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## EDITED BY

Mirian Tavares,  
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## REVIEWED BY

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University of Algarve, Portugal  
Adérito Fernandes-Marcos,  
University of Saint Joseph, Macao SAR, China

## \*CORRESPONDENCE

Wenpei Zhang  
✉ zwpahut@ahut.edu.cn

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# Differentiated impacts of image samples on creative performance in cultural tourism product design

Lun Wei<sup>1</sup>, Hui Wu<sup>2</sup>, Mingzhu Yu<sup>1</sup>, Xuan Qin<sup>1</sup> and Wenpei Zhang<sup>2\*</sup>

<sup>1</sup>School of Art and Design, Ma'anshan University, Ma'anshan, Anhui, China, <sup>2</sup>School of Business Administration, Anhui University of Technology, Ma'anshan, Anhui, China

**Purpose:** Creativity plays a pivotal role in the design of cultural tourism products. This study investigates the impact of different types of image samples on enhancing the creative performance in cultural tourism product design, and and clarifies the practical role of image samples in design inspiration.

**Methods:** A total of 66 design students were recruited and randomly assigned to three groups of 22 each. The samples of cultural tourism product design were categorized into three types: historical site, local culture and natural landscape. Each group was tasked with designing a cultural tourism product based on different samples (historical site, local culture and natural landscape). The design process was divided into three stages, corresponding to three dimensions of creativity and the related seven assessment indicators: idea generation stage—divergent thinking (fluency and flexibility indicators), idea aggregation stage—convergent thinking (adaptability and feasibility indicators), and final design performance stage—design creativity (novelty, aesthetic and practicality indicators).

**Results:** The results indicate that historical site and local culture samples significantly contribute to stage 1—divergent thinking (on fluency and flexibility indicators, respectively), while natural landscape contributes to stage 3—design creativity (on both novelty and aesthetics indicators).

**Conclusion:** This study reveals the unique role of image samples in the cultural tourism product design process and emphasizes the necessity of selecting samples based on design stages or creativity dimensions. These findings inform teaching practices, optimizing students' innovation and cultural expression skills.

## KEYWORDS

image sample, divergent thinking, convergent thinking, product design, creative cultural design

## 1 Introduction

In the global economic map of the 21st century, tourism, with its unique comprehensive and diversified characteristics, has become an important force in promoting economic growth (Khan et al., 2020). In particular, cultural tourism products, serving as a bridge connecting local culture and economic development, play an indispensable role in promoting the development of local tourism. By integrating local history, art and culture, cultural tourism products not only enrich the tourism market and enhance the tourists' experience, but also promote the dissemination and protection of culture (Cuomo et al., 2021). Therefore, it is significant to develop culturally distinctive tourism products with regional characteristics, as this contributes to enhancing the appeal and competitiveness of tourism destinations.

In order to design creative tourism products with new perspectives and concepts, it is necessary to meet the comprehensive needs of all stages of tourism. This approach should align with the harmonious development of society and the economic growth needs of the industry, thereby raising the standards for the use value of tourism products. Central to this design process is the acquisition of design inspiration, which can arise from both intentional searches and unintentional harvest (Gonçalves et al., 2014; Mougenot et al., 2008; Zhu, 2020; Liu et al., 2023a, 2023b). The acquisition of design inspiration can occur through active seeking or unexpected encounters, with sources encompassing diverse domains such as architecture, customs, and natural landscape (Gonçalves et al., 2014). Current research indicates that distinct forms of design inspiration sources impart unique advantages and perspectives. By analyzing and constructing such inspiration, designers can stimulate novel thinking and solve design challenges effectively. Malaga demonstrates that exposure to pictorial stimuli generates a greater volume of divergent ideas compared to text-based or text-image hybrid sources (Malaga, 2000). Relative to textual materials, images deliver richer visual information that more effectively elicits designers' associative thinking and creative ideation. In contrast to video, images offer superior operational flexibility and efficiency in the design process, facilitating more intuitive analysis and straightforward modification (Robey, 2019; Higdon et al., 2025; Wong and Chang, 2018). These characteristics make images have obvious advantages in Cultural Tourism Product Design.

Previous studies have found that in cultural tourism products, image inspiration plays an important role in influencing the design process and design outcomes (Cheng et al., 2014; Malaga, 2000). A critical gap exists in current practices: Is there an optimal type of image that can effectively inspire design creativity during the teaching process? The specific mechanisms through which different image types activate designers' creative capacities remain inadequately elucidated. These unresolved issues engender arbitrary and stochastic responses when designers process stimuli, thereby impeding the developmental efficacy of designer competencies and amplifying variance in design quality. Furthermore, the absence of scientifically grounded guidance for inspiration selection may constrain the effective transfer and continuity of designer competencies.

Regarding content typology of images, conventional categories encompass natural phenomena, architecture, everyday objects, and cultural customs (Gonçalves et al., 2014; Hanington, 2003; Keller et al., 2006), with each typology potentially exerting distinct influences on product design from varied perspectives. Exemplified by Lladró's "Gaudí Collection," designers executed artisanal translation of key motifs from Antoni Gaudí's architecture (e.g., Sagrada Família and Casa Batlló), including naturalist reliefs, curved structures, and mosaic collages. This was achieved through precise replication of architectural elements such as undulating contours, draconic scale spirals, and geometric stained-glass patterns on ceramic surfaces, thereby transforming products into three-dimensional cultural signifiers. It confirms the effectiveness of specific image types (architectural drawings) on cultural tourism product design. It also reveals that the choice of image content type needs to be a deep fit with the cultural attributes of the product.

Therefore, by thoroughly investigating and understanding how different types of images influence design inspiration, designers can more scientifically select inspirational image sources to enhance the

stability of design quality. This study aims to provide scientific insights for cultural tourism product design, thereby elevating design quality and stability while fostering both quality and creativity. It examines the specific mechanisms through which diverse image types function in the creative design process, observing their differential impacts on various dimensions of creativity during design activities. Adopting a between-group experimental design, the research will expose participants to distinct categories of images as inspiration sources to analyze their varied effects on creativity dimensions. The findings will reveal how to more scientifically leverage targeted image-based inspiration sources, optimize the stability of cultural tourism product design, cultivate designers with innovative thinking and cultural expression capabilities, and ultimately advance the innovation and development of cultural tourism products.

## 2 Theory

### 2.1 Cultural tourism product design process

Cultural tourism product design is a design activity that integrates creativity, culture and art, focusing on the creation of modern products designed to enhance the tourism experience (Vecchio et al., 2018). Such design activities are profoundly influenced by human experiences, creative thinking, and a deep understanding of rich cultural knowledge, especially through the in-depth exploration and application of local culture, such as architecture, customs, and natural landscape. Typically, cultural tourism products differ in nature from conventional products. While traditional product design primarily aims to address practical needs in daily life, cultural tourism design additionally fulfills functions such as decoration, collection, and commemoration. For example, Italian jewelry house Bulgari drew inspiration from the smooth outline lines of the Roman Colosseum, integrating the magnificent architectural art with the exquisite and dazzling jewelry design to create the b.zero1 collection. Taking the circular arcades of the Colosseum as its design element, the collection showcases the majestic grandeur of the Colosseum through the cutting and splicing of metal, while retaining the delicacy and splendor of jewelry (Zhiyuan, 2022). By integrating these cultural elements, cultural tourism products not only deliver unique visual and sensory experiences but also offer valuable cultural references and educational significance for designers and consumers, thereby promoting the development of cultural heritage and tourism. To provide meaningful guidance for designers, researchers have proposed a valuable cultural tourism product design process for creating successful culture-oriented tourism products (Hsu et al., 2011; Qiu, 2020).

To deliver distinctive cultural experiences, the design process must systematically extract iconic and representative elements from local architecture, customs, and other cultural resources. As evidenced by Fjällräven's "Fjord" backpack (Sweden), which recreates the textural strata of glacial fjord rock formations through mineral coating gradient technology, while its strap structure mirrors Viking ship carpentry techniques. Designated as official equipment for Norwegian national parks (with a 62% repurchase rate), this exemplifies the efficacy of translating natural landscape into functional aesthetics (Zhiyuan, 2022). Incorporate the unique style and historical value of local architecture into product design, so that the product not only becomes a commodity

on the market, but also a carrier of cultural dissemination. Consequently, cultural tourism product design should transcend superficial visual enhancements to delve into the essence of local culture. Synthesizing these cultural nuances with contemporary design principles enables the creation of innovative products that fulfill modern consumer demands while embodying regional cultural identity. This approach effectively communicates territorial culture, enriches consumer cultural experiences, safeguards local heritage, and advances sustainable tourism development. Therefore, it is necessary to analyze the unique creation process based on the characteristics of cultural tourism products.

Building upon conventional product design processes, this study proposes a structured framework for cultural tourism product design. Specifically, traditional product design typically involves three sequential stages: product planning, solution refinement, and design presentation. Therefore, the first stage of the process of cultural tourism product design in this study is to understand the local cultural and tourism resources and identify the key cultural features that represent the local cultural and tourism resources for subsequent design work (Gao and Huang, 2022; Su et al., 2018). As Moalosi et al. emphasize, designers must integrate sociocultural factors through “conscious design efforts” rather than “accidentally,” thereby creating innovative, culturally resonant, and appealing products (Moalosi et al., 2007). This approach fosters broader market acceptance for higher economic value and socio-cultural dissemination. In summary, at this stage, the designer should delve deeply into the distinctive elements of local architecture, customs, and natural landscape, extracting iconic design features and integrating them into cultural tourism product design. By doing so, the products not only become commodities but also serve as vehicles for cultural transmission, a process referred to as the idea generation stage (Hsu et al., 2011).

The second stage involves translating impressive cultural traits into design features and generating a variety of conceptual ideas using rough sketches, called the idea aggregation stage. The designer then selects an idea to create a detailed design (Wu et al., 2023). At this stage, designers should holistically consider factors including form, color, materials, functionality, structural elements, and environmental contexts while adhering to fundamental design principles. Diverse approaches exist for engaging with historical authenticity in design practice. For example, cultural inspiration sources may serve as metaphorical or analogical references for target designs (Luo and Dong, 2017; Zhu, 2020); morphological correlation methodologies (Hsieh and Guan, 2011) and cultural imagery transmission modes can also be strategically employed.

The third stage is known as the final design presentation stage. During this stage, the designer refines the concepts from the initial two stages and develops a detailed visual representation. Utilizing specialized design tools, the designer transforms the initial hand-drawn sketches into precise and detailed images. These images should show the visual characteristics of the product in detail, including size, color and material texture, to ensure that every detail accurately reflects the characteristics of the local culture and the innovative nature of the design.

## 2.2 Dimensions of creativity at the core of different design stages

Creativity is one of the most central competencies in the process of design. Understood as an individual’s ability to generate novel and appropriate ideas or products within specific contexts (Jagtap, 2019;

Oman et al., 2013), it not only reflects the potential to solve problems and propose innovative solutions but also serves as a critical driver for societal advancement and cultural development. In the design domain, creativity is not only about the generation of original concepts, but also about the ability to transform these concepts into practical, functional design solutions (Atman et al., 1999; Daly et al., 2012).

In exploring the influence mechanism of different types of design samples on the cultural tourism design process, this paper focuses on the three key dimensions of divergent thinking, convergent thinking, and design creativity, derived from Sarkar and Chakrabarti’s “Universal Definition of Creativity” (Sarkar and Chakrabarti, 2011). These dimensions elucidate the core cognitive processes that designers engage in during the development of cultural tourism products. Specifically, they correspond to the three stages of idea generation, idea aggregation, and the final performance of cultural tourism product design.

Divergent thinking refers to the process of exploring multiple possible solutions to generate innovative ideas and reflects a designer’s exploratory and open-minded approach to creative thinking (Runco and Acar, 2012). This process provides designers with a source of inspiration and is a key step in stimulating innovative ideas, primarily evident during the idea generation stage of design.

Convergent thinking focuses on identifying the most appropriate strategy from these possible solutions. This process focuses on analysis, evaluation, and decision-making, emphasizing the feasibility and practicality of creative ideas to ensure that it is a necessary part of realizing design innovation. It is mainly reflected in the conceptual aggregation phase of design (Wang et al., 2023).

Design creativity refers to the ability to generate solutions within the design process that are both novel (original, unique) and useful (effective, feasible, valuable). It represents the specific manifestation of creativity in the design domain and serves as the central driving force for innovation in products, services, systems, or experiences. Design creativity examines the distinctive cognition and thinking modes of designers, encompassing how they demonstrate and apply creativity through specific “creative thinking” processes.

## 2.3 Research on image-based inspiration

Design inspirations usually include inspiration from nature, daily life, artworks, and history and culture (Gonçalves et al., 2014; Zhu, 2020). Currently, most studies are based on image-based inspiration because images are intuitive, vivid, and can quickly convey design concepts and emotions (Goucher-Lambert et al., 2020). However, despite the wide application of image-based inspiration in design, there is a notable lack of scholarly research examining how the classification of these images influences creativity. To address this gap, we conduct a comprehensive study on the categorization of image-based inspirations, specifically concerning the design of cultural tourism products, to investigate their distinct effects on design creativity.

In order to gain a deeper understanding of the categorization of image samples, the perspective of cultural gene (Meme) theory can be drawn upon (Gill and Price, 2022; Yang and Seo, 2022). Meme theory was proposed by British evolutionary biologist Richard Dawkins in 1976 to explain how cultural factors are transmitted

non-genetically, especially in the form of mimicry. The New Oxford Dictionary of English defines cultural genes as “the basic units of culture,” emphasizing the combination and transmission of cultural factors in various aspects such as social traditions, customs and beliefs. Under the framework of cultural gene theory, this study categorizes cultural tourism product design samples according to the two main components of cultural genes: dominant and recessive genes (Liu et al., 2023a, 2023b; Dou et al., 2025).

Dominant genes include those cultural elements that are intuitive, easy to recognize and capture, such as natural landscape and historical site (Wise and Jimura, 2020; Erysheva and Moor, 2019). These elements usually have a strong visual impact and recognition, and can directly reflect the natural environment and historical precipitation of a region. They serve as obvious sources of inspiration in the design creation process, providing designers with direct and concrete creative materials. In contrast, recessive genes pertain to intangible cultural heritages, legends, traditional social views and customs that are deeply rooted in the local culture (Ruhanen and Whitford, 2021; Lizardo, 2022). Although these elements are not as intuitive and easy to see as dominant genes, they are the carriers of cultural depth and spiritual connotation, and through various combinations and arrangements, they form unique cultural expressions. In the process of design creation, recessive genes can inspire designers to engage in deeper thinking and inspire more nuanced and innovative design ideas. For specific content, as shown in Figure 1.

Through this sample categorization based on cultural gene theory, this study not only tries to understand how different types of cultural elements affect the creativity of cultural tourism product design, but also explores how designers can create cultural tourism products that are both locally distinctive and innovative through the interpretation and transformation of dominant and recessive genes. It is evident that elements of local characteristics play a crucial role in stimulating designers' creativity in the development of cultural tourism products. Consequently, this study selects three categories of image samples that best represent local culture: historical site, local culture and natural landscape. This selection is intended to provide designers with a rich source of design inspiration.

Of these, the historical site samples include photographs of buildings, monuments, and ruins representing local historical heritage (Perriam, 2023; Jadon and Patil, 2025). Historical site provides deep insights into local history, enabling designers to explore and recreates

the historical narratives and cultural traditions of a region, thus facilitating the design of cultural tourism products imbued with storytelling and cultural depth (Siri et al., 2024; Wu, 2021). Local culture samples consist of photographs that represent the unique culture and lifestyle of the area, such as local festivals, traditional crafts, folk activities, and distinctive cuisine (Chen, 2024). These samples visually demonstrate the way of life and cultural values of local communities, offering designers a source of inspiration that connects people with the spirit of the place (Chen, 2024). Natural landscape samples cover photographs of local natural beauty, including mountains, rivers, forests, and other scenic landscape (Shepard and Daly, 2022). Natural landscape not only provides a serene and aesthetically pleasing visual experience, but also inspires designers to incorporate natural elements into the creation of culturally and environmentally sustainable tourism products, fostering a harmonious interaction between visitors and nature (Qin and Ng, 2020).

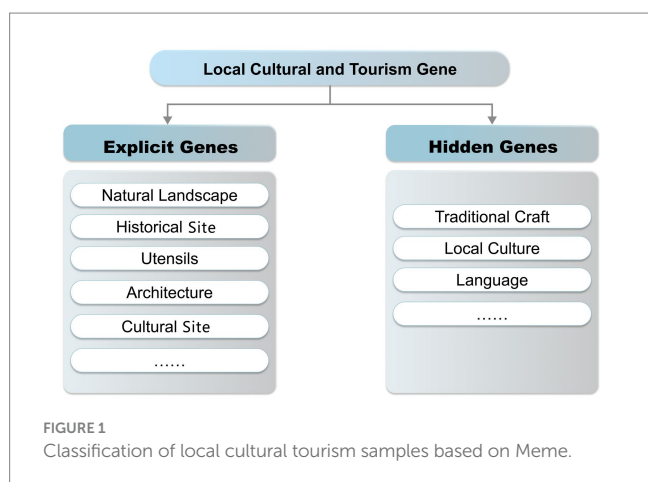
This study seeks to address the question of how various types of image-like samples influence creativity in the design process and the innovation of the resulting design work, particularly within a design activity that encompasses multiple dimensions of creativity. To analyze the subjects' creative performance at different stages of cultural tourism product design under different image samples, this study will use a between-groups design to compare the creativity performance of three groups of subjects. Although some studies have shown that there may be some interaction between different dimensions of creativity, there is always only one dimension that dominates at different stages of product design. These studies are usually conducted independently, ignoring the interconnections between creativity dimensions.

Therefore, this study also ignored these subtle connections in the experimental design and discussed and analyzed each dimension separately. When evaluating individual performance, this study evaluates the program separately in terms of three indicators: divergent thinking, convergent thinking, and final design presentation. Specifically, fluency and flexibility are employed as indicators of divergent thinking, while adaptability and feasibility are used for convergent thinking (Bonnardel and Didier, 2020). Novelty, aesthetics and practicality are used for design creativity.

## 2.4 Purpose and assumptions

This study subdivided the visual stimulation inspiration in design inspiration into three types of image samples: historical site, local culture and natural landscape. The primary objective of this research is to investigate whether different types of image samples affect designers' creativity in the design stage of cultural tourism products. Additionally, it aims to analyze how these varied image samples influence the design process, thereby assisting designers in more effectively utilizing the local characteristic image samples to stimulate design inspiration and enhance both creativity and market attractiveness in product design.

Therefore, this study hypothesizes that the use of different types of pictorial inspiration affects both the design process and the resulting design outcomes. This section will reason on the basis of different dimensions of creativity. Specifically, in the dimension of divergent thinking, local culture is rich in cultural characteristics and traditional





values, and these unique cultural elements provide designers with a wide range of cognitive stimuli. When designers are exposed to these diverse cultural symbols, they can stimulate their imagination and creativity, thus promoting the divergence of thinking. This exploration of the diversity of the sample not only enhances the flexibility of thinking, but also strengthens designers' fluency in the creative process (Xia et al., 2023; Cheng et al., 2014). As a result, they are empowered to innovate and experiment more freely with a variety of cultural elements, thus producing designs with cultural depth and innovation. Therefore, the first hypothesis of this study is:

*H1: The local culture image samples may have a positive effect on their divergent thinking (fluency and flexibility).*

Different types of image samples, such as historical site, local culture, and natural landscape provide multidimensional visual and conceptual information that can be used as a source of design inspiration (Weinberger et al., 2021; Li et al., 2024). By analyzing and comparing these different image inputs, designers can better integrate various design elements to suit specific design requirements or solve specific problems (Schifferstein et al., 2022). This integration of information not only enhances the adaptability of the design solution and makes the design more responsive to practical applications, but also increases the feasibility of the design and ensures that the design solution is both innovative and practical. Therefore, the second hypothesis of this study is:

*H2: All three types of image samples may have a positive impact on designers' convergent thinking (adaptability and feasibility), prompting them to integrate and optimize design elements.*

Natural landscape, as its underlying dominant genes provides a wealth of design inspiration, and endless diversity and pure beauty provide designers with unlimited design creativity, prompting them to develop and produce novel design concepts. The harmony and beauty of nature are often used by designers to enhance the aesthetic value of their products (Chulvi et al., 2020). At the same time, studies have also shown a correlation between increased creativity and the presence of natural elements in the environment (Mangone et al., 2017). For example, Ceylan et al. pointed out that the presence of natural elements in the office environment, such as plants and good lighting, can have an impact on the creativity of workers (Ceylan et al., 2008). Therefore, natural landscape samples not only stimulate designers' creative thinking, but also help them achieve a balance between novelty, aesthetics and practicality to create innovative designs that are both aesthetically pleasing and practical. Therefore, the third hypothesis of this study is:

*H3: The natural landscape image samples may significantly enhance designers' creativity, which may lead to the creation of more original design works.*

## 3 Methodology

### 3.1 Subject of the study

In this study, we successfully recruited 66 senior undergraduate students majoring in art and design as experimental participants. These participants included 38 males and 28 females with an average

age of 22 years. All participants had completed the compulsory art and design-related courses and possessed the basic skills required to become a designer, making them ideal candidates for this study. For this experiment, participants were randomly and equally assigned to three groups of 22 each. Before the start of the experiment, the research team explained the purpose, process and precautions of the experiment in detail to all participants and obtained their written consent to ensure that the participants fully understood the content of the experiment and participated in the experiment based on the principle of voluntariness.

### 3.2 Experimental design, stimulus materials, and procedures

#### 3.2.1 Experimental preparation

In the preparatory stage of this study, participants first completed the informed consent form and provided demographic information in the laboratory to ensure that they had a full understanding of the purpose, procedures, and potential risks of the experiment and that they were participating in the experiment on a voluntary basis. Subsequently, the laboratory assistant introduced the procedures and rules of the experiment in detail, provided background knowledge about the cultural and tourism resources in the image sample area, aiming to enhance participants' understanding of the relevance of the experiment.

The experiments were conducted by configuring computer monitors with a resolution of 1,920 × 1,080 to display specific samples and task content. The experimental environment included a standardized desk and chair configuration to ensure subject comfort. Each subject was provided with the same materials, including unlimited A4 paper, markers, pencils, and erasers to record data and experimental results. This method ensured consistency of experimental conditions and accuracy of data recording.

#### 3.2.2 Experimental sample and grouping

The Great Wall was selected as the historical heritage sample primarily because it comprehensively showcases the historical and cultural legacy of the Chinese nation. As a world-famous ancient defense project, the Great Wall was built 2,200 years ago and symbolizes the essence of Chinese culture. In December 1987, the Great Wall was listed as a World Heritage Site. Its grand architecture and profound historical significance reflect ancient China's engineering prowess and military strategy, while also carrying rich historical narratives and embodying the spirit of the nation. According to authoritative data from the China Great Wall Protection Report issued by the National Cultural Heritage Administration in 2016, the total length of the extant walls and moats of the Great Wall is 21,196.18 kilometers.

In terms of sample selection, this study focuses particularly on the "Badaling" section of the Great Wall. As the quintessential segment of the Great Wall, Badaling features walls averaging approximately 7.8 meters in height, with the highest point reaching 14 meters. The wall base measures approximately 6.5 meters in width, while the top averages 4.5 meters wide: dimensions enough to accommodate five horses abreast or 10 people walking side by side. The walls are primarily constructed with massive ashlar stones and bricks forming the exterior cladding, filled internally with rammed earth mixed with

crushed stones, rendering them exceptionally robust. Badaling served as one of the primary demonstration site when the Great Wall was inscribed on the World Heritage List. As is shown in [Figure 2a](#).

In the category of local culture samples, we selected the totemic image of the “Chinese Dragon.” As a mythical creature in ancient Chinese legends, the dragon symbolizes imperial power throughout Chinese history. Its imagery constitutes not only a cultural symbol profoundly embedded in traditional Chinese culture but also a representative element of China’s intangible cultural heritage. For the image samples, we focused on the dragon’s unique design elements, including intricate patterns, vivid colors, and expressive gestures, which vividly showcase the artistic and cultural significance of this iconic symbol. These distinctive features make the dragon an ideal source of inspiration for developing cultural tourism products with a strong sense of local identity and artistic value, as shown in [Figure 2b](#).

In the category of natural landscape samples, we selected Mount Huangshan in China. Mount Huangshan, a renowned scenic area in China, was inscribed on the UNESCO World Cultural and Natural Heritage List in December 1990. It enjoys the reputation as “the most astonishing mountain in China.” Known for its breathtaking mountain scenery, Mount Huangshan offers abundant inspiration for cultural and tourism design ([The Central People’s Government of the People’s Republic of China, 2012](#)). The selected

samples comprise three carefully chosen images: a bird’s-eye view of Mount Huangshan, the iconic “Greeting Pine” (Ying Ke Song), and a breathtaking sunrise over the mountain peaks. Together, these images provide a comprehensive representation of Mount Huangshan’s awe-inspiring natural landscape and rich cultural symbolism. By encapsulating both its visual grandeur and profound natural landscape, these samples serve as an invaluable source of inspiration for innovative design and the development of cultural tourism initiatives, as shown in [Figure 2c](#).

Accordingly, the experiment is divided into three groups: the first group uses images of the Great Wall, the second group features images of the dragon, and the third group includes images of Mount Huangshan. This grouping aims to explore the influence of different cultural and natural elements on design inspiration and creative generation.

### 3.2.3 Experimental flow

The subjects were all given the same design task description: to design a cultural tourism product that meets modern aesthetics and was told to elicit as many of their ideas as possible. In this study, the experimental design consisted of three tasks, with the duration of each task being determined based on previous literature research as well as the results of the preliminary

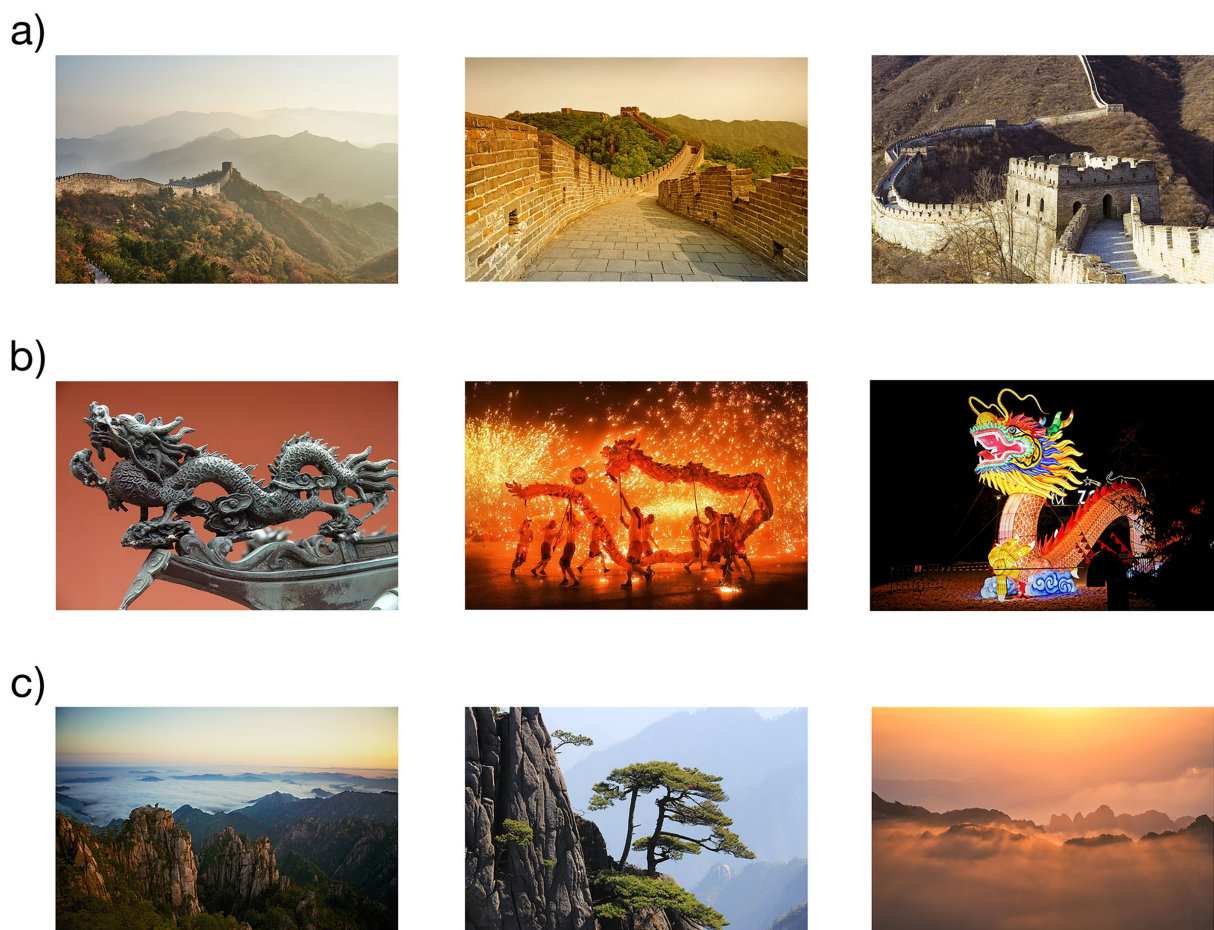


FIGURE 2

Display of experimental samples: (a) historical site samples, (b) local culture samples, and (c) natural landscape samples.

experiment (Xia et al., 2023). This approach ensured that the time settings of the experimental tasks reflected the standard durations reported in the literature and were adapted to the specific conditions of this study. The specific experimental procedure is shown in Figure 3.

**Task 1: divergent thinking experiment.** The experimental participants were presented with samples of cultural and tourism images from the appropriate group. Participants were asked to use the provided image samples as stimulus materials to engage in multiple perspectives and directions of divergent thinking within a 20-min time limit. Through this process, participants were required to capture and record their associations and imaginations of the concept of cultural tourism product design, which should be presented in the form of a mind map to ensure that a wide range of content and types of product design are covered.

**Task 2: convergent thinking experiment.** Based on the results of the association and dispersion in Stage 1, participants are required to integrate their thinking and form a creative idea of cultural tourism product design within 15 min. Participants are required to draw the integrated idea into a simple sketch of the product design, focusing on the basic form and function of the product.

**Task 3: design a creativity experiment.** On the basis of the sketches in Stage 2, participants are required to refine the design scheme within 30 min to form a more detailed design plan for the cultural tourism product. The design proposal should be a combination of graphics and text, showing the complete modeling and structure of the product, and accompanied by a design description detailing the product's functions, structure, materials and other aspects. The layout should be reasonable, showing the specific steps of extracting features and modeling deduction.

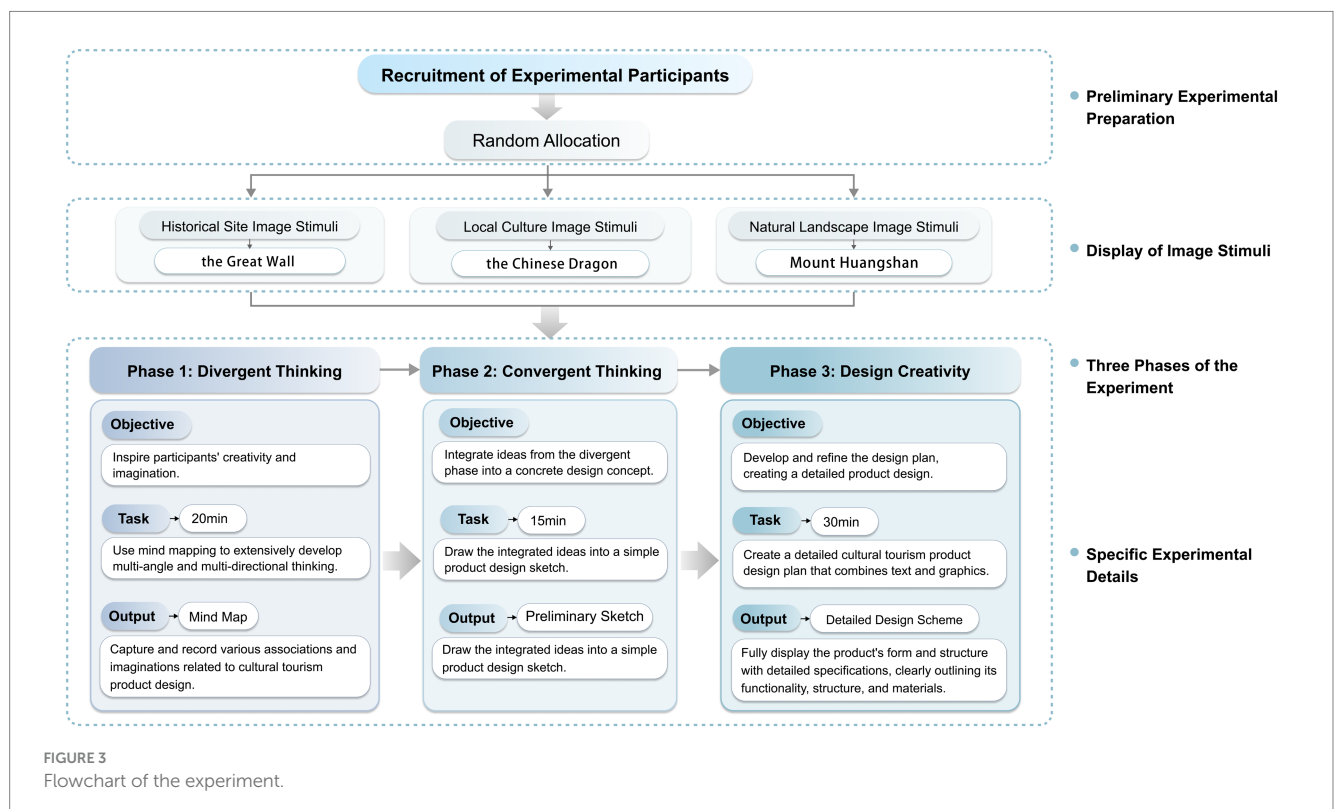
### 3.3 Evaluation methodology

#### 3.3.1 Evaluation criteria for divergent thinking

For this study, divergent thinking is defined as the ability to generate diverse solutions when confronted with a particular problem, which is assessed primarily through two indicators: fluency and flexibility (Guilford, 1966).

Fluency is used for the measure and rate of thinking demonstrated by participants in the process of designing cultural and creative products, which is measured by counting the number of complete design concepts that participants were able to generate within a limited time frame, and incomplete design ideas are not included in the statistics (Ritter and Ferguson, 2017). In this study, fluency scores range from 3 to 6. A high fluency score indicates that participants can retrieve and process information quickly and extensively and come up with numerous innovative ideas in a short period of time.

Flexibility is used to measure the participants' ability to think out of the box and adopt new thinking in the design of cultural tourism products. It is derived by calculating the diversity of design concepts in four dimensions: function, principle of implementation, appearance and detail (Shah et al., 2003). Each dimension is scored according to its weight: function is 10, principle is 6, appearance is 3, and detail is 1. The flexibility score is the sum of the number of categories in each dimension multiplied by its weight and then divided by the number of design ideas (divergent thinking fluency scoring). For example, supposing a participant generates five design ideas within the time limit, of which two ideas differ in function, three ideas differ in principle of implementation, four ideas differ in appearance, and all five ideas differ in details. The total score would then be  $(2 \times 10 + 3 \times 6 + 4 \times 3 + 5 \times 1)$  totaling 55 points. The final flexibility score would be  $55/5$ , resulting in a score





of 11. Flexibility scores in this study range from 8 to 20. A high score indicates that the designer demonstrates a greater ability to think outside the box.

### 3.3.2 Evaluation criteria for convergent thinking

The evaluation of convergent thinking is defined in this study as the ability of participants to select the design solution with the best fit and highest implementation potential (Clements-Croome, 2018). Therefore, adaptability and feasibility are chosen as the core indicators for evaluating convergent thinking.

Adaptability is used to assess the consistency of the design solution with the initial design task and its responsiveness to the design needs of cultural and creative products. This indicator not only measures whether the design solution closely matches the characteristics of the cultural sample, but also examines whether the design solution can flexibly adapt to changes in market and cultural trends. Raters independently rated the adaptability of the design solution using a Likert scale from 1 (not at all relevant) to 5 (very relevant). The adaptability score reflects the sensitivity and creativity of the designer in understanding and applying the cultural characteristics, and reflects the application value of the design solution in meeting the culture, the context of the times and the needs of the users.

Feasibility is used to assess the likelihood that a design solution will be implemented at the economic, technical and social levels. Economic feasibility focuses on the cost-effectiveness and market potential of the design solution, technical feasibility assesses the accessibility and maturity of the required technology, and social feasibility considers whether the solution meets social and ethical standards and cultural acceptance. The rater will take these three dimensions and rate the feasibility of the program from 1 (not at all feasible) to 5 (very feasible) using a Likert scale, which ensures a comprehensive assessment of the practical application potential of the program (Xia et al., 2023).

### 3.3.3 Evaluation criteria for design creativity

Design creativity is defined as the ability to generate novel and valuable ideas, which is a key indicator for evaluating the performance of design tasks in the design creativity process (Sarkar and Chakrabarti, 2011). Given that cultural and creative design attaches great importance to the aesthetic value of products, this study selects

novelty, aesthetics and practicality as the main criteria for measuring design creativity based on Sarkar and Chakrabarti's comprehensive definition of design creativity.

Novelty is concerned with the degree of uniqueness and innovation of the elements in the design scheme of cultural and creative products. In this study, the novelty of design solutions was assessed in four dimensions: function, shape, experience and culture, with three rating scales of 3, 7 and 10, and weights of 0.3, 0.2, 0.3, and 0.2 assigned to these four dimensions, respectively, and the final score is obtained by summing the product of the weights of the dimensions and the corresponding ratings (Shah et al., 2003). The metric measures whether the design solution provides a new perspective, approach, or solution that breaks out of the existing design realm and introduces never-before-seen product forms, features, or usage scenarios.

Aesthetics is concerned with the artistic expression and aesthetic delivery of the design solution at the visual and sensory levels. The assessment of this indicator aims to identify whether the design is presented in a pleasing form, and at the same time, reflects the designer's ability to understand and apply aesthetic principles.

Practicality is concerned with the functionality and user experience of the cultural and creative products, including whether the product meets the user's needs, the ease of use and the ability to provide effective and efficient solutions in practical applications. Both indicators, aesthetic and practicality, were conducted through an expert scoring method, where each design proposal was evaluated based on a scale of 1 to 5. Detailed descriptions of each evaluation dimension and their specific contents are shown in Table 1.

## 3.4 Data analysis

Three senior experts were invited to review the design program for this study. The experts all have more than 5 years of design teaching experience and hold the title of professor. They have achieved fruitful results in cultural and creative design competitions and cultural tourism design research, reflecting their professionalism and authority. To ensure the objectivity and accuracy of the evaluation, the experts thoroughly reviewed all the submitted design proposals before the evaluation to prevent the influence of the initial impression.

TABLE 1 Evaluation dimensions and specific content introduction.

Dimensions of creativity		Descriptive
Divergent thinking	Fluency	Breadth and speed of thought, measured by the number of effectively designed ideas.
	Flexibility	Ability to think outside the box and to think outside the box, scored by the number of design ideas in different categories.
Convergent thinking	Adaptability	The extent to which the design solution matches the initial mission, assessing how well the design concept connects to the cultural samples and how well it fits in the marketplace.
	Feasibility	The economic, technical and social implementation possibilities of the program.
Design creativity	Novelty	The degree of uniqueness and innovation of the elements of the program, including the introduction of new perspectives, approaches or solutions.
	Aesthetic	The visual artistic expression and aesthetics of the design solution involve the harmony and aesthetic resonance of the composition, pattern, and color.
	Practicality	Product functionality and user experience, focusing on meeting user needs, ease of use, comfort and safety.



The analysis in terms of flexibility also found significant differences among the three groups. The results of the analysis for each group were as follows: there were significant differences between the design options for the historical site, local culture and natural



TABLE 2 Results of analysis of variance (ANOVA) of the seven indicator scores of the design process ( $n = 66$ ;  $M \pm SD$ ).

Dimensions of creativity		Historical site group ( $n_1 = 22$ )	Local culture group ( $n_2 = 22$ )	Natural landscape group ( $n_3 = 22$ )	$F$	$p$
Divergent thinking	Fluency	4.55 $\pm$ 0.91	6.18 $\pm$ 0.80	4.91 $\pm$ 0.81	22.971	0.000**
	Flexibility	14.71 $\pm$ 2.39	13.11 $\pm$ 2.24	12.17 $\pm$ 1.73	7.989	0.001**
Convergent thinking	Adaptability	2.79 $\pm$ 0.71	2.88 $\pm$ 0.68	2.77 $\pm$ 0.55	0.172	0.843
	Feasibility	2.95 $\pm$ 0.40	3.02 $\pm$ 0.45	2.80 $\pm$ 0.43	1.421	0.249
Design creativity	Novelty	5.34 $\pm$ 1.54	4.53 $\pm$ 1.03	6.28 $\pm$ 1.22	10.231	0.000**
	Aesthetic	3.30 $\pm$ 0.91	2.67 $\pm$ 0.65	4.17 $\pm$ 0.69	21.601	0.000**
	Practicality	3.23 $\pm$ 1.05	2.71 $\pm$ 0.75	3.26 $\pm$ 0.89	2.520	0.089

\* $p < 0.05$ , \*\* $p < 0.01$ .

landscape groups [ $F_{(2, 63)} = 7.989$ ,  $p = 0.001$ ]. Post hoc comparisons with Bonferroni correction showed that there was a significant difference between the historical site group and the local culture group ( $p = 0.040$ ); a highly significant difference between the historical site group and the natural landscape group ( $p < 0.001$ ); and no significant difference between the local culture group and the natural landscape group ( $p = 0.315$ ). It can be seen that the historical site group performed significantly better than the other two design solutions in terms of flexibility, i.e., diversity of thinking and ability to adapt to change.

## 4.2 Convergent thinking

Two indicators are included in the convergent thinking dimension: adaptability and feasibility. The ANOVA results showed that in terms of adaptability, the difference between the three groups of design solutions for historical site, local culture and natural landscape [ $F_{(2, 63)} = 0.172$ ,  $p = 0.843$ ] was not significant, suggesting that in terms of the design solutions, they had similar abilities in understanding and applying the characteristics of the cultural samples.

In terms of feasibility, the analysis of variance results showed that there were no significant differences between the three image sample design options in terms of economic, technical and social feasibility [ $F_{(2, 63)} = 1.421$ ,  $p = 0.249$ ]. This indicates that the three groups of design options exhibit similar levels of economic, technical and social feasibility. This shows that there is no significant difference in the performance of the scores among the three groups in terms of total convergent thinking.

## 4.3 Design creativity

The dimension of design creativity contains three indicators: novelty, aesthetics and practicality.

In terms of novelty, the ANOVA results showed that there was a significant difference [ $F_{(2, 63)} = 10.23$ ,  $p < 0.001$ ] between the design alternatives for the historical site, local culture and natural landscape groups. After *post-hoc* comparison with Bonferroni correction, the natural landscape group was significantly higher than the historical site group ( $p = 0.048$ ) and the local culture group ( $p < 0.001$ ), but there was no significant difference between the historical site group and the local culture group ( $p = 0.099$ ). From the analysis of the

above data, it can be seen that the design solution of the natural landscape group has a significant advantage in stimulating the novelty of design creativity.

In terms of aesthetics, there was a significant difference in design solutions [ $F_{(2, 63)} = 21.601$ ,  $p < 0.001$ ] among the three groups. After Bonferroni corrected the post hoc test, the score of the historical site group was significantly higher than that of the local culture group ( $p = 0.019$ ); there was a significant difference between the historical site group and the natural landscape group ( $p = 0.001$ ); and there was a significant difference between the local culture group and the natural landscape group ( $p < 0.001$ ). It was found that there were significant differences in the aesthetic scores of the design solutions of the three groups, with the natural landscape group having the highest score for the most aesthetic value of the design solutions, followed by the historical site group, and the local culture group having the lowest score for the aesthetic value of the design solutions.

In terms of utility, the ANOVA showed that there was no significant difference [ $F_{(2, 63)} = 2.520$ ,  $p = 0.089$ ] in design alternatives among the three groups.

# 5 Discussion

## 5.1 Divergent thinking

The results showed that the local culture sample had a significant advantage in promoting divergent thinking fluency, while the historical site sample performed more prominently in improving divergent thinking flexibility.

Local culture samples have a significant positive effect on divergent thinking fluency, aligning with our initial hypothesis that local cultural elements inspire broader associative thinking. The concrete and visually rich elements found in samples such as “dragon” provide designers with diverse sources of inspiration. In contrast, the abstract nature of historical site and natural landscape samples appears to weaken the divergent thinking gradually. Meanwhile, we speculate that local culture samples with distinctive national characteristics and the same cultural background, evoke designers’ emotional resonance among designers, facilitating a more comprehensive understanding of the samples and thereby making it easier for them to generate associations and innovations. Moreover, the strong narrative inherent in local culture samples can furnish designers with more creative ideas and stimulate their imagination.

In terms of flexibility, samples of historical site have a significant positive impact on divergent thinking flexibility. This phenomenon may be attributed to the richness of design elements in historical site, which can be easily integrated with the actual product design and facilitate the generation of innovative ideas. The historical site category combines explicit and implicit features, the former including intuitive architectural details, while the latter encompasses deeply rooted cultural heritage and traditions, collectively providing a rich source of inspiration for designers. In contrast, local culture samples show distinctive cultural characteristics and spiritual expressions, but their effectiveness in promoting designers' divergent thinking is relatively limited. This limitation often arises from the tendency of local culture samples to focus too much on specific symbols and elements, which limits designers' creative ability and makes it difficult for them to explore the broader cultural meaning and design potential behind these elements. Although natural landscape samples offer abundant inspiration in terms of color and form, they encounter challenges in translating this inspiration into direct applications for product functional innovation, resulting in relatively limited flexibility.

## 5.2 Convergent thinking

In this study, we observed no statistically significant differences among the experimental groups regarding the feasibility and adaptability of convergent thinking. As the research focused on differences in inspirational stimulation between the three sample types, this result primarily indicates a lack of significant difference in their impact on convergent thinking. However, this does not imply that these samples failed to stimulate or inhibit convergent thinking generation; that is, all three sample types may have stimulated convergent thinking, or conversely, none may have produced a positive effect. This suggests that historical site, local culture, and natural landscape samples may provide consistent stimuli in promoting convergent thinking, with no single sample type demonstrating an advantage during the convergence process. This observation indicates that while different types of inspiration sources may vary in their capacity to stimulate divergent thinking, their effectiveness in stimulating convergent thinking may be similar, insufficient to significantly differentiate their influence.

Notably, the present study found that the group with stronger divergent thinking ability was able to generate more creative solutions; however, this ability appeared to inhibit the execution of convergent thinking (although not statistically significant). We hypothesize that this may be due to the fact that the diversity of results generated by divergent thinking complicates the decision-making process and ultimately affects the efficiency and quality of the final choice. This phenomenon is consistent with the findings of Kuypers et al. (2016), who noted that increased divergent thinking may have an inhibitory effect on convergent thinking. Furthermore, we also hypothesized that in the early stages of design and creation, designers need to generate as many solutions as possible, a process that may be accompanied by anxiety that negatively affects convergent thinking. These findings emphasize the importance of maintaining a dynamic balance between divergent and convergent thinking during the creative process. According to Vartanian et al. (2020), there are significant differences between divergent and convergent thinking in terms of mental readiness and the brain functions involved (Vartanian et al., 2020). Especially for less

experienced novices, the simultaneous execution of both divergent and convergent abilities is often challenging, leading to a tendency for designers to excel in one area while struggling in the other. Consequently, education and training should concentrate on strategies to assist designers in effectively transitioning between these two modes of thinking, thereby fostering their overall creative development.

## 5.3 Design creativity

The results show that the natural landscape sample has a significant advantage in promoting the novelty of design creativity, and the sample of historical site and local culture offers greater aesthetic stimulation. However, there is no significant difference in the performance of the three samples in terms of practicality.

In terms of novelty, in this study, we explored the manifestation of the originality dimension of design creativity and found that the natural landscape sample significantly outperformed other samples in promoting original design. This advantage may stem from the abstract nature of natural landscape, which, due to their relative distance from the design task, afford designers a broader cognitive space for exploration, thereby stimulating a higher level of creativity. This phenomenon is consistent with logical reasoning theory, which suggests that the distance between the source of inspiration and the design problem can significantly influence the design thinking process and creative performance (Pinkow, 2023; Pringle and Sowden, 2017). Natural landscape, characterized by rich colors, abstract shapes, and varied textures, provides a strong visual impact and high recognition. Consequently, due to their inherent flexibility and ambiguous boundaries, natural landscape is well-suited to be integrated with practical aspects, resulting in innovative and functional design solutions.

Several studies have demonstrated the positive effects of natural elements in enhancing efficiency and creativity in the workplace (Mangone et al., 2017). For example, Ceylan et al. found that incorporating natural elements, such as plants and adequate lighting, in office environments significantly boosted workers' creativity (Ceylan et al., 2008). Consequently, the presence of natural elements in the landscape category may have been instrumental in enabling designers to create more original products.

Our findings indicate that while the historical site sample generated a variety of creative ideas, the implementation of specific products focused on common office supplies and daily necessities. These products often incorporate figurative design elements directly related to everyday life, but lack deeper design thinking. This tendency may stem from the nature of the samples provided, which led designers to overly depend on the direct extraction of elements, thereby missing opportunities to delve into more intricate details. Consequently, this reliance restricts the depth and breadth of innovation. It was found that novelty necessitates not only a fresh perspective and approach but also a seamless integration with existing design products in terms of functionality, applicable scenarios and other practical situations. A more direct reference to the samples may inadvertently constrain the novelty of design creativity.

In terms of aesthetics, we compared the differences in aesthetic ratings between natural landscape samples and the other two sample types (historical site and local culture), observing a significant grouping effect. Dominant-gene samples (e.g., natural landscape) consistently outperformed dominant-recessive-gene samples (e.g.,

historical site), which in turn outperformed recessive-gene samples (e.g., local culture). The superior aesthetic performance of natural landscape group designs may be attributed to their dominant-gene characteristics, such as abundant organic lines and streamlined forms, which align with contemporary aesthetic preferences. For example, the humidifier designed by the experimental participants using the streamlined curves of the natural landscape received a high aesthetic evaluation due to its modernized form.

In contrast, the samples of historical site and local culture do not perform as well as those of natural landscape in terms of aesthetic stimulation. Historical site samples, due to the combination of their dominant genes and recessive genes, such as figurative architectural elements and deep cultural background, provide designers with a rich source of inspiration. This advantage allows designers to extract and apply these elements more effectively, facilitating a better reinterpretation of traditional elements in modern design and enhancing aesthetic appeal. Conversely, local cultural samples primarily rely on their recessive genes, such as the original shapes, colors, and movement features of the dragon. These elements often exhibit significant differences from contemporary aesthetic preferences. Most designers tend to extract these elements directly without successfully modernizing their reinterpretation, leading to a final product that lacks aesthetics. We posit that this phenomenon may stem from four primary factors: first, both designers and users do not have enough knowledge of and familiarity with local culture, which makes them likely to perform weakly in modern aesthetic

evaluations; second, due to time constraints of the experiment, participants may not have enough time to think deeply about how to effectively combine traditional elements with modern aesthetics effectively; third, the student designers who took part in the experiment were inexperienced, and this experiential limitation may have caused them to be extracting and applying the cultural elements without giving full play to their creativity.

In terms of practicality, the results of the study on practicality showed that the three types of samples showed similarity, despite the different types of samples. This phenomenon may be related to the characteristics of cultural tourism product design. Unlike traditional product design, which primarily aims to address life's pain points, cultural tourism product design fulfills additional functions, such as decoration, collection and commemoration. Consequently, designers typically select small, everyday objects as design elements, including hanging jewelry and office products. This design choice reflects the specific needs and functional positioning of cultural tourism products in terms of practicality, i.e., emphasizing aesthetics and commemorative rather than daily practicality. It can be seen that the design requirements of cultural tourism products are significantly different from those of conventional product designs. When designing cultural tourism products, designers should give more consideration to the emotional value and cultural significance of the products rather than just pursuing functionality. The results of the impact of different samples on design thinking are shown in Figure 5.

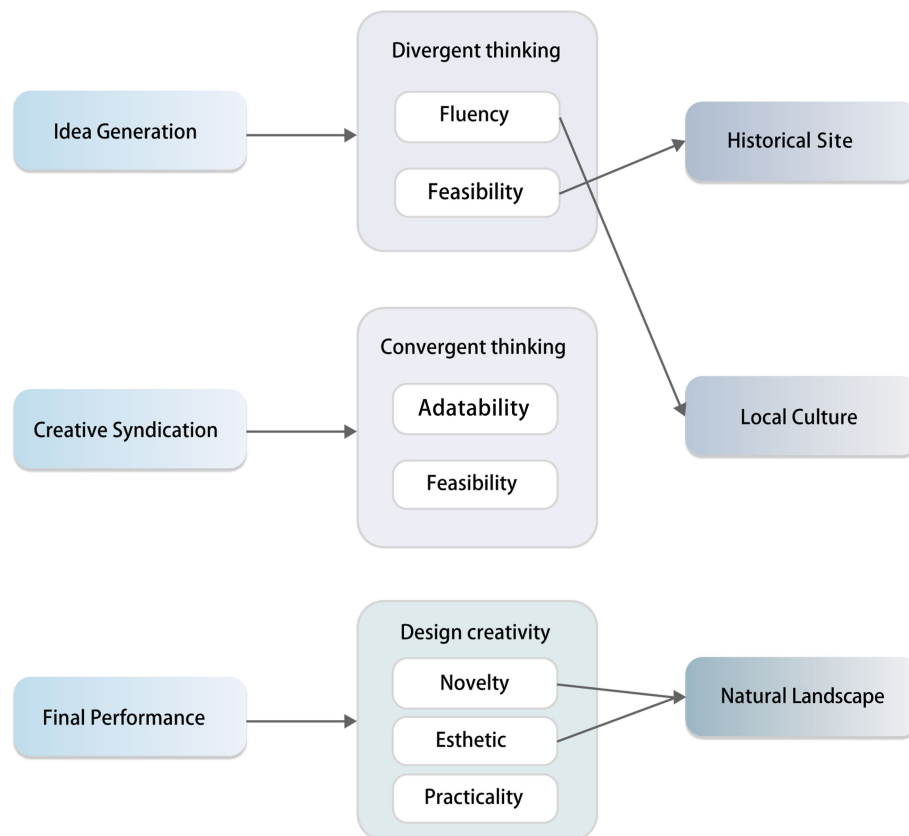


FIGURE 5  
Different sample performance at various design stages.



## 6 Theoretical implications

First, addressing the characteristics of the cultural tourism product design process, this research systematically verified the types of image samples required at different creative stages within the design process. Specifically, it matched different types of image samples (historical site, local culture, natural landscape) to their unique roles across different design stages (divergent thinking, convergent thinking, design creativity) and corresponding dimensions of creativity: The idea generation stage—Divergent thinking (fluency and flexibility indicators). The idea convergence stage - Convergent thinking (adaptability and feasibility indicators). The final design expression stage—Design creativity (novelty, aesthetic appeal, and practicality indicators). Furthermore, a rigorous longitudinal experimental design was employed to validate the causal impact of different image samples on different creative stages. This not only provides a concrete theoretical analytical framework for the creative design process of culture-related products but also offers a paradigm for experimental design and a validation framework for other specialized product design domains.

Second, this research reveals and validates that image content indeed exerts different effects on cultural tourism product design, demonstrating a matching effect between image types and different creative stages. Specifically, local culture samples significantly enhance divergent thinking (fluency), meaning they stimulate broader associations and a greater quantity of ideas. This finding supports the theory that “cultural characteristics stimulate associations.” Conversely, natural landscape samples significantly enhance final design creativity (novelty and aesthetic appeal). Furthermore, the study is the first to discover that local culture samples, while promoting fluency in divergent thinking, may simultaneously inhibit the efficiency of convergent thinking. This reveals the potential “double-edged sword” effect of image materials, thereby enriching the discourse on cognitive transitions and balance within design cognition theory.

Finally, grounded in the cultural meme theory, this study elucidates the underlying mechanisms of these differential effects. Specifically, Natural landscape samples: Their explicit memetic traits (physical characteristics such as color, shape, texture) exert a strong visual impact and enhance cognitive flexibility, thereby reducing designers’ cognitive fixation. Their abstract properties expand the space for cognitive exploration, fostering free association and cross-domain connections. This significantly enhances the novelty of design outcomes and, by aligning with modern aesthetics, improves the aesthetic. Local culture samples: Their recessive genes (non-physical cultural core, including cultural narratives and symbolic meanings) carry deep cultural value and emotional significance. This possesses the potential to stimulate profound associations. However, decoding and transforming these genes depend heavily on the designer’s cultural literacy and transformative skills. Under the constraints of time and experience in the study, participants struggled to effectively activate and transform this potential, resulting in underutilization. Consequently, these samples underperformed in terms of aesthetic and novelty. Historical site samples: These possess both dominant genes (concrete architectural elements, forms) and recessive genes (historical context, cultural connotations). Designers can effectively extract and apply the dominant elements while attempting to reinterpret the recessive cultural meanings within a modern context. This primarily enhances aesthetics through the utilization of dominant elements and the transformative potential of recessive elements. However, the ease of directly extracting concrete

elements imposes limitations on novelty. Therefore, by analyzing the different mechanisms of dominant-recessive-composite genes, this research reveals how different types of image samples exert varied influences on cultural tourism product design. It provides a theoretical reference for efficient pathways in transforming design inspiration.

## 7 Practical implications

This study provides explicit guidance for design educators: during different phases of design instruction (e.g., the brainstorming phase, the solution refinement phase, and the final presentation phase), educators should consciously select the type of image samples best matched to the creativity objectives of that specific phase. It specifically highlights that over-reliance on local cultural materials may inhibit convergent thinking. The study reminds educators to deliberately incorporate designs or materials that promote convergent thinking during training. This helps students balance divergent and convergent thinking, enhancing the feasibility and integration efficiency of design solutions, thereby optimizing the design process. It provides an empirical basis for selecting course content and building material libraries related to cultural tourism product design.

This study also offers insights for design practitioners: they can proactively integrate diverse sample types at different stages of their own design processes to maximize creative output at each phase. For example, local cultural materials can be employed to broaden conceptual thinking, while natural landscape materials may enhance the visual appeal and innovative integrity of final solutions.

Particularly for the final product, this approach facilitates the development of more appealing cultural tourism products that align with contemporary aesthetic trends. It can enhance tourist experiences, promote cultural dissemination, and drive industry growth. The findings indicate that natural landscape materials enhance aesthetic quality and novelty, whereas practicality remains largely unaffected by sample type (being more dependent on product positioning). This underscores the need for designers to maintain independent attention to and ensure the practical functionality of products while pursuing aesthetic and innovative excellence. The study clarifies the unique value of natural landscape as inspiration for enhancing the aesthetic and innovates dimensions of final designs, encouraging designers to transcend conventional reliance on cultural symbols.

## 8 Limitations

The following limitations exist in this study. First, this study primarily employed young designers lacking practical experience as experimental subjects. While this selection facilitates providing guidance for design education and training, professional designers with extensive experience may follow different patterns in their overall design creativity. This indicates that the applicability of the study’s conclusions to the broader population of professional designers may be limited. Second, A limitation of this study lies in the experimental design’s lack of a blank control group. A design group not exposed to any image samples. This omission may also have contributed significantly to the failure to fully identify the specific image types most effective for activating divergent thinking. Future research could employ a more robust experimental design to clarify the distinct role

of image samples in facilitating divergent thinking. Finally, this study did not compare the impact of different sample presentation modalities on the results. For example, the potential effects of emerging technologies such as virtual reality (VR) or augmented reality (AR) in presenting images. Comparisons between images and other media formats, like videos, physical models, or interactive media, were not investigated. Such presentation modalities may differ in their capacity to stimulate the novelty and aesthetic of design creativity. Consequently, the study's conclusions may not fully capture the potential benefits offered by different media types.

## 9 Conclusion

This study systematically analyzes and categorizes, from a creativity perspective, three primary types of image samples: historical site, local culture, and natural landscape. It further explores the specific mechanisms through which these distinct sample types influence designers' creativity. By comprehensively evaluating designers' divergent thinking, convergent thinking, and overall design creativity, the research reveals the concrete mechanisms by which different sample types affect design procedures. Targeted experimental data are provided to substantiate these findings.

First, the results of divergent thinking indicate that local culture samples demonstrate outstanding performance in enhancing ideational fluency. This suggests that samples with strong cultural characteristics can stimulate broader associative thinking and creative output. However, regarding cognitive flexibility, our study found no significant influence from sample types. This implies that sample types play a less pronounced role in the ability to flexibly adjust thinking directions and switch between different cognitive modes compared to their impact on fluency. Subsequently, analysis of convergent thinking revealed an important finding. Analysis of convergent thinking showed no significant differences between the three sample groups. Local culture samples were observed to promote ideational fluency in divergent thinking while simultaneously compromising the efficiency of convergent thinking. This outcome underscores the need to maintain a balance between divergent and convergent thinking in design education. This ensures that the creative process encompasses not only extensive ideational expansion but also effective integration and practical application of ideas.

Second, the results on design creativity reveal that natural landscape samples demonstrate distinct advantages in novelty and aesthetic appeal, attributable to their rich organic lines and streamlined designs. This likely stems from the abstract nature of their dominant visual features, which align with contemporary aesthetic trends. Furthermore, no significant differences in practicality were observed among the three specimen types. Cultural tourism products predominantly focus on daily applications, making it challenging to manifest variations in utilitarian functionality. This finding underscores the necessity of striking a dynamic balance between aesthetic value and practical utility when designing cultural tourism products.

In summary, the findings of this study underscore the importance of leveraging different sample types in design education and practice to maximize the potential of divergent thinking while maintaining the efficiency of convergent thinking. Additionally, they highlight the need to creatively integrate aesthetics, novelty, and practicality in

design. For future research, we suggest further exploration of alternative sources of design inspiration for cultural tourism products, alongside innovative specimen presentation methods. Examples include utilizing modern digital technologies (e.g., AR/VR) to enhance immersive experiences or adopting video-based formats to deepen understanding of cultural artifacts. Such explorations and innovations may not only enrich the sources of inspiration and expressive forms in cultural tourism product design but also elevate designers' creative capabilities, thereby unlocking new development prospects for this field.

## Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

## Ethics statement

The studies involving humans were approved by the Institutional Review Board of the School of Business, Anhui University of Technology (Research Ethics Committee number: SB-AHUT-REC-2024-04-HS01). The studies were conducted in accordance with the local legislation and institutional requirements. Written informed consent for participation in this study was provided by the participants' legal guardians/next of kin.

## Author contributions

LW: Writing – review & editing, Writing – original draft, Funding acquisition, Conceptualization. HW: Writing – review & editing, Writing – original draft. MY: Methodology, Writing – original draft. XQ: Formal analysis, Writing – original draft. WZ: Writing – review & editing, Writing – original draft, Funding acquisition, Supervision.

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## Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

## Generative AI statement

The authors declare that no Gen AI was used in the creation of this manuscript.

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## Supplementary material

The Supplementary material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/fcomm.2025.1619510/full#supplementary-material>

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