adoption. Rather than functioning merely as a tool for rapid image production, AI in this study became part of a pedagogical process involving experimentation, symbolic interpretation, cultural judgment, and iterative refinement. This indicates that the educational significance of AI in design contexts lies not simply in what it generates, but in how it repositions students within the processes of selection, evaluation, and meaning-making. This overall direction is already present in your current discussion, but here it is framed more explicitly around contribution rather than summary.

Reframing AI as a Creative Catalyst in Design Education

One of the central implications of the findings is that AI is most productively understood not as a substitute for design thinking, but as a creative catalyst that expands exploratory space while intensifying the need for judgment. Students in this study used AI to generate alternatives, test stylistic directions, and accelerate early-stage ideation, but the pedagogical value of that process did not lie in automation alone. What proved educationally meaningful was the fact that AI generated more possibilities than students could accept uncritically, requiring them to compare outputs, reject inappropriate options, and decide which directions were worth pursuing.

This interpretation aligns with recent scholarship suggesting that AI can function as a co-exploratory partner in design learning, particularly during ideation and experimentation. However, the present study extends that discussion by showing that, in a heritage-based context, the value of AI lies not only in increasing the number of possible visual solutions, but also in making evaluative responsibility more visible. Students were not relieved of intellectual labor by AI; rather, they were required to engage in a different kind of labor, one centered on filtering, interpreting, and refining machine-generated possibilities. In this sense, AI did not reduce the role of the designer. Instead, it shifted that role from direct production toward a more judgment-intensive practice.

This point is especially important in educational terms. If AI is framed only as a productivity tool, its role in the classroom may remain shallow and instrumental. By contrast, the findings suggest that AI can support deeper creative learning when it is embedded in tasks that require students to articulate why one visual direction is more meaningful, appropriate, or conceptually coherent than another. The study therefore contributes to current discussions of AI in design education by showing that the most valuable learning may emerge not from what AI makes easier, but from what AI makes harder to ignore: the need for critical choice.

From Visual Generation to Cultural Interpretation

A second important implication concerns the relationship between AI use and cultural interpretation. The findings show that students' engagement with Chinese tiger symbolism gradually shifted from an initial emphasis on visible features toward a more nuanced concern with symbolic meaning and representational intention. This shift is pedagogically significant because it suggests that heritage-based design learning can move beyond aesthetic borrowing and encourage students to work with cultural symbols as meaning-bearing resources.

This interpretation is consistent with educational and heritage scholarship emphasizing that cultural heritage should be understood not as static content, but as a living body of meaning that is continually reinterpreted in new contexts. In the present study, students did not simply reproduce tiger imagery through digital tools. Instead, many of them came to recognize that posture, facial expression, ornamentation, color, and compositional emphasis all influenced how the tiger would be culturally read. The design task therefore became interpretive rather than merely stylistic. Students had to consider not only how to make the tiger visually striking, but what kind of power, protection, or cultural identity the image should communicate.

This finding also extends current conversations on AI-supported creativity. Much of the existing literature focuses on ideation, efficiency, or student attitudes toward AI. By contrast, the present study foregrounds symbolic interpretation as a central dimension of AI-assisted design learning. It shows that generative AI can become a medium through which the complexity of cultural representation becomes more visible, especially when learners are required to compare generated outputs against cultural intention rather than visual appeal alone. In this sense, the study contributes to a more culturally grounded understanding of AI in design pedagogy.

At the same time, the findings also caution against assuming that access to cultural symbols automatically produces deep interpretation. Students' engagement with symbolic meaning developed unevenly, and some remained more comfortable discussing general visual impressions than more specific cultural nuances. This suggests that heritage-based AI design learning requires explicit pedagogical scaffolding. Cultural interpretation does not arise simply because students are exposed to traditional symbols or AI tools; it must be taught, modeled, and reinforced through structured inquiry and guided comparison.

The Pedagogical Value of Friction, Mismatch, and Revision

A third contribution of the study lies in the role of friction within AI-supported learning. Students frequently encountered AI-generated outputs that were visually impressive but culturally inappropriate, overly fantastical, or symbolically weak. These moments of mismatch were not incidental failures within the project; they became central to the learning process. In fact, one of the most pedagogically valuable aspects of the study was that students were repeatedly confronted with the gap between visual attractiveness and cultural appropriateness.

This finding is important because it complicates common narratives that treat educational success with AI as a matter of smoother production or better outputs. In this study, learning often occurred precisely when AI outputs

were inadequate. Students had to identify why certain generated images felt culturally displaced, decide what kind of symbolic distortion was occurring, and revise the image or prompt accordingly. This process made interpretation, rather than generation itself, the core of the task.

Seen in this way, mismatch functioned as a productive form of pedagogical friction. It slowed down automatic acceptance, exposed weaknesses in both prompts and assumptions, and required students to negotiate between visual novelty and symbolic coherence. This suggests that AI in design education should not be evaluated only in terms of efficiency or polished outputs. Its educational value may also lie in whether it creates moments that force students to question what a good design actually is. In heritage-based projects especially, such friction appears to be highly valuable because it reveals that culturally meaningful design cannot be reduced to technical sophistication or surface-level aesthetic success.

The findings therefore support a broader claim: AI-enhanced learning is not pedagogically meaningful only when it works smoothly. It may be most meaningful when it produces tension that students must interpret and resolve. This point strengthens your current discussion by making the “friction” insight more central rather than leaving it as an implied subtheme.

Toward Judgment-Centered AI Literacy in Design Education

The study also points toward a more specific pedagogical implication: the need to develop judgment-centered AI literacy in design education. Current discussions of AI literacy often emphasize technical familiarity, prompt-writing ability, or broad ethical awareness. While these dimensions remain important, the findings of this study suggest that design education requires a more situated and practice-based form of AI literacy, one grounded in the capacity to evaluate outputs critically, identify conceptual or cultural distortion, and revise generated material through informed human judgment.

By the end of the project, many students had not simply become more confident in using AI tools; they had become more selective in trusting them. This shift from tool confidence to interpretive caution is significant because it reflects a more mature educational outcome. Students learned that professional-looking images could still be symbolically inaccurate, culturally misplaced, or conceptually shallow. In other words, they began to distinguish technical polish from design validity.

This distinction is especially important for visual design education, where the quality of an outcome cannot be judged by appearance alone. Designers must ask what an image communicates, what values it carries, and whether it represents its subject responsibly. The present study therefore suggests that AI literacy in design education should be framed not only as operational competence, but also as evaluative and interpretive responsibility. In practical terms, this means that students should be taught not only how to generate outputs, but how to question them, compare them, and revise them in relation to contextual meaning.

This argument also adds specificity to the broader AI literacy conversation by grounding it in a classroom-based design setting. Rather than treating literacy as an abstract competency, the study shows how it can emerge through concrete acts of comparison, rejection, prompt revision, symbolic analysis, and reflective decision-making. In that sense, the present findings support a move from tool-centered AI literacy toward a more judgment-centered and culturally informed model.

Theoretical and Pedagogical Contributions

This study contributes to scholarship in at least three ways. First, it extends research on AI in visual design education by showing that generative tools can support not only speed, novelty, or experimentation, but also interpretive learning and reflective judgment when situated within a culturally grounded design task. Second, it contributes to heritage-based design pedagogy by demonstrating that traditional cultural symbols can serve as effective educational resources for developing both creativity and cultural understanding in contemporary studio practice. Third, it provides an empirical case showing how students negotiate creativity, technology, and cultural meaning in an emerging AI-supported educational context.

Pedagogically, the findings suggest that educators should avoid integrating AI into design learning as an isolated tool exercise. AI appears to be most educationally meaningful when it is embedded within structured tasks that require cultural research, visual comparison, reflective writing, and iterative refinement. Heritage-based projects may be especially effective in this regard because they make the relationship between form and meaning difficult to ignore. In such contexts, students are pushed to move beyond prompt production and engage instead in a cycle of interpretation, evaluation, and redesign.

The study also suggests that successful AI integration in design classrooms depends on instructional framing. Students need support in identifying when outputs are merely impressive and when they are conceptually or culturally appropriate. This means that the role of the educator remains central. AI does not eliminate the need for pedagogy; it increases the need for carefully designed pedagogical structures that help students develop discernment.

Limitations and Future Research

Several limitations should be acknowledged. First, the study was based on a single qualitative case involving 24 students within one course context. The findings therefore offer in-depth insight into process and pedagogy, but they are not intended to support broad generalization. Second, the research focused on one heritage symbol, Chinese tiger symbolism, which, although culturally rich and pedagogically valuable, cannot represent the full diversity of heritage-based design contexts. Third, the data were collected within a relatively bounded project period and therefore do not capture longer-term changes in students' design thinking, cultural understanding, or continued use of AI beyond the course.

In addition, although the study drew on multiple qualitative sources rather than self-reported reflections alone, it did not include a comparative non-AI learning condition. As a result, the study can illuminate how AI functioned within this particular pedagogical setting, but cannot fully isolate the distinctive contribution of AI compared with other forms of heritage-based design learning. This is one of the editor's clearest concerns, and it is better to acknowledge it directly here than to leave it implicit.

Future research could build on this study in several directions. Comparative designs involving AI-supported and non-AI-supported studio environments would be valuable for clarifying what AI specifically changes in cultural design learning. Longitudinal studies could examine whether the judgment-centered and reflective use of AI observed here continues beyond a single project. Research across different cultural symbols, institutions, and design disciplines would also help determine how far the present findings can travel across contexts. Finally, future work may combine qualitative analysis with more systematic visual tracing of how design features evolve from early AI generation to final refined outputs. This would deepen understanding of how students learn to transform generated images into culturally meaningful design outcomes. These limitation and future-research points are already present in your current discussion, but here they are aligned more directly with the editor's feedback.

CONCLUSION

This study examined how generative artificial intelligence can be integrated into visual design education through a heritage-based learning project centered on Chinese tiger symbolism. By adopting a qualitative case study approach, the research explored how students used AI tools during visual experimentation, symbolic interpretation, design refinement, and reflective review within a university-level design course.

The findings indicate that AI did not function merely as a tool for rapid image production. Instead, when embedded in a culturally grounded design task, it served as a creative catalyst that expanded exploratory possibilities while also increasing the need for critical selection, cultural interpretation, and human judgment. Students' engagement with Chinese tiger symbolism gradually moved beyond surface-level image making toward a more reflective consideration of symbolic meaning, cultural appropriateness, and representational responsibility. In this sense, the study shows that the pedagogical value of AI in design education lies not only in what it helps students generate, but also in what it prompts them to question, compare, and refine.

The study contributes to current discussions on AI in design education in three main ways. First, it extends existing work by showing that generative AI can support not only ideation and experimentation, but also interpretive learning when it is situated within a heritage-based creative context. Second, it demonstrates that traditional cultural symbols can function as effective pedagogical resources for connecting contemporary digital practice with cultural understanding. Third, it suggests that AI literacy in visual design education should be understood not only as technical competence, but also as a form of judgment-centered literacy grounded in evaluation, contextual sensitivity, and responsible decision-making.

At the pedagogical level, the study suggests that the educational value of AI becomes stronger when it is integrated into structured learning designs rather than used as a stand-alone production tool. In particular, heritage-based projects appear to be especially valuable because they require students to engage simultaneously with form, meaning, context, and interpretation. Under these conditions, AI can support not only creative exploration, but also reflective and culturally responsive design learning.

At the same time, the conclusions of this study should be interpreted within the limits of a small-scale qualitative case involving 24 students in a single course context. The study offers in-depth insight into process and pedagogy, but it does not claim broad generalizability. In addition, because no comparative non-AI learning condition was included, the study cannot fully isolate the distinctive contribution of AI from other elements of the teaching design. Future research may therefore build on this work through comparative, cross-context, and longitudinal studies that further examine how students develop interpretive and judgment-centered uses of AI in design education.

In conclusion, this study argues that AI-enhanced visual design education can become pedagogically meaningful when it moves beyond image generation and engages students in the reinterpretation of cultural meaning. By connecting generative AI with heritage-based inquiry, design education can foster not only creativity and experimentation, but also cultural understanding, critical awareness, and reflective judgment in the digital era.

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