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Design-thinking integration in cultural project planning: bridging theory and practice

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ABSTRACT

This qualitative study aimed to bridge the gap between theoretical knowledge and practical skills by developing a design thinking-based innovative pedagogy for creative planning of cultural projects at Shanxi University of Finance and Economics (SUFE). The discover, define, design, develop, and deploy (5Ds) model, an innovative pedagogy grounded in design thinking, was designed with five phases. After evaluation by five cultural project planning experts, the model was refined to align closely with pedagogical objectives. Three primary research instruments were employed: a theoretically derived framework, a meticulously designed lesson plan, and an achievement test. Contextually tailored to Chinese culture, each phase was symbolized by a Chinese lantern, signifying prosperity and the intended positive outcomes of the pedagogy. The phases comprised: i) discover, where consumer needs were analyzed; ii) define, identifying problems and setting objectives; iii) design, focusing on idea generation; iv) develop, involving prototyping, implementation, and revisions; and v) deploy, for final product testing and market introduction. This culturally resonant pedagogical framework supports a comprehensive approach to teaching cultural project planning, fostering innovation, and practical application. Through symbolic integration, the 5Ds model aligns with educational goals while encouraging Chinese students to embrace innovation. Outcomes indicate enhanced teaching quality and instructional effectiveness, addressing existing educational challenges.

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1. INTRODUCTION

China's rapidly evolving cultural industries have created an urgent demand for professionals who can blend traditional cultural elements with contemporary innovation. However, a significant challenge has emerged: a disconnect between academic curricula and the practical skills required by industry [1]–[3]. This gap is particularly evident in the instruction of cultural project planning at Shanxi University of Finance and Economics (SUFE). The core issue lies in the lack of innovative pedagogical approaches in teaching cultural project planning at SUFE. This deficiency has resulted in course outputs that fail to meet the increasingly demanding standards of the dynamic cultural sector [2]. Students often struggle to create culturally relevant projects that resonate with contemporary consumers, grappling with understanding the essence of modern cultural product design [4]. Current teaching methodologies frequently overlook the incorporation of design

thinking, a systematic approach essential for crafting effective solutions to specific challenges within the cultural industry. Despite its recognized capacity to foster innovative problem-solving and creative thinking, there is currently no comprehensive model tailored specifically for cultural project planning at SUFE that integrates design thinking principles. This study is crucial because the current teaching methods for cultural project planning at SUFE are not achieving the desired educational outcomes. As China's cultural industries continue to grow and evolve, there is an urgent need for professionals who can merge traditional cultural elements with contemporary innovation [5], [6]. Without addressing these pedagogical shortcomings, students will continue to struggle in meeting industry standards, potentially hindering their future careers and the development of the cultural sector.

Design thinking emerges as an optimal solution to address the gap between design education and industry needs for several compelling reasons [7]–[9]. It fosters a user-centered approach that encourages students to empathize with the needs of stakeholders, leading to more relevant and impactful cultural projects. Additionally, design thinking cultivates a mindset of innovation and adaptability, which is crucial in the rapidly evolving cultural and creative industries [10]–[12]. By encouraging students to approach challenges with creativity and resilience, this methodology enhances problem-solving skills and equips students with the tools to collaborate effectively across disciplines, ensuring meaningful contributions to diverse cultural initiatives [3], [8], [13].

One of its key strengths is the ability to bridge the divide between theoretical knowledge and practical application. By integrating real-world projects and industry collaborations into the curriculum, design thinking helps students understand the profound essence of modern cultural product design, fostering a deeper appreciation for its complexities while allowing for experimentation and innovation in addressing real societal needs [14]. Moreover, it promotes the development of essential soft skills highly valued in the industry, including empathy, problem-solving, critical thinking, collaboration, communication, and adaptability [5], [7]. In the context of cultural project planning, design thinking encourages students to consider diverse perspectives and cultural nuances, which is particularly valuable in China's cultural industries, where blending traditional elements with contemporary innovation is crucial. Furthermore, it facilitates industry-education alignment by providing a framework for closer collaboration between educational institutions and industry partners [13]. Involving industry professionals in curriculum development and project work ensures that education remains relevant and aligned with current industry needs. The iterative nature of design thinking, with its emphasis on prototyping and testing, teaches students the value of continuous improvement and learning from failure—an essential mindset in the fast-paced cultural and creative industries [15]. Ultimately, design thinking is well-suited for addressing the complex, multifaceted challenges faced in cultural project planning, encouraging interdisciplinary thinking and collaboration that allows students to approach problems from multiple angles and develop holistic solutions [16]–[18]. This approach not only enhances students' problem-solving skills but also prepares them for real-world scenarios where adaptability and innovation are crucial for success.

To address this pressing need, this study employed a qualitative methodology. This approach included a comprehensive review of relevant literature to understand the current state of cultural project planning education and the potential of design thinking in enhancing educational quality. Furthermore, the methodology involved the analysis of case studies that illustrate successful applications of design thinking in various cultural projects, providing practical insights into its implementation and impact on educational outcomes. The study also included drafting an innovative pedagogical model that integrates design thinking principles into the curriculum of cultural project planning, and engaging in discussions with five experts in the field to refine and validate the proposed model, ensuring it is grounded in both theoretical insights and practical expertise. Ultimately, this approach facilitated an in-depth exploration of existing challenges and opportunities in teaching cultural project planning, leading to the development of a tailored pedagogical model aimed at aligning educational practices with industry needs.

This study introduces a pioneering discover, define, design, develop, and deploy (5Ds) design thinking-based innovative pedagogy tailored for cultural project planning at SUFE, uniquely integrating Chinese cultural symbolism (lanterns) with design thinking principles. Unlike existing models, it bridges theoretical knowledge and practical skills in a culturally resonant framework, addressing a gap in culturally specific design thinking applications. Refined through expert feedback, it fosters creativity, empathy, and real-world problem-solving, offering a transformative educational tool. Its contextual adaptation to China's cultural industries and focus on student-centered learning distinguish it as a novel contribution to design thinking in education. It focuses on the cultural project planning course at SUFE in China. However, its implications extend beyond this specific institution. The proposed model seeks to bridge the theory-practice divide, cultivating professionals who can effectively navigate the complexities of China's cultural industries while contributing to human progress and cultural preservation. By fostering creativity, adaptability, and cultural sensitivity among students, this research aspires to prepare them for the demands of a rapidly

changing industry. Ultimately, this study aims to yield invaluable insights and substantial advancements for both students and educational institutions, potentially serving as a model for other universities facing similar challenges in cultural and creative education.

From the research problems, the researcher formulated the following research questions: i) How can a prototype of design thinking-based innovative pedagogy be developed for teaching creative planning of cultural projects at SUFE, China? and ii) In what ways can the design thinking-based innovative pedagogy be refined and improved for the creative planning of cultural projects course at SUFE, China? Accordingly, this study sets forth two primary objectives: i) to create a prototype of design thinking-based innovative pedagogy for teaching the creative planning of cultural projects at SUFE, China and ii) to refine a design thinking-based innovative pedagogy in the creative planning of cultural projects at SUFE, China.

2. LITERATURE REVIEW

2.1. Definition of design thinking and its application in education

As an intellectual construct, "design thinking" emerges from the discipline of design, having garnered significant attention concomitant with the proliferation of human-centered design methodologies during the 1980s [7], [8], [19]. Within the scientific domain, design thinking is conceptualized as a distinctive "cognitive framework." Magistretti *et al.* [19] is recognized as the pioneering scholar who articulated the concept of design thinking. In his seminal work, "the sciences of the artificial," Magistretti *et al.* [19] delineate the distinction between design science and natural science, employing the term "design thinking" to encapsulate the cognitive strategies and processes utilized by designers in addressing design-related challenges. While Villiers [7] and Foster [8] contest Magistretti *et al.* [19] characterization of "design science" as predicated upon a structured approach to problem-solving, they underscore instead the artistic and intuitive faculties that practitioners of design employ to comprehend and resolve complex issues in contexts marked by uncertainty, ambiguity, and instability.

Research by Pinkow [15] has characterized design thinking as a strategic approach to collaborative and creative problem-solving that stems from the methodologies of designers, serving as a mechanism to propel innovation and to organize creative processes across various fields of study. Interest in how designers work and think gradually shifted from the purview of designers and architects to other fields. Coming into the early 21st century, design thinking has been widely studied, accepted, and applied in more fields [20]. Recently, design thinking has become an open field, characterized by gradual overlap with other disciplines, being promoted in research and practice in management, education, medicine, sociology, and other fields [10]. Taking one of the most significant features of design thinking: creativity into account, design thinking is a human-centered approach that aims to solve problems in uncertain and ambiguous situations through the process of using effective design methods conducted by professional designers [16].

In the field of education, Stanford University has achieved integrating design thinking into education and divided the model into five sections: empathy, define, ideation, prototype, and test [17]. The empathy stage emphasizes understanding the needs and perspectives of the end-users. By empathizing with the users, educators can gain insights into their motivations, challenges, and aspirations. The define stage involves synthesizing the information gathered during the empathy stage and identifying the core problems or challenges that need to be addressed. In the ideation stage, creativity and innovation come into play [3]. The team members are encouraged to share their viewpoints and inspire one another, generating as many ideas as possible [17]. Prototype stage involves transforming the selected ideas into tangible forms, such as lesson plans, teaching materials, or classroom activities. Prototyping allows educators to visualize and test their ideas in a real-world context, enabling them to refine and improve their teaching methods based on feedback and observations. The final stage, the test, involves implementing the prototypes in the classroom and evaluating their effectiveness. This stage allows educators to gather valuable feedback from students and other stakeholders [19].

Besides the design thinking model proposed by Stanford University, various scholars have proposed their understandings for applying design thinking in education. The researcher team from Norway has expressed that design thinking is a mode of thinking employed in design-based activities. It can be characterized as a systematic, intelligent process in which designers generate, evaluate, and specify concepts for devices, systems, or processes whose form and function achieve clients' objectives or users' needs while satisfying a specified set of constraints [9]. The evolution of design practices developed at Stanford University has been analyzed, and it has been found that design qualities elucidate design thinking as a cognitive process. A humanistic perspective on innovation theory and practice is offered by this value-driven process [16]. Furthermore, an innovation management schema of design qualities essential for developing design-driven innovation capabilities in organizations and educational institutions is also offered [21]. Meanwhile, Kelly and Gero [13] have discovered that applying design thinking into education mainly contains analyzing the situation, defining the problem, modeling ideas, designing prototypes, predicting

results, questioning unexpected outcomes, and managing the design process. Within the consideration of managing the teaching process, Lynch *et al*. [9] suggest that curriculum design should consider students' active participation, the creation of experiential space, and a combination of guidance from others and self-practice. In contrast, they advocate problem-solving as the primary strategy.

Diverse authors and institutions have made significant contributions in broadening the application of design thinking into education. Having attempted to optimize educational experiences of medical students, Deitte and Omary [22] have applied design thinking in radiology education, having found that design thinking provides innovative solutions in medical education through the design thinking process. Research by Bravo *et al.* [23] has chosen two schools at Chile as research targets, having applied design thinking in solving the educational problems. They found that integrating design thinking into education and teaching can help to improve students' motivation and engagement in learning and to develop students' innovative thinking and problem-solving skills [23].

2.2. Design thinking model for educational administration

The prototype of the innovative pedagogy enhanced by design thinking is greatly associated with the design thinking model. Therefore, in this part, different design thinking models would be introduced concretely. The first design thinking model is the double diamond model. The double diamond model is introduced by the British Design Council, being made up of four stages: discover, define, develop, and deliver [18]. The first stage of discovery is aimed at identifying the user's central demand through things like market and user research and secondary source research. This stage is the divergent stage where design thinkers should maintain a broad lens as they gather knowledge and information. Coming into the defining stage is characterized by design thinkers sifting through the knowledge being acquired to solve the possible problems being identified in the discovery word. After knowing the potential problems and the resources required in the discovery and define stages, the development stage aims to allocate the relevant resources necessary and develop the possible solutions to solve the potential problems. After the available solution is proposed, it is the next step to deliver this solution into practice. In this sense, the delivery stage includes the final testing, marketing, and launch of the solution and encompasses the evaluation and feedback loops for the new design.

The second model is the model created by the International Design for Change. It proposes a methodology of four steps, for children and young people to develop creative proposals to solve problems of their communities. It seeks to develop leadership, empathy, collaboration, and promote analytical thinking and creativity. The stages have pictograms and motivating names as feel, imagine, do, and share [24]. These stages not only encourage active participation but also empower young individuals to take ownership of their ideas, fostering a sense of agency in addressing community challenges.

The third model is called model being used as an innovative teaching approach for teachers teaching instructional lessons [25]. The design thinking and instructional lessons (DTAIL) model is made up of five steps in total: problem defining, perspective discovering, solution exploring, prototype testing, and reflecting. Each phrase compensates for each other, aiming to cultivate student's practical solving problem ability so as to improve learning efficiency furtherly [25]. The DTAIL model consists of five phases aimed at developing students' problem-solving skills [25]. In the problem defining phase, educators help students articulate the problem, fostering critical thinking. The perspective discovering phase encourages exploration of diverse viewpoints, enhancing empathy and understanding. In the solution exploring phase, students brainstorm potential solutions, promoting creativity. The prototype testing phase allows for practical implementation and refinement of ideas based on feedback, building resilience. Finally, the reflecting phase enables students to assess their learning and improve future problem-solving efforts. Together, these phases enhance students' learning efficiency and effectiveness in real-world applications.

The forth design thinking model is an integrated thinking method that combines mature concepts, methods, and tools, widely utilized in the field of education [26]. It serves as a structured framework aimed at enhancing students' career planning abilities, particularly within vocational college settings. The components of this educational model based on design thinking include five key aspects of career planning [26]: i) self-analysis: encouraging students to reflect on their strengths, weaknesses, interests, and values; ii) environmental analysis: helping students assess the external factors that influence their career choices, such as job market trends and opportunities; iii) goal establishment: guiding students in setting realistic and achievable career goals; iv) strategy development: assisting students in formulating actionable plans to reach their career objectives; and v) evaluation and modification: providing a framework for students to assess their progress and make necessary adjustments to their strategies [26]. By aligning these five aspects of career planning with the five steps of design thinking, educators can create a more engaging and effective learning experience. This approach not only enhances students' career planning skills but also fosters a dynamic and interactive educational environment.

2.3. Further application of design thinking into education

Since 2020, literacies relevant to design thinking have continued to evolve. In the field of entrepreneurship education, Mansoori and Lackéus [27] explored the intersection of design thinking and entrepreneurship, focusing on approaches like effectuation and discovery-driven planning. It emphasized identifying opportunities, creating value propositions, and developing business models. Their contribution is suitable for entrepreneurship education and courses that aim to develop innovation and entrepreneurial skills [27]. Taking into consideration the iterative nature of design thinking, the design thinking model first proposed by Pata [16] was further explored. This design thinking model, which incorporated three stages—explore-create-refine—encouraged exploration of ideas, creation of prototypes, and continuous refinement based on feedback [19]. Subsequently, a dual-process model for addressing complex design problems was offered, combining design thinking with computational thinking. It incorporated elements like systems thinking, abstraction, and algorithmic thinking, available for science, technology, engineering, and mathematics (STEM) education and courses that involve digital design and development [28].

Despite the growing body of research on design thinking, several gaps that current literacies remain. While design thinking has been widely applied in various fields, its application in cultural project planning education remains limited. Additionally, there is a need for more qualitative research on the specific educational model based on design thinking to bridge this theoretical gap. By developing and refining an innovative pedagogy specifically tailored for the cultural project planning education, the proposed 5Ds design thinking-based innovative pedagogy aligns with established design thinking principles, and incorporates elements from various design thinking models. This integration ensures a comprehensive and structured approach to teaching cultural project planning, fostering key skills such as empathy, collaboration, creativity, and problem-solving.

2.4. Design thinking framework adoption

The necessity for a design thinking model in culture-related subjects in China is increasingly evident. As cultural education evolves, it is essential to adopt innovative pedagogical frameworks that can effectively address the complexities of cultural dynamics and social issues [6]. Design thinking, with its core principles of empathy, ideation, prototyping, and testing, serves as a powerful tool to enhance cultural education. In a rapidly changing society, students must develop sophisticated problem-solving skills that allow them to navigate cultural nuances and challenges. By integrating design thinking into culture-related subjects, educators can foster a collaborative environment where students actively engage with diverse perspectives and learn to empathize with various cultural contexts.

This approach not only enriches their understanding of cultural heritage but also equips them with the ability to address contemporary cultural issues creatively and effectively. Moreover, a design thinking model encourages students to prototype solutions and rigorously test their ideas, promoting a hands-on learning experience that aligns with real-world applications. This is particularly relevant in China, where the interplay of tradition and modernity presents unique challenges that require innovative solutions. By empowering students with a user-centered approach, we can cultivate a generation of culturally aware individuals who are capable of contributing positively to society. In conclusion, the integration of design thinking into culture-related subjects in China is not just beneficial; it is essential for preparing students to tackle the complexities of cultural understanding and social cohesion in an increasingly interconnected world.

3. RESEARCH METHOD

3.1. Study design

The research ethics for this study were deemed exempt due to its classification as low-risk research. This designation indicates that the potential for harm or discomfort to participants is minimal. Additionally, the consent form provided to all participants clearly stated that their involvement was entirely voluntary. They were informed that they had the right to withdraw from the study at any time, ensuring that their participation was based on informed consent and respect for their autonomy. This approach aligns with ethical research practices, safeguarding the rights and well-being of all participants involved in the evaluation of the innovative pedagogy. The research primarily employs qualitative methodology to develop and refine an innovative pedagogy grounded in design thinking. It specifically aims to propose and cultivate a design thinking-based pedagogy that aligns with the professional teaching of creative planning for cultural projects. The process commenced with the creation of an original prototype of design thinking, which the researcher successfully completed. Subsequently, based on this prototype, an original iteration of the design thinking-based innovative pedagogy was formulated. This iteration was then subjected to evaluation by five experts, who assessed the effectiveness of the proposed pedagogical approach. Informed by the experts' feedback, the researcher undertook a refinement of the prototype, ultimately resulting in the establishment of a final model of innovative pedagogy.

3.2. Research instruments

In the present study, two distinct research instruments have been employed to facilitate comprehensive analysis. The first instrument is derived from the framework established in the literature review, which provides a theoretical foundation for the investigation. The second instrument is a meticulously designed lesson plan, which serves to elucidate the intricate context of the subject matter under consideration. Finally, the third instrument is an achievement test, which enables experts to assess and quantify the measurement of contextual understanding. Together, these instruments contribute to a robust methodological approach, ensuring a thorough exploration of the research objectives.

3.2.1. Design thinking framework

The significant pedagogical approach was meticulously developed based on the foundational tenets of design thinking. Design thinking serves to highlight the critical role of empathy towards prospective stakeholders, assist learners in engaging in ideation sessions to generate innovative concepts, and propose viable solutions. Through an assessment of the proposed solutions, it further encourages learners to create prototypes and evaluate their efficacy. Considering the instructional requirements of the creative planning of cultural projects, the rationale for implementing the design thinking framework may be derived from its exceptional capacity to foster advanced problem-solving skills, encourage a cooperative learning atmosphere, and impart to learners a deep understanding of the end-user's needs and the challenges they encounter [29], [30]. By incorporating design thinking into the educational framework, this paradigm could equip students with the capabilities to confront intricate challenges through creativity, empathy, and innovative approaches.

3.2.2. Lesson plan

The lesson plan was mainly used in the implementation process of the innovative pedagogy. The ultimate goal of the creative planning of cultural projects was to cultivate students' abilities in finding the empathized point with central targets and developing high-quality and modernized culture prototypes. Thus, the lesson plan primarily adopted a student-centered teaching approach by designing various teaching activities such as user research design, demand analysis, idea generation, prototype design, test iteration, and other teaching activities. The theoretical knowledge of the creative planning of cultural projects was finally combined with the methods and tools of design thinking, broadening students' innovative thinking, and improving their ability to apply theoretical knowledge to practice. On the other hand, the corresponding lesson plan cultivated "application-oriented" talents who can solve practical problems.

3.2.3. Achievement test

The final stage of the design thinking process is testing. Consequently, it is imperative to develop an appropriate assessment to evaluate the effectiveness of the proposed innovative pedagogy. In alignment with the new lesson plan, this assessment was structured as a multiple-choice test that encompasses the requisite knowledge and skills necessary for designing cultural project components. Additionally, it includes a series of integrated questions that combine elements of design thinking with cultural project development. By concentrating on assessing students' actual capabilities in creating modernized cultural projects, the achievement test was administered at the conclusion of the instructional period.

4. RESULTS AND DISCUSSION

4.1. A development of the design thinking prototype

The prototype was conceived through a comprehensive examination of established design thinking frameworks delineated within the scholarly literature. Theoretically, numerous models were identified as exceptionally appropriate. There exist two categories within the framework: the foundational design thinking model developed by the Stanford Center for Professional Development, which encompasses five distinct stages [9], [19], [25], [26], [31], [32], and an alternative model proposed by Lynch *et al*. [9] which consists of four stages. Figure 1 exemplifies the iterative process involved in the development of the design thinking prototype, which is composed of two separate phases.

Step one involved proposing design thinking concepts from literature to a group of experts. The researcher presented these two design thinking models and explained why they are suitable for the subject of cultural project planning. The design thinking model proposed by the Stanford Center incorporated five phases: empathy; define; ideate; prototype; test and refine. Each stage complements the others and functions cohesively. The empathy phase helps explore the points that motivate consumers. Based on these insights, the define stage helped to confirm specific objectives. Using these objectives as a foundation, the ideate phase promoted the exploration and formation of diverse ideas. In cultural project planning, transforming

innovative ideas into actual mock-ups and action plans was essential. In this context, the prototype phase is advantageous for transforming abstract ideas into tangible realities [6]. The test phase examined the quality of the prototype and provides feedback, leading to more effective and impactful outcomes.

Another selected design thinking model is in entrepreneurship education at a Norwegian university, focusing on a master's level course in corporate entrepreneurship [9]. The research provides valuable insights into how combining technology and entrepreneurship through design thinking can enhance students' learning experiences in higher education. The analysis of students' reflections revealed four main themes: i) Being challenged: students found the course demanding due to task complexity, team dynamics, and time constraints. While initially stressful, most students ultimately viewed these challenges as valuable learning opportunities that pushed them out of their comfort zones; ii) Developing tangential skills: participants reported significant improvements in various soft skills, including empathy, teamwork, communication, networking, and handling ambiguity. These skills, often not explicitly taught, emerged as a result of the course structure and design thinking process; iii) Developing knowledge: students gained specific knowledge about commercializing technology and design thinking as a method. They appreciated learning about both the theoretical aspects and practical applications of these concepts in a corporate setting; and iv) Seeing real-life application: many students reported immediate applications of their learning in their current jobs, future careers, and even personal lives. This transfer of knowledge beyond the classroom setting indicates a deep and transformational learning experience. The study findings suggest that design thinking can be an effective approach for teaching entrepreneurship to science and engineering students in Norwegian higher education, providing them with both technical knowledge and essential soft skills for the 21st century workplace.

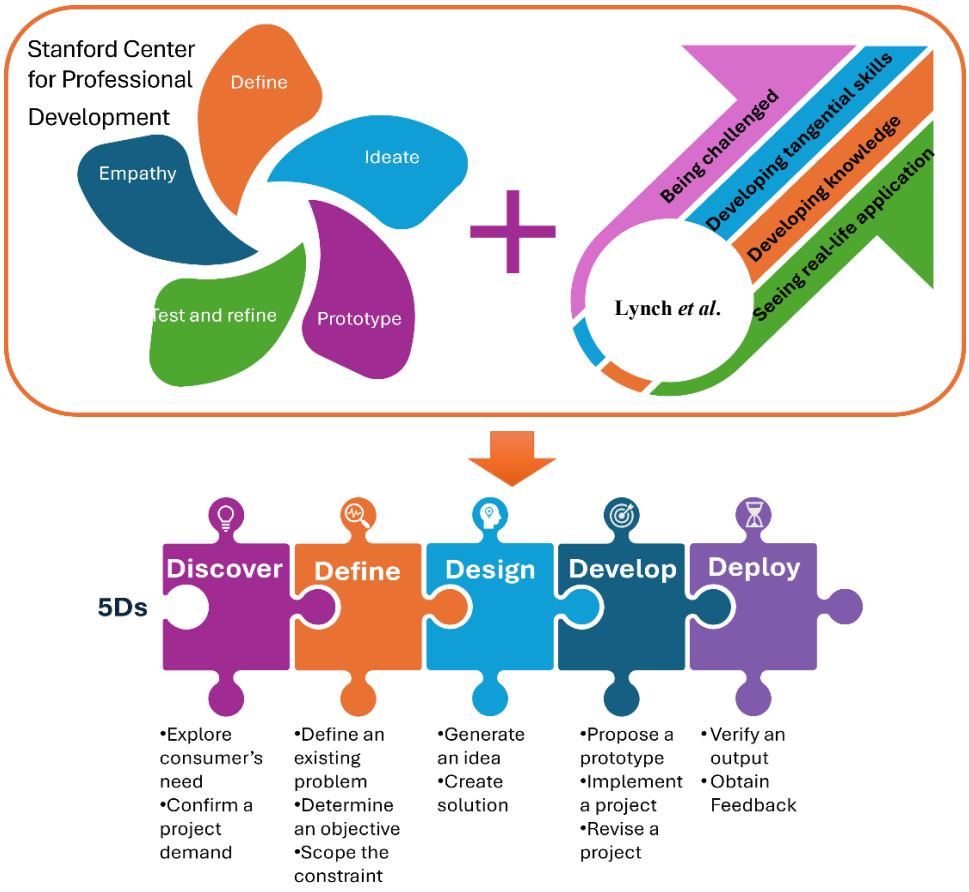

Figure 1. Conceptual framework for developing the design thinking prototype

Step two involved conducting a brainstorming session with a group of five experts. The discussion aimed to develop a prototype for the design thinking model. Firstly, although the Stanford Center model provided a comprehensive framework for design thinking, it lacked specific guidance on incorporating cultural aspects into the process. Meanwhile, the model proposed by Lynch *et al.* [9] did not explicitly address the iterative nature of cultural project planning. Therefore, there was a need for an integrative model

combining design thinking elements with cultural elements. Secondly, the five experts proposed several recommendations for the 5Ds pedagogy. To begin with, the 5Ds pedagogy should incorporate cultural context by analyzing cultural trends, traditions, and preferences of the target audience. It should emphasize the importance of understanding the cultural context of the project. Additionally, the model should explicitly incorporate mechanisms for iterative development and refinement of the project plan, including regular feedback loops, prototyping, and testing. Furthermore, the 5Ds pedagogy should be designed to evaluate students' design thinking skills, creativity, and problem-solving abilities.

Step three involved proposing a prototype of the 5Ds pedagogy, integrating design thinking elements and cultural elements. The 5Ds prototype consisted of five phases: discover, define, design, develop, and deploy. Discover phase aimed to identify the central target. The origin of cultural project design lied in meeting consumer demand. Thus, the instructor should guide students to explore consumer needs to accurately confirm the project demand. In the define phase, problems, objectives, and constraints were accurately oriented. Based on the project demand, the project group determined a research objective. Additionally, defining existing problems and scoping constraints, such as budget and time, were crucial for forming a solution [29]. Design phase involved generating effective ideas and creating corresponding solutions based on the analysis of current problems and constraints [33]. Develop phase focused on proposing the prototype and implementing the project. Proposing the prototype transformed abstract ideas into reality, while implementing the project provided further guidance for revision. Finally, in the deploy phase, the effective output was verified and introduced to the market to obtain feedback from consumers. This integrated model, combining design thinking with cultural project planning, aimed to bridge the gap between theoretical knowledge and practical application, ensuring students are well-equipped to tackle complex challenges in the cultural industries.

4.2. A development of a design thinking-based innovative pedagogy

In developing a design thinking-based innovative pedagogy for the course creative planning of cultural projects at SUFE, an educational model called the 5Ds pedagogy was created through two main research instruments: a detailed lesson plan and an achievement test. The initial phase of this research involved the meticulous development of a comprehensive framework. Building upon the proposed design thinking prototype, the original 5Ds model was refined to better accommodate the intricacies of the teaching process. This refinement was achieved through a collaborative discussion among five domain experts, who collectively crafted a lesson plan, and an achievement test tailored to the specific requirements of cultural project planning, ensuring alignment with the overarching principles of design thinking.

The lesson plan was at the core for the conduction of the 5Ds innovative pedagogy in creative planning of cultural projects. To be more accurate, the course consisted of 32 units teaching with four units in two weeks teaching the basic concepts and theory relevant to culture and cultural projects. Corresponding to the new lesson plan of the proposed innovative pedagogy. This new lesson plan spends eight units on teaching students' basic concepts and essential theories in the form of course discussion, helping students to gain better understanding about the core concepts and necessary cultural elements in the project designment process.

In the next step, completely different from traditional teaching plans, the new lesson plan adopted 16 units of practical teaching. By adopting the "student-orientated" teaching method, each six students were divided into one cultural project group and given an existing cultural project gained enormous success in the design field. Each group discussed the designment process of the cultural project and summarized the key components contributed to the success of the current teaching process. Once the analysis was completed, the whole cultural project group spent 30 minutes in the class to illustrate their results. After the project analysis, each group spent six units in conducting a self-thinking cultural project: with one unit defining the project themes, two units in designing the original prototypes, two units in finishing the cultural project designment, and one unit in testing the cultural project. Regarding the last eight units, all of the cultural project groups shared their final results with other cultural project groups together and the teaching committee gave the concrete analysis and critics toward the final projects.

The achievement test was taken advantage in evaluating the 5Ds innovative pedagogy. The proposed 5Ds innovative pedagogy cultivated student's ability mainly in five aspects: discovering the user's need, defining the problems, designing the prototype, developing the solution, deploying the strategy, based on which the achievement test was designed. In the process of designing the achievement test, the five involved experts had set two concrete standards. The first standard stressed the alignment with cultural project planning goals. To be more specific, each test item must comprehensively address the specific goals of the cultural project planning curriculum. The second standard is mainly based on the statistical measurability of the test items. Regarding the items that could not be measured through standard statistical methods, they were excluded from the final test.

This rigorous review process has resulted in the selection of 88 items that met the established criteria, ensuring that the test could measure students' proficiency and the alignment of their learning with the course objectives effectively. In the 88 items, each item belongs to one of the mentioned five sections. Thus, the five sections have 7, 24, 18, 34, 15 test items separately.

The 5Ds prototype comprised of five phases: i) discover: this phase focused on identifying the central target by understanding consumer needs, which form the basis of accurate project demands; ii) define: problems, objectives, and constraints were clearly oriented, ensuring that project goals were well-defined and aligned with practical limitations such as budget and time; iii) design: based on the identified problems and constraints, the project group generated effective ideas and creates corresponding solutions; iv) develop: this phase involved proposing prototypes and implementing the project, transforming abstract ideas into tangible outcomes and guiding further revisions; and v) deploy: the final phase verified the project's effectiveness and introduced it to the market to gather consumer feedback.

The advancement of 5Ds pedagogy seeks to reconcile the disparity between abstract theoretical constructs and their pragmatic implementation in the context of cultural project development. Through the integration of design thinking principles and emphasis on cyclical progression and enhancement, this groundbreaking pedagogical approach equips students with the requisite skills to address multifaceted issues within the cultural sectors. Thus, it can foster their design thinking competencies, imaginative capacities, and analytical problem-solving proficiencies in practical settings.

4.3. Refinement of the 5Ds design thinking-based innovative pedagogy

Following an extensive evaluation conducted by a panel of five distinguished experts, the innovative pedagogy grounded in design thinking has undergone refinement, culminating in the establishment of the 5Ds design thinking-based innovative pedagogy. Figure 2 elucidates the model, which comprises five discrete phases: discover, define, design, develop, and deploy, thereby offering a systematic framework for the education of cultural project planning. The 5Ds design thinking-based innovative pedagogy has been conceived within the profound context of Chinese cultural heritage, with each phase symbolized by a Chinese lantern. In the context of Chinese tradition, lanterns signify prosperity and auspiciousness, encapsulating the aspirations and favorable results that this pedagogical approach seeks to accomplish [32], [34]. By integrating these culturally significant symbols, the 5Ds model not only aligns with educational goals but also resonates profoundly with Chinese students, motivating them to embrace and adopt this avant-garde methodology. The figure encompasses tasks from two perspectives that of the instructor and that of the student.

Instructor	Explore fundaments of culture and cultural project	Extract and define attributes of cultural project	Generate culturally aligned strategy	Transform strategy into original	Adopt market segmentation strategy
Student	Explore concept of the cultural projects and select appropriate manifestations	Define objectives and confirm project characteristics	Develop a comprehensive and creative plan	Implement the plan and form the final cultural product	Verify an output and gather consumer's feedback

Figure 2. 5Ds design thinking-based innovative pedagogy

4.3.1. Discover

In cultural project planning, the primary goal was to design projects that satisfy consumer needs, placing the consumer at the core. The discover phase involved diverse explorations led by the instructor, who guided students to understand the fundamentals of cultural projects. Students engaged in confirming the

concepts of cultural projects and selecting appropriate manifestations. Through this process, they ultimately uncover the real commercial demand of consumers, which provided specific directions for conducting the project.

4.3.2. Define

The commercial demand identified in the discover phase guided the planning of the cultural project. In the define phase, the instructor extracted and defined unique attributes of the selected cultural project. This step ensured that students could set clear objectives and characteristics for the project. Comprehensive analysis of these attributes leads to high-accuracy definitions of the final cultural product's characteristics.

4.3.3. Design

The design phase focused on proposing strategies and adopting appropriate plans to promote the project. The success of the project hinges on selecting a strategy that meets both the commercial demand and the defined characteristics of the final cultural products. The instructor identified an effective strategy that engages consumers, while students developed concrete plans to implement this strategy. The result is a well-designed plan and creative strategy.

4.3.4. Develop

In the develop phase, ideas and concepts from previous stages were transformed into tangible forms. The instructor oversaw the development of the confirmed strategy and transformed the concrete plans into the original form of creative cultural-centric products. Students play a crucial role in developing and forming the prototype of the finalized cultural products. This stage provides valuable insights for refining project plans and finalizing the product.

4.3.5. Deploy

The deploy phase was the culmination of the 5Ds pedagogy. It focuses on the marketization of the final prototype. The instructor selected and adopted market segmentation strategies to ensure the products function effectively. Students obtain feedback from consumers and deploy revised solutions and updated products. The outcome is a successful creative cultural product ready for the market.

The 5Ds design thinking-based innovative pedagogy began with discovering commercial demand, defining product characteristics, and proposing corresponding strategies and plans in the define and design phases. In the development phase, prototypes were created, providing both the instructor and students with intuitive graphics for further refinement and deployment. The deploy phase transformed project plans into real creative products and ensures their marketization. This comprehensive approach covered all sections of cultural project planning and offered practical guidance for cultural project planning education. Through the symbolism of the lanterns, the 5Ds model not only represented the stages of design thinking but also integrated cultural significance, enhancing its relevance and appeal to Chinese students. The hope was that all Chinese students will adopt this 5Ds approach, benefiting from its comprehensive and culturally resonant framework for innovative cultural project planning.

4.4. Research limitation

This current study's focus on a specific program at a single Chinese university should be viewed as a strength rather than a limitation. By concentrating on students majoring in creative planning of cultural projects at this institution, the research provides an in-depth, context-specific analysis that is highly relevant to the Chinese higher education landscape. This targeted approach allows for a nuanced understanding of how design thinking can be effectively integrated into culturally relevant entrepreneurship education within the unique cultural and academic environment of China. Furthermore, the involvement of experts with extensive experience in the field, Chinese cultural contexts, and design thinking methodologies significantly enhances the validity and applicability of the research. Their expertise ensures that the innovative pedagogy is not only theoretically sound but also practically relevant to the Chinese educational and cultural setting.

This combination of local expertise and design thinking knowledge provides a robust foundation for developing a culturally resonant pedagogical framework. The specificity of the sample and the involvement of experienced experts enable a more detailed examination of the pedagogical approach's impact on students within the Chinese cultural context. This focused perspective offers valuable insights that can be directly applied to improve and refine culturally relevant entrepreneurship education programs in China and potentially in other Asian countries with similar cultural backgrounds. While the findings may not be universally generalizable, they provide a solid foundation for future research and offer a model that can be adapted and tested in other Chinese universities and programs. This study serves as a crucial first step in understanding the effectiveness of design thinking in culturally relevant entrepreneurship education within

the Chinese context, paving the way for broader applications and further investigations across the country's higher education sector.

4.5. Discussion

The research objectives of this study focus on creating and refining a design thinking-based innovative pedagogy for teaching creative planning of cultural projects at SUFE, China. The discussion of the findings in relation to these objectives reveals several important insights.

4.5.1. Objective 1: creating a prototype

The creation of a prototype for a design thinking-based innovative pedagogy addresses a significant gap in the current teaching process of cultural project design. By integrating the concept of creative planning of cultural projects into design thinking, the proposed model offers a potential solution to the shortcoming of achieving continuous innovation in cultural project design. The prototype developed in this study emphasizes a human-centered approach, focusing on empathy, collaboration, and iteration to solve complex problems. This approach is particularly relevant in the context of cultural project planning, where understanding and addressing human needs is crucial. By placing students at the center of the learning process, the prototype stimulates practical application of knowledge, which is a departure from traditional teaching methods. This aligns with Mishra [20] that design thinking can be a significant instrument for facilitating interdisciplinary education. Furthermore, it corresponds with the research conducted in Cyprus that formulates a design thinking model which underscores a human-centric approach [4].

This finding is consistent with prior research that emphasizes the application of design thinking as a crucial methodology for enhancing problem-solving skills, which are increasingly recognized as essential soft skills in various professional contexts [8], [23], [24], [29]. By leveraging design thinking, individuals can approach complex challenges with a structured yet flexible mindset, fostering creativity, collaboration, and innovative solutions. This alignment underscores the importance of integrating design thinking principles into educational and training programs to cultivate these vital competencies in future leaders and problem solvers. The integration of design thinking principles into cultural project planning education represents an innovative approach that has been rarely implemented in culture-relevant courses. This addresses a research gap by effectively classifying the most important components of design thinking and integrating them to form a comprehensive innovative teaching tool for a specific subject.

4.5.2. Objective 2: refining the pedagogy

The refinement of the prototype, based on expert feedback, led to the final 5Ds design thinking-based innovative pedagogy. This refined model addresses several key aspects.

a. Practical learning

The pedagogy promotes a deeper understanding of key cultural elements essential in cultural project design. It equips students with the necessary knowledge to apply theoretical concepts in practical scenarios, enabling them to navigate more complex cultural projects in the field. It bridges the gap between theoretical knowledge and practical application, representing a transformative teaching approach in cultural project planning education. This aligns with prior research indicating that the iterative process of design thinking significantly enriches students' comprehension and application of knowledge, fostering their ability to tackle intricate cultural projects with greater proficiency [3], [14].

b. Real-world problem solving

By participating in authentic cultural projects, students can apply their learning to solve real-world problems, gaining valuable experience. This approach addresses the research gap by forming a student-centered practical learning model and obtaining iterative feedback loops. This aligns with previous research that highlights how the design thinking process helps students transition from uncertainty to acquiring new practical knowledge [8], [13], [17], [19], [23], [29].

c. Bridging theory and practice

The pedagogy effectively bridges the gap between theoretical knowledge and practical application, representing a transformative teaching approach in cultural project planning education. This innovative approach fills a critical gap in current research by tailoring design thinking principles to the unique challenges and requirements of cultural education, rather than merely replicating existing frameworks [7], [32].

d. Unique cultural focus

Unlike existing design thinking models that are often applied as general management tools, this pedagogy is specifically tailored for cultural project planning. It provides comprehensive teaching plans and details, offering more guiding significance for further teaching programs in culture-related professional education courses. This aligns with previous research indicating that design thinking is a vital approach for transforming abstract knowledge into practical skills, as the design thinking process offers diverse experiential opportunities that enhance learning and application in real-world contexts [18], [25].

In conclusion, the creation and refinement of this design thinking-based innovative pedagogy represent a significant contribution to the field of cultural project planning education. The refined pedagogy goes beyond simply applying existing design thinking models like the double diamond model. Instead, it transforms design thinking into a unique teaching method specifically designed for cultural project planning education. This addresses a gap in current research, which often relies on existing models without adapting them to the specific needs of cultural education. This aligns with previous studies that highlight how design thinking not only enhances students' soft skills but also enables them to engage with contemporary technology effectively. By addressing the shortcomings in current teaching processes and providing a practical, student-centered approach, this pedagogy offers a promising solution for enhancing innovation and practical skills in cultural project design. Its unique focus on cultural projects and comprehensive implementation guidelines makes it a valuable tool for educators in this field, potentially transforming the way cultural project planning is taught and learned.

4.6. Recommendation

To fully harness the insights derived from these findings, it is imperative to implement the 5Ds model within cultural studies programs at Chinese higher education institutions. This strategic integration aims to cultivate an environment that nurtures innovation and creativity among students. To facilitate this transformation, it is essential to develop comprehensive training programs tailored specifically for educators. These programs should focus on equipping them with the necessary skills to effectively apply design thinking methodologies within the context of cultural education. Moreover, the establishment of a centralized repository containing a diverse array of culturally relevant case studies and projects is crucial. This resource will serve as a vital tool for educators and students alike, providing practical examples that illustrate the application of the 5Ds model across various cultural domains. In addition, fostering partnerships with cultural organizations and industry stakeholders is paramount. Such collaborations will create a bridge between academic learning and the professional world, offering students the opportunity to engage in real-world challenges. By tackling these challenges, students can effectively apply their design thinking skills in practical scenarios, thereby enhancing their educational experience and preparing them for future careers in the cultural sector.

To enhance the effectiveness and sustainability of the 5Ds model in cultural education, it is imperative for universities to integrate recommended strategies into their policy frameworks. By formalizing these initiatives within institutional policies, a systematic approach to fostering innovation and collaboration across disciplines can be ensured. Universities should adopt policies that mandate the establishment of regular feedback loops involving students, educators, and industry partners, facilitating continuous refinement of the 5Ds model and its implementation. These policies should also encourage the development of assessment tools that evaluate both creative thinking processes and the tangible cultural products produced by students. International collaboration is essential, inviting educational institutions from other countries to participate in inter-institutional design thinking competitions that focus on solving cultural heritage challenges. Such collaboration promotes innovation and encourages the cross-pollination of ideas and practices, enriching the educational experience for students globally. Additionally, universities should actively seek partnerships with businesses and industries to co-develop innovative products stemming from the design thinking process. Engaging with industry leaders allows students to gain real-world insights and experience while businesses benefit from fresh ideas and innovative solutions to cultural heritage challenges.

The incorporation of artificial intelligence technologies can further enhance the quality and efficiency of the design thinking process, as artificial intelligence or AI can streamline research, analyze data, and assist in the prototyping and visualization of cultural products, ultimately accelerating the development of high-quality outcomes. Establishing a national network of design thinking hubs specializing in cultural education will facilitate knowledge sharing and best practices across higher education institutions in China, serving as a platform for collaboration, resource sharing, and the dissemination of innovative pedagogical approaches. Conducting longitudinal studies is essential to track the long-term impact of this pedagogical approach on graduates' career outcomes and their contributions to cultural industries. The findings from these studies can inform policy decisions and further enhance the educational framework. By implementing these recommendations, universities can create a robust ecosystem that fosters creativity, innovation, and collaboration, ultimately leading to meaningful contributions in the realm of cultural heritage and beyond. This comprehensive strategy benefits students and institutions while strengthening the cultural sector by producing graduates who are well-equipped to navigate and contribute to an evolving landscape. This study advances cultural project planning education through the culturally attuned 5Ds model, enhancing theory-practice integration. Future research should explore its scalability across institutions, integration with AI technologies, and longitudinal career impacts to refine and broaden its applicability.

5. CONCLUSION

This research presents a significant advancement in the pedagogical landscape of cultural project planning through the development of the 5Ds design thinking-based innovative pedagogy. By integrating design thinking principles with culturally resonant elements, particularly within the rich tapestry of Chinese culture, this model not only enhances educational practices but also addresses the specific needs of the cultural industries. The structured, iterative framework of the 5Ds model, symbolically represented by Chinese lanterns—serves as a powerful metaphor for the prosperity and positive outcomes that this innovative pedagogy seeks to foster among students. The meticulous development of this prototype, grounded in rigorous feedback from domain experts, underscores the iterative nature of design thinking, emphasizing continuous improvement and adaptation. This research effectively bridges the critical gap between theoretical knowledge and practical application, equipping students with essential skills that are increasingly vital in an AI-driven world. The emphasis on empathy, idea generation, prototyping, and iterative testing within the 5Ds model prepares students to navigate the complexities of cultural industries, thus reaffirming the relevance of design thinking in contemporary education.

Furthermore, as the field continues to evolve, the potential for integrating emerging technologies such as artificial intelligence, virtual reality, and augmented reality within the 5Ds framework opens new avenues for immersive and interactive learning experiences. This research not only confirms the value of design thinking in education but also extends its application to foster innovation and cultural preservation in an era marked by rapid technological advancement. In essence, the proposed 5Ds design thinking-based innovative pedagogy stands as a testament to the transformative power of education, advocating for a holistic approach that harmonizes theoretical insights with practical execution. It encourages students to embrace innovation while remaining anchored in their cultural heritage, ultimately contributing to the development of skilled professionals who are well-prepared to meet the challenges of the future. As such, this study represents a meaningful contribution to both educational practice and theoretical advancement, paving the way for further research that can explore the integration of advanced technologies within this innovative pedagogical framework.

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C : **C**onceptualization
M : **M**ethodology
So : **So**ftware
Va : **Va**lidation
Fo : **Fo**rmal analysis
I : **I**nvestigation
R : **R**esources
D : **D**ata Curation
O : Writing - **O**riginal Draft
E : Writing - Review & **E**diting
Vi : **Vi**sualization
Su : **Su**pervision
P : **P**roject administration
Fu : **Fu**nding acquisition

CONFLICT OF INTEREST STATEMENT

Authors state no conflict of interest.

INFORMED CONSENT

We have obtained informed consent from all individuals included in this study.

ETHICAL APPROVAL

The research related to human use has been complied with all the relevant national regulations and institutional policies in accordance with the tenets of the Helsinki Declaration and has been approved by the authors' institutional review board or equivalent committee.

DATA AVAILABILITY

The data that support the findings of this study are available on request from the first author, [SZ]. The data, which contain information that could compromise the privacy of research participants, are not publicly available due to certain restrictions.

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