

Article

Intangible Cultural Heritage Course Design in the Digital Age and Its Effects of Interdisciplinary Workshop

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Abstract: This study demonstrates a new intangible cultural heritage (ICH) design course and its effectiveness of interdisciplinary teams with digital technology beyond conventional single-disciplinary teams. A design guideline for ICH was built on the basis of Bronfenbrenner's Ecological Systems Theory (EST). Then, an evaluation standard involving five criteria (culture fit, creativity, aesthetics, experientiality, diversity) was established. Thirty students participated in the course and were divided into four teams of two types as follows: two interdisciplinary teams consisting of students from different backgrounds and two single-disciplinary teams consisting of students from the visual communication department. Experts assessed the design works and design process of the four teams according to the evaluation criteria as follows: (1) there are differences in the application of the ICH design guideline between the interdisciplinary approach with digital technology and the conventional teaching method, and (2) the ICH design course positively affects the five criteria. The interdisciplinary approach with digital technology in ICH design is more likely to stimulate students' creativity. These findings emphasize the importance of new ICH design courses and provide insights for future design educators.

Keywords: intangible cultural heritage; Bronfenbrenner's Ecological Systems Theory; design guideline; evaluation criteria; digital technology; interdisciplinary team



Citation: Xia, J.; Yuizono, T.; Wang, T.-Y.; Kim, E. Intangible Cultural Heritage Course Design in the Digital Age and Its Effects of Interdisciplinary Workshop. *Educ. Sci.* **2024**, *14*, 325. <https://doi.org/10.3390/educsci14030325>

Academic Editor: Kendall Hartley

Received: 30 January 2024

Revised: 5 March 2024

Accepted: 9 March 2024

Published: 18 March 2024



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1. Introduction

UNESCO's Convention for the Safeguarding of intangible cultural heritage (ICH) (2003) recognizes that ICH transmission by formal and nonformal education becomes an important key for its safeguarding [1]. Since then, the Culture and Education Sectors of UNESCO have jointly launched an Information Clearinghouse on Living Heritage and Education [2], which aims to promote living ICH in the form of synergistic development of ICH transmission and tertiary education. It means that instead of freezing ICH in a pure and traditional form [3,4], it rather allows the knowledge, skills, and content of ICH to be preserved through education. Its forms of ICH can be dynamic to fit different societies [5,6]. Education plays an important role in the transmission and development of ICH [7,8]. In particular, the combination of art and design education and the inheritance of ICH is considered more meaningful [9]. Many art majors in colleges and universities offer courses on ICH art to cultivate ICH art talents to promote the inheritance and protection of ICH [10].

However, the ICH design course faces several challenges and many problems. One challenge is that the dynamics and meaning of ICH are difficult to present in traditional two-dimensional design work [11,12]. In addition, in the ICH design course, students often superficially understand ICH, and many of the design works are formalized by ignoring the derived meaning of ICH [13]. Moreover, the design works have low creative diversity

and weak interactivity, which fail to arouse people's interest. Therefore, there is a need to design a new ICH design course to guide students' learning.

In recent years, digital communication and preservation have gradually become the focus of attention at the World Heritage Conferences. Several researchers have combined digital technology with ICH design education and argued that digital technology can better represent the characteristics and active parts of ICH and help to express the implicit and fleeting meanings of ICH movements and behaviors [14,15]. Other scholars advocated to use interdisciplinary approaches in higher education [16–18] to promote idea generation [19] and the development of multidimensional solutions [20] and to generate new knowledge in the process [21–23].

Nevertheless, researchers' attention to the construction of an ICH design course is still lacking. ICH design is limited in the class. Its design involves the history of ICH, national culture, national beliefs, knowledge of art and design, digital technology, etc. The class does not provide students with comprehensive knowledge and information about ICH. Bronfenbrenner's Ecological Systems Theory (EST) provides a new perspective for organizing learning research on ICH design. Bronfenbrenner's EST emphasizes that learning occurs within a system that contains multiple nested domains [24]. This system includes the learners at the center of the system; a microsystem in which the individual learner is at the center; a mesosystem that emphasizes interactions between environments within the learner's immediate environment; an exosystem that emphasizes interactions between environments outside of the immediate environment; a macrosystem that consists of values and practices and influences interactions between other layers; and a chronosystem [24]. We can organize the knowledge and information related to ICH design according to this system, which makes it easier for students to collect them and understand the connections between them.

In this study, we demonstrated a novel course in ICH design, and we explored the efficiency of interdisciplinary teams utilizing digital technology beyond ordinary single-discipline teams under the guidelines. Specifically, the knowledge that students learn in the course of designing ICH occurs within four systems: microsystem, mesosystem, exosystem, and macrosystem.

The design guideline is based on four systems to create a framework to link ICH learning. We have linked ICH learning through a design guideline that provides a structured foundation for students to understand or use ICH elements, engages multiple disciplines in ICH design learning, and creates a dialogue between different fields. The guideline also provides a design method for students. We have also constructed a new evaluation standard for ICH design works with cultural attributes. This evaluation standard contains the following five criteria: cultural fit, creativity, aesthetics, experience, and diversity. Among them, cultural fit is an important part of cultural products [25], and creativity aesthetics and diversity are usually the evaluation criteria for evaluating artworks and creative products [26]. Experience is the standard for judging interactive products. Then, the differences between the interdisciplinary approach of utilizing digital technology and conventional teaching methods were compared in a new ICH design course.

Therefore, this research aims to address two key research questions:

RQ1: Are there differences in the application of ICH design guidelines based on Bronfenbrenner's EST in interdisciplinary approaches with digital technology versus conventional teaching methods? And what factors contributed to this result?

RQ2: To what extent does the ICH design course fulfill the five criteria (culture fit, creativity, aesthetics, experience, and diversity)?

The two main contributions of this study are as follows. First, we designed an ICH design guideline based on Bronfenbrenner's EST. This guideline guided students to acquire, collect, and organize ICH information and knowledge, and to use ICH elements to reconstruct their designs. It also encouraged students to understand ICH culture from multiple perspectives. Second, we constructed an evaluation standard from the five criteria (cultural fit, creativity, aesthetics, experience, and diversity), which can be useful for ICH educators.

This study provides design aids and evaluation standards for ICH design education and enriches the research field of ICH design education and teaching. Our findings assist educators in designing and implementing programs that incorporate design guidelines as an important part of the ICH design course. This study also offers valuable insights for teaching ICH design courses.

2. Related Work

2.1. Current Issues about Teaching ICH Courses

UNESCO promulgated the Convention for Safeguarding intangible cultural heritage (ICH) in 2003, proposing the safeguarding and transmission of ICH through formal and nonformal education [1]. The important role of education in safeguarding and transmitting ICH is increasingly recognized [3]. An increasing number of universities offer ICH design courses to develop the ICH design skills of students. Recent years have witnessed numerous studies on ICH design education, many of which have focused on ICH transmission and talent development [27–29].

ICH design refers to the innovative design of ICH based on the original culture of ICH, utilizing modern composition to derive derivative artwork or cultural derivative products with cultural connotations. ICH design is a highly practical course that requires much creativity and involves a wide range of knowledge and skills. The existing ICH design courses are mostly concentrated in art colleges [10], especially in the visual communication department. This department is based on graphic design, and its ICH design course contents include ICH creative products, posters, and pattern design.

However, ICH is mostly presented in physical forms, such as rituals, traditional performing arts, or handicrafts. The traditional two-dimensional graphic design cannot show the dynamic characteristics and meanings of ICH [11,12]. Conventional design courses often involve students from similar backgrounds, so the generated ideas are less diverse [30]. Moreover, students are often from arts/design or related departments, which makes them less able to translate their ideas into interactive design works. Reportedly, teaching methods in arts and design education sometimes have a detrimental effect on the creativity of students [28]. Consequently, students in conventional ICH design courses often perform poorly [30]. Thus, we consider it necessary to create a new ICH design course.

2.2. Bronfenbrenner's Ecological Systems Theory (EST)

ICH involves knowledge from multiple fields. Conventional ICH design courses do not focus on information and knowledge about ICH design, or how to utilize that information and knowledge to reconstruct designs. Instead of only focusing on the displays of ICH pattern combinations in forms, we focused on research that gathers and reconstructs ICH-related information and knowledge in a novel way, and we introduced Bronfenbrenner's EST to build a new framework that supports the needs of ICH design.

Bronfenbrenner's EST, proposed in the 1970s and 1980s [24], describes a system of nested domains of contextual and interactive influences that affect learning. Bronfenbrenner's EST consists of an ecosystem of multiple domains: the individual at the center of the system, a microsystem (e.g., family, teachers), a mesosystem (interactions and interrelationships among microsystem elements), an exosystem (external environment that affects the learners), a macrosystem (e.g., worldview, political system, cultural practices), and a chronosystem (a dynamic system of change) [24]. Bronfenbrenner states that children's growth is influenced by their surroundings and the interactions of their surroundings, and explains how the environment around a child helps or hinders the child's continued development. Then, Bronfenbrenner's EST is used in student learning [31–36]. However, there are some shortcomings in Bronfenbrenner's EST. Payne believed that the ecological systems theory has limitations and pointed out the weaknesses in its connection with current social work values [37]. Christensen [38] pointed out that this theory overly emphasizes individual adaptation and fails to consider the impacts of globalization and technological development, which have different impacts on different parts of the world.

Although it has many shortcomings, many researchers have applied Bronfenbrenner's EST to various fields. In one study, Patricia et al. described the interactive influence of socioecological elements on professional knowledge and understanding [33]. Especially in a recent study, Bronfenbrenner's EST has been applied to art education to examine the factors that influence the creation of drawings and paintings, and how drawing works of art extends the meaning of an artwork [36]. Although this study has inspired us, our research treats digital technology as technological development to advance Bronfenbrenner's EST for ICH education. This theory was used to summarize ICH-related information and knowledge and guide students in designing. It may improve the ICH knowledge of students and clarify how to design for ICH. It may also benefit art and design educators.

2.3. Digital Technology

As digital technology has developed by leaps and bounds, human life has entered the digital age. Digital technology has opened up new opportunities for ICH preservation and transmission. ICH is considered difficult to preserve and is preserved through digital technology. The intervention of digital technology in the preservation and transmission of ICH is considered to be an effective means of preserving ICH [39]. Many researchers have studied the digitization of ICH, especially digital preservation, digital dissemination, digital transmission, and development.

From the perspective of digital preservation, researchers have used image recognition technology and three-dimensional modeling to restore and record the operational processes of ICH skills and craft production [40]. As for digital communication, some researchers have proposed a virtual experience system for traditional crafts from the perspective of digital preservation, inheritance, and development [36]. Some researchers used digital technology to achieve panoramic immersive experiences [14]. These studies stimulate the interest of the audience and promote the sustainable development of ICH. In terms of digital heritage and development, some researchers have utilized digital technology to establish pattern libraries for innovative applications and interactive experiences of ICH [41].

Although these studies have utilized digital technology to safeguard and transmit ICH in various ways, few attempts have been taken to understand how to use digital technology to enable creative design using ICH elements [13], especially for interdisciplinary learners working together.

2.4. Interdisciplinary Approach in Design Course

Historically, the interdisciplinary approach was introduced by Miller [42] in the 1960s and described as an intersection between different cognitive approaches. Subsequently, it has been widely studied in different fields [43–49]. In the 1970s and 1980s, many universities implemented interdisciplinary and transdisciplinary course design into their teaching [42,50]. Then, it was applied to design school curricula [50] to enhance students' creativity [51].

Thus, we considered that bringing together students from arts/design departments with those from technology or industrial departments, with the use of digital technology, can further help them successfully transform their ideas into interactive ICH design. In this study, we explored the differences in practices of the ICH design guideline between the interdisciplinary approach with digital technologies and the conventional single-disciplinary approach.

3. Course Design for ICH

The essence of teaching this course lies in guiding students to combine traditional elements (e.g., pattern, color, and behavior) with contemporary popular elements to convey concepts and information, and in employing visual language. Students need to use art and design as vehicles to communicate concepts and information.

3.1. Guidelines for the ICH Design Course

The ICH design course is different from other design courses because it cannot be separated from the history, culture, and beliefs of the people [52], which serve as the foundation of ICH. Therefore, we designed ecological systems in the ICH design course based on Bronfenbrenner's EST, which is a system of multiple nested domains (Figure 1). The position of each domain in the ecological systems and the relationship between the penetration and influence of each element are reflected in Figure 1.

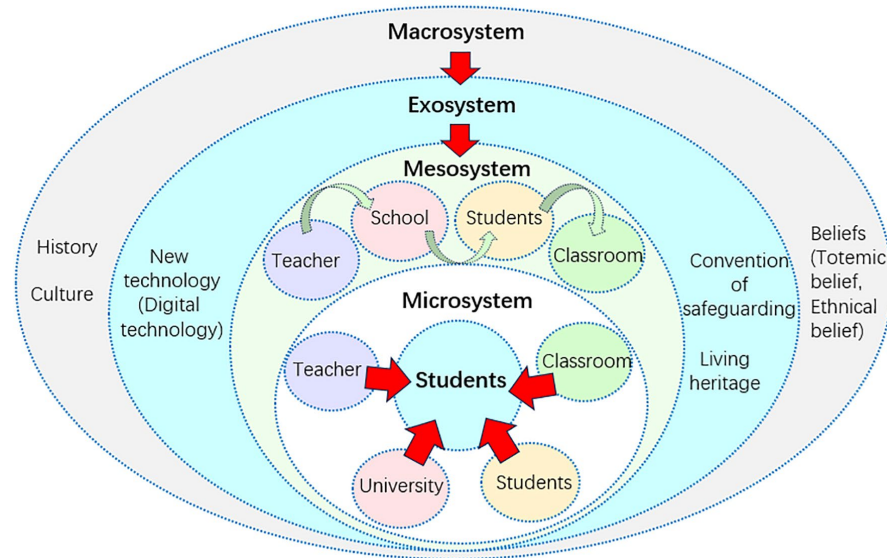


Figure 1. Ecological system theory in the ICH design course.

In this system, the student is at the main body of the classroom and at the center of the system. The microsystem is centered around the student as the subject. It includes course resources and learning activities that the student is in direct contact with, such as the impact of what the teacher teaches in the classroom on the students, and the student's relationship with other students, the teacher, and the learning space, that is the "nearest" impact on the center of the system. Surrounding the microsystem are the activities that take place within the mesosystem. That is the interrelationships between students and their classmates, teachers, and the environment in which they are educated. In microsystems, the teacher's teaching in the classroom and the university teaching environment, the relationships between group members, and the university's support for the course are all factors that can have an impact on the relationships between the various elements of the mesosystem. The exosystem does not have a direct effect on the center of the system, but because it encompasses the context in which teaching and learning take place, the policies for the preservation and transmission of ICH, the policies of institutions of higher education, the emergence of new technologies, and so on, it therefore has an indirect impact on the center of the system—the learning of students. At the same time, it also affects the relationships between various elements in the system. The macrosystem describes the broader cultural context of ICH, including the ICH history, ethnical beliefs, etc. It provides background knowledge for students' learning. Due to the short duration of our course, the chronosystem was not set up.

The ICH design guidelines (Figure 2) were constructed based on Bronfenbrenner's EST in the ICH design course as well as previous research [25,26]. We separated the students who served as the center of the system and grouped the ICH-related information into four systems. First, the microsystem contains basic information and characteristics (e.g., shape, pattern, color, style, material) about ICH. Second, the mesosystem includes mutual learning and influence among students. Third, the exosystem consists the current problems encountered by ICH, mainly including the dilemma and requirements of ICH,

and the opportunities brought by the development of digital technology. Fourth, the macrosystem contains the historical and cultural knowledge of ICH.

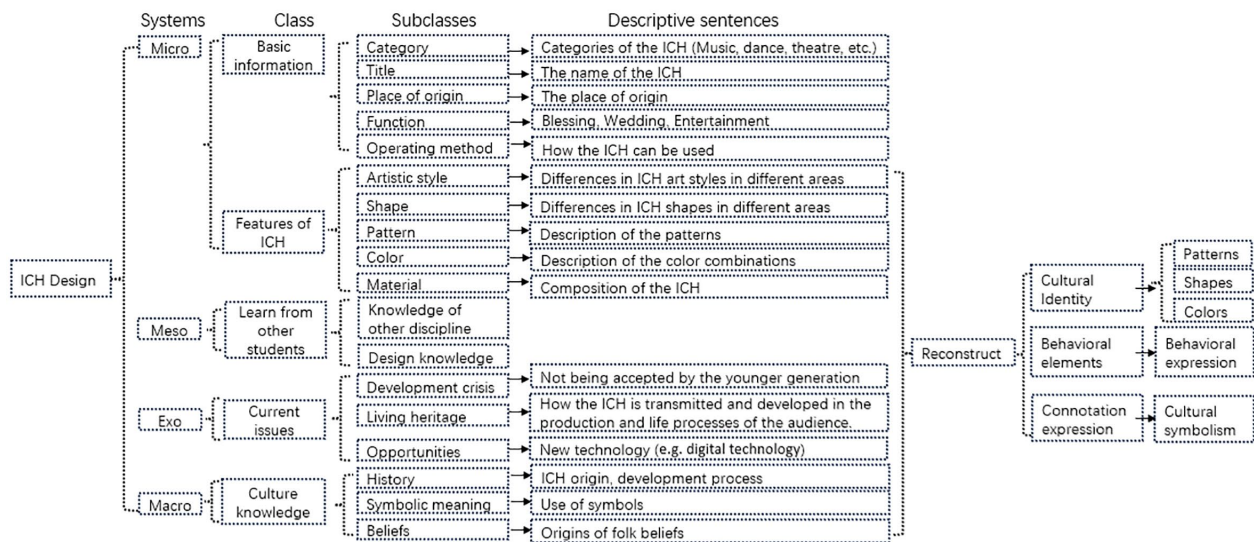


Figure 2. Guideline for the ICH design course.

In addition, in this design guideline, based on the cultural specificity of ICH, we proposed to reconstruct the three levels of ICH design work as follows: cultural identity, behavioral elements, and connotation expression. These levels can guide students in the early stages of the design process and help them make informed decisions by examining cultural identity, behavioral elements, and connotations of previous use.

3.2. Course Plan

The ICH design course spanned 5 weeks with each lesson lasting 3 h, and contained 16 sessions (e.g., 3 lessons in the first 4 weeks and 4 lessons in the last week). This course applied both the interdisciplinary approach with digital technology and the conventional teaching methods to compare their effectiveness. We structured the course design and divided the design section of the student project into four phases. The design process includes four stages: (Stage 1) divergent thinking, (Stage 2) convergent thinking, (Stage 3) design implementation, and (Stage 4) design work presentation and evaluation. The schedule and tasks for ICH Design are listed in Table 1.

Table 1. Schedule and task of the course.

Week	Focus of the Week	Tasks	Assignment
1	Lecture 1 (ICH-related information—VC teacher) Lecture 2 (Methods of ICH design—VC teacher) Divergent thinking (Search for ICH-related information) Applying the guidelines Survey—Cultural Places For ID teams: Lecture by ISE teacher	T1: Examples of design work T2: ICH information T3: Each team shall choose one ICH, check its background information and related design works, and analyze the design methods of its design works.	Presenting information on the selected topic, and analyzing of related design works
Stage 1 Divergent Thinking			
2	Generating ideas (follow the design guidelines) Forming a mind map based on generated ideas, For ID teams: Acquiring some knowledge about digital technology from a lecture	T4: Team discussion to brainstorm and generate as many ideas as possible, draw a mind map, and report the results T5: Team members explain the process of idea formation.	Mind map
Stage 2 Convergent Thinking			
3	Sketching based on mind maps For ID teams: Running experiments to test specific equipment (motion tracking or lighting)	T6: Each team is asked to draw sketches T7: Team members explained the process of forming the sketches. (ID teams present the process of the experiment and the problems encountered)	Sketches

Table 1. Cont.

Week	Focus of the Week	Tasks	Assignment
Stage 3 Design Implementation			
4	Electronic sketches For ID teams: Implementing technical functions	T8: Each team is asked to draw e-sketches (ID teams to present how the visual design section is combined with the technology, and the problems they encountered.)	Electronic sketches
Stage 4 Design Work Presentation and Evaluation			
5	Finishing the design work Experiencing and evaluating each other's design work	T9: Teams are asked to produce objects. Teams report on their designs and make suggestions for other teams' designs.	Outcomes (creative products or art installations)

ICH design is a process of extracting, rethinking or revisiting, and designing with the cultural features of ICH. The students need to collect the basic information from the microsystem, exosystem, and macrosystem related to ICH, and then extract and analyze the cultural characteristics of this information (Figure 2). Cultural characteristics are the cultural meanings expressed through the shape, pattern, color, material, technology, function, and other characteristics of ICH. The extraction of cultural features from ICH can be divided into the following three aspects: basic information (shapes, colors, and patterns); development status and problems faced; and connotations related to spiritual and symbolic culture. These cultural features provide sources of inspiration for subsequent design processes.

The students translate the cultural identity and design information collected from ICH into design knowledge and identity. Innovative ICH design necessitates imaginative interpretation rather than simply repeating the interpretation. The students are encouraged to use divergent thinking and to generate multifaceted ideas by considering diverse perspectives and directions. They can achieve this task in three ways:

1. **Cultural Identity:** The students use the principles of formal beauty to deconstruct and reconstruct external cultural features (patterns, colors, shapes) and to create an attractive visual appearance.
2. **Behavioral Elements:** They focus on behavioral elements in the ICH and consider incorporating digital technologies to transform them into design outcomes.
3. **Connotation Expression:** They transform the intrinsic cultural elements into design outcomes, and particularly focus on spiritual dimensions and conveying cultural symbolism.

The students then transform the creative concepts generated in the transformation phase into design outcomes. At this step, the students are influenced by their classmates in the mesosystem and by new technology, especially digital technology. Consequently, they think about ICH design from the perspective of technology and materials.

3.3. Assessment Method

We constructed an evaluation standard for the ICH design course by considering ICH education and creative design product. Chai et al. [25] studied the relationship between traditional cultural elements and customer satisfaction. Their study showed that local cultural elements and cultural elements that can be resonated with are most likely to enhance product satisfaction [25]. Christensen et al. [26] indicated that creativity and aesthetics are distinct factors in product evaluation, where creativity encompasses novelty and aesthetics refers to typicality.

ICH design works belong to cultural products, but they are different from ordinary cultural products. Whether they express the cultural meaning of ICH is an important criterion for evaluating ICH design works. Therefore, we have constructed new evaluation criteria (Figure 3).

Criteria	Detailed contents	Example		
Cultural fit	Meaning of the visual part	Redesigning traditional patterns based on symbols		
		Using traditional colors		
	Meaning of the behavioral part	Behaviors in rituals	Actions in dance	Behaviors in opera
Creativity	Novelty	Novelty		
	Originality	Non-copying		
Aesthetics	Color artistry	Followed the principles of formal beauty		
	Pattern artistry			
Experience	Interaction	Immersion/ Arousing audience interest		
	Entertainment	Arousing audience interest		
Diversity	Diversity of expression	Combination of traditional elements and modern design		
	Diversity of interaction	Modern technological methods to present traditional culture		

Figure 3. Evaluation standard for ICH design.

The first criterion is the cultural fit. The core of ICH design work is to carry cultural attributes. In traditional Chinese cultures, the use of graphics, colors, and behaviors becomes a subjective symbol and icon and is endowed with emotions and cultural concepts. The design of ICH needs to be innovative by following its intrinsic meaning. The key to testing an ICH design work is to see if the design fits the cultural nature of ICH. There are two ways of testing. In the visual aspect, the designer recombines traditional colors and reconstructs traditional patterns based on symbolism. In the behavioral aspect, the designer presents the behavioral parts shown in rituals or plays in other ways.

The second criterion is creativity, which is one of the most important criteria for testing the quality of performance of art and design works. Creativity means whether or not a student creates their design independently, rather than copying someone else's design. Novelty is an important feature of creativity [53], and refers to whether the designer has applied a new idea, design method, or way of expressing a design. For example, if a student takes a symbol from a traditional motif not used in other works and applies it to a new design. It is also considered to be a novelty if the student applies a design method that has been applied in other fields but not in the field of ICH.

Aesthetics is the expression of the unique aesthetics characteristics of a design work. It includes the artistry of pattern and color. An ICH design work involves the reconstruction of the stylistic design of the pattern and the recombination of colors to achieve the beauty of harmony.

Experience includes interaction and entertainment. The purpose of the ICH innovative design is to generate interest in ICH. The interactive part and the entertaining part of a work are used to increase the immersion and interest of the participants, respectively.

Diversity refers to the variety of creative processes and expressive forms in design work. The innovative design of ICH is often presented by combining traditional culture and modern design. Designers use digital technology to display traditional culture or use modern composition to redesign it to meet the aesthetic standards of contemporary people.

4. Comparative Practices of the ICH Design Course

4.1. Participants

Our comparative practice was approved by the university in Dalian, China, in December 2021. Thirty students participated in this course, hailing from this university, which included 22 women and 8 men. There were 24 fourth-year students from the Visual Communication Department (VC), 3 master's degree students from the Design History and Theory (DHT) department of the Art and Design School, and 3 third-year students from the Lighting Department of the School of Information Science and Engineering (ISE).

Participation in this study was voluntary, and all students were informed about the aims of the experiment and had the option to withdraw from the experiment at any time. We set up four teams as follows: two interdisciplinary teams (ID1 and ID2) and two visual communication teams (VC1 and VC2). Therefore, the ID teams used an interdisciplinary approach with digital technology, although the VC teams used a conventional single-discipline approach. We randomly assigned the students to the four teams, with ID teams composing students from VC, ISE, and DHT, while VC teams consisted solely of VC students. Each team followed a distinct course plan. The ID teams and the VC teams attended lectures from a VC teacher during the first week. The ID team also attended a lecture by an IST teacher and gained some knowledge of digital technology.

4.2. Topics in North Chinese Culture

Our university, located in Northern China, is surrounded by significant ICH practices and artistic expressions. Students chose a representative ICH, including Shadow Play, Dragon Dance, Lion Dance, and the Legend of the White Snake. Shadow Play, a traditional form of theater, was used first to disseminate the Buddhist concept of karma and reincarnation, and later was transitioned to secular stories. The Dragon Dance, originally a rain ritual, was integrated into a festive entertainment trend, specifically the Lantern Festival. The lion's reverence traces its origins to Chinese Buddhism, where it symbolizes protection from disasters. The Lion Dance, initially a part of military performance, gradually diffused into folklore. The Legend of the White Snake, one of the four great Chinese love folklore legends, is often presented as a piece of Peking Opera repertoire. However, with the development of society, electronic products based on sound and light have replaced traditional forms of entertainment. These four traditional forms of performance fail to arouse people's interest. They lack creative products and are gradually moving away from people's lives.

These four teams visited and investigated a cultural place during the first week of the course. The purpose of the investigation was to collect information related to the topic. The ID1 Team surveyed the Ancient City of Fuzhou, which is a cultural park where the origin and development process of Fuzhou Shadow Play is displayed in the Shadow Theater Exhibition Hall. Students carefully observed the stylized features of the characters in the Shadow Play and collected relevant information. The ID2 team visited the ICH Cultural Experience Center, where students took notes on the props of the Dragon Dance, especially the shape of the dragon head. The VC1 team visited the Dalian Peking Opera House. The manager introduced the students to the dressing of the Peking Opera *Legend of the White Snake*. Students learned about the characteristics of the Peking Opera headdress and costumes of the *Legend of the White Snake* and took detailed notes. The VC2 team visited the ICH Cultural Experience Center, where valuable props of the Lion Dance were presented. The students documented their visit through photos and writing.

4.3. Evaluation Method

4.3.1. Expert Assessment of the Four Teams at the Four Stages of Design

Two associate professors and one professor with graphic design backgrounds from the visual communication design department were invited. With more than 10 years of work experience in the design field, they have all published several academic papers, and have been involved in many evaluation projects.

In stages one to four, the experts were asked to evaluate the mind maps, sketches, electronic sketches, and final designs. They assessed the outcomes of each team at each stage across the five criteria: cultural fit, creativity, aesthetics, experience, and diversity (Figure 3). Notably, the experts did not assess the aesthetics and experience in the first stage, which were considered inappropriate.

Each expert assessed the designs of any team in a random order to avoid order effects. For each stage and aspect, the experts used a seven-point Likert scale to assess the design work. There was no discussion among the experts, which ensured independent evaluation.

4.3.2. Interview

One week after the course, we conducted focus group interviews with all participants via Tencent meetings. Focus groups facilitate dynamic group discussions and information collection [54]. This approach encourages students to consider aspects that they may not have considered individually. The interview in each group lasted 10–15 min, during which the students were asked to respond to two questions as follows: (1) please review the creative process and how ideas are generated, and (2) please tell us what you think about the ICH design course. The interviews were recorded on transcribed and translated videos. A researcher collected and analyzed relevant data. Open-ended responses were coded and categorized using inductive qualitative analysis. In this process, the responses from the students were divided into small paragraphs of texts and labeled with open codes that were used to summarize the themes in each paragraph. These interviews provide valuable insights into teaching and learning from the students' perspectives, and help to better analyze the underlying reasons [54,55].

5. Results

5.1. Final Design of the Interdisciplinary Team

For the final design of interdisciplinary team, team ID1 made an innovative design for the Dalian Fuzhou Shadow Play (Figure 4) and used digital technology to design a Shadow Play film related to the history of Shadow Play. Team ID2 made an innovative design for the Dalian Jinzhou Dragon Dance using digital technology (Figure 5), and integrated the Dragon Dance into a music video game. Both design works were interactable.

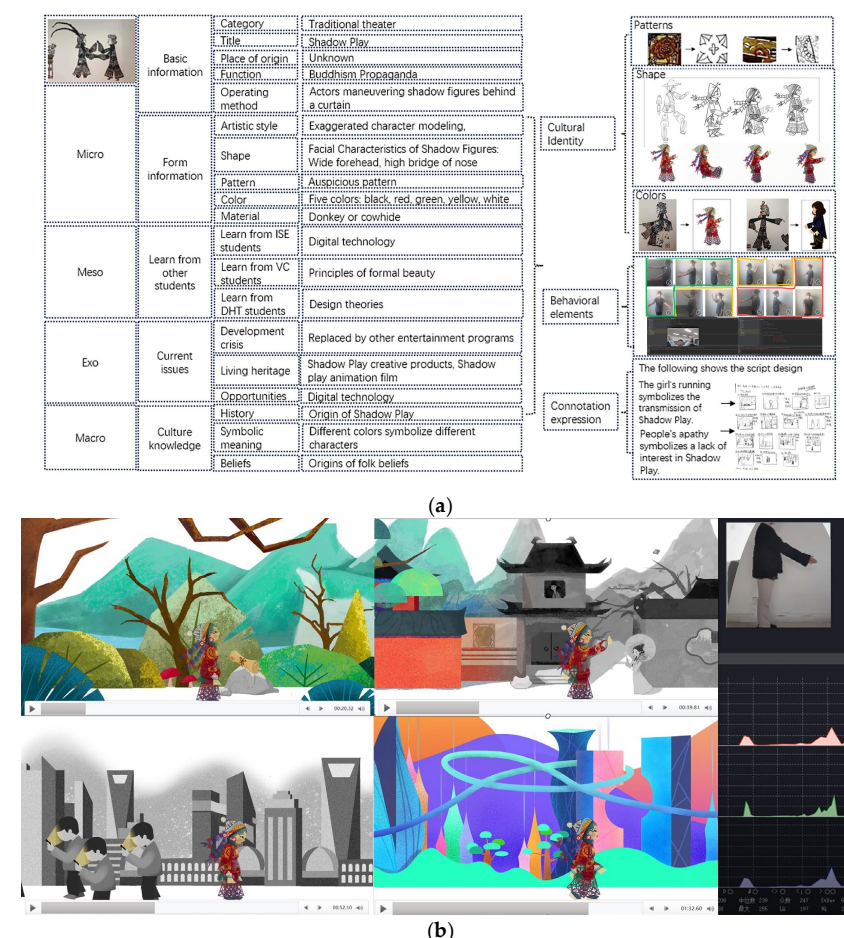


Figure 4. ID1's design work: ICH for Shadow Play: (a) ICH guideline results: extract elements from the information collected on Shadow Play and redesign them; (b) final ICH work: designing a Shadow Play film relating to the history of Shadow Play with motion capture.



Figure 5. ID2's design work: ICH for Dragon Dance: (a) ICH guideline results: extract elements from the information gathered about the Dragon Dance and redesign them; (b) final ICH work: integrating the Dragon Dance into a music video game.

5.2. Final Design of Single-Discipline Team

Team VC1 produced White Snake Intellectual Property (IP) image designs, illustrations, and cards related to the Legend of the White Snake (Figure 6). Team VC2 made an innovative design for the Dalian Jinzhou Lion Dance (Figure 7), and used elements of the Lion Dance to make several posters about traditional festivals and puzzles.

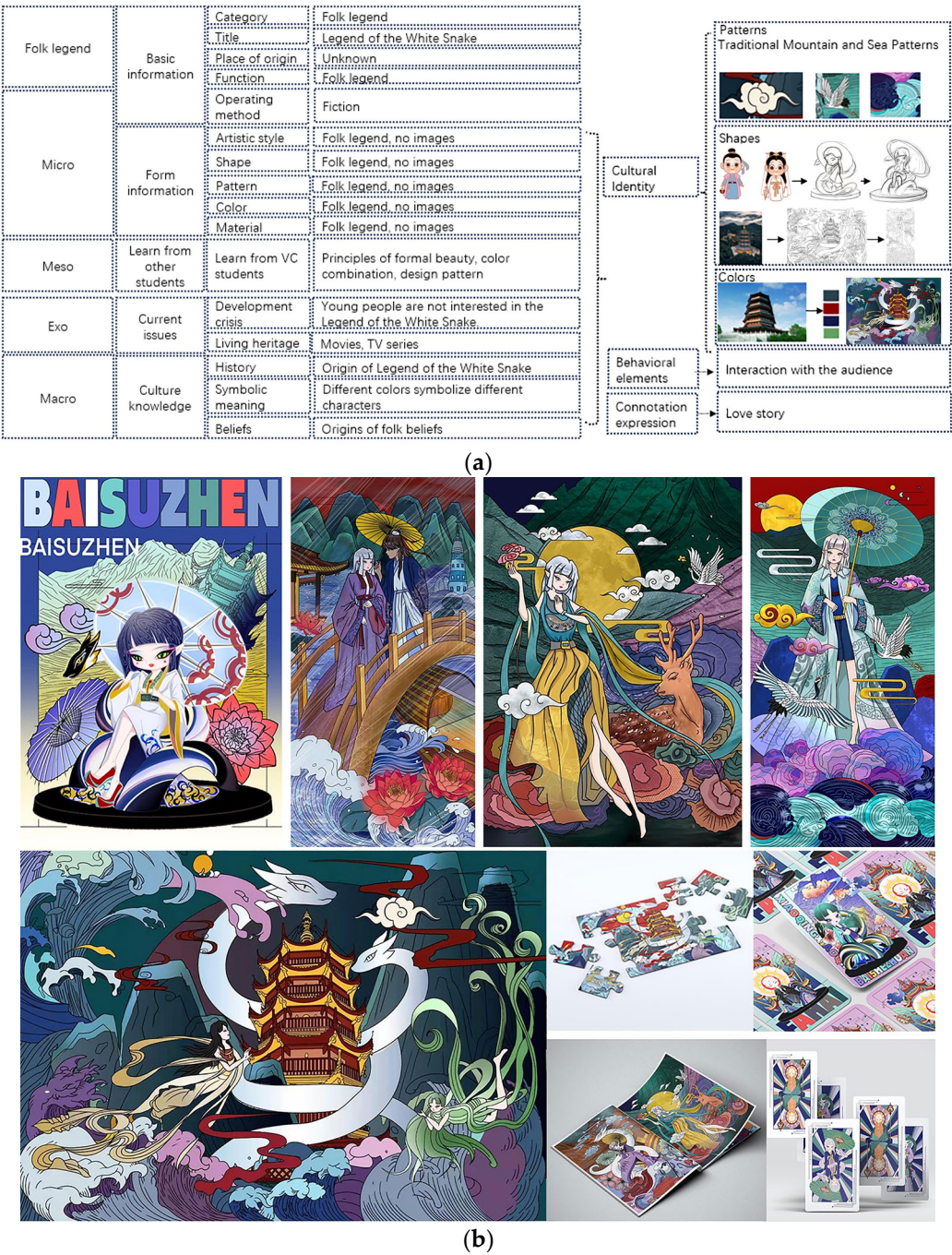


Figure 6. VC1’s design work: ICH for the Legend of the White Snake: (a) ICH guideline results: Extract elements from the collected information on the Legend of the White Snake and redesign them; (b) final ICH work: designing postcards with cartoon-like characters of the Legend of the White Snake.

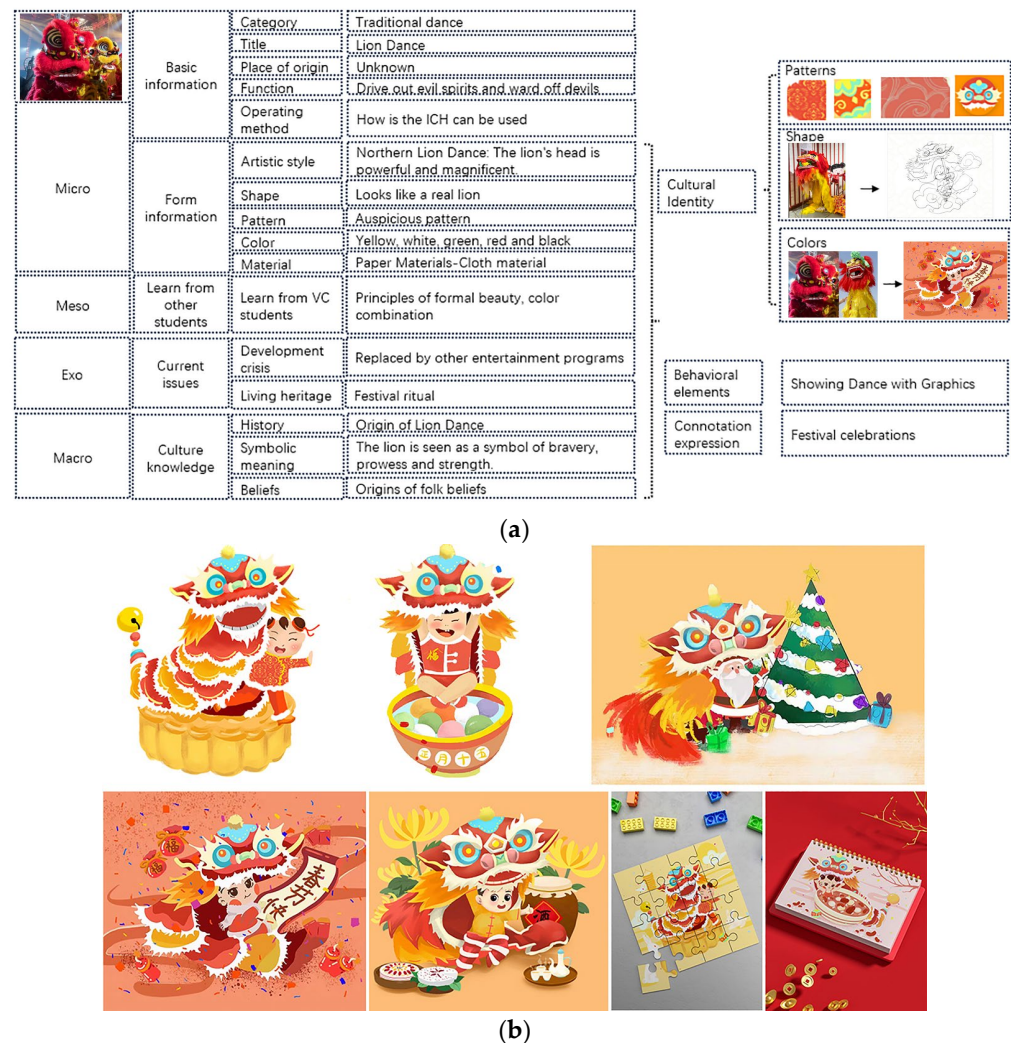


Figure 7. VC2's design work: ICH for the Lion Dance: (a) ICH guideline results: extract elements from the information gathered about the Lion Dance and redesign them; (b) final ICH work: designing traditional festival posters and puzzles containing Lion Dance elements.

5.3. The Scores of the Teams in Four Stages of the Design

The scores of teams are shown in Table 2. A consistency test was performed to test the reliability of the experts. The intraclass correlation coefficient (ICC) of the three experts was 0.753, indicating that the experts' scores were consistent and reliable.

Table 2. Team Scores.

Type	Team	Stage 1 (Divergent Thinking)	Stage 2 (Convergent Thinking)	Stage 3 (Design Implementation)	Stage 4 (Design Presentation and Evaluation)	Average Score
Culture fit	ID1	6.3	6.7	7.0	6.7	6.8
	ID2	6.0	6.0	5.0	5.0	5.5
	VC1	3.7	4.0	4.7	3.7	4.0
	VC2	5.7	5.0	5.3	5.3	5.3
Creativity	ID1	6.0	6.3	6.3	7.0	6.1
	ID2	6.7	6.7	6.7	7.0	6.8
	VC1	5.3	4.7	5.0	4.7	4.9
	VC2	3.7	3.7	3.7	3.7	3.7

Table 2. Cont.

Type	Team	Stage 1 (Divergent Thinking)	Stage 2 (Convergent Thinking)	Stage 3 (Design Imple- mentation)	Stage 4 (Design Presentation and Evaluation)	Average Score
Aesthetics	ID1		6.7	6.7	6.7	6.7
	ID2		3.7	4.0	3.7	3.8
	VC1		6.0	6.3	6.0	6.2
	VC2		5.3	4.7	5.3	5.0
Experience	ID1		6.3	6.3	6.3	6.3
	ID2		6.7	6.7	6.7	6.7
	VC1		4.7	4.7	4.7	4.7
	VC2		3.7	3.0	3.7	3.5
Diversity	ID1	6.7	6.7	6.7	6.0	6.6
	ID2	6.3	6.3	6.0	6.7	6.3
	VC1	4.7	4.7	5.3	4.7	4.8
	VC2	3.7	3.0	3.7	3.7	3.5

From the results for culture fit, both ID teams scored higher than the VC teams. In the mesosystem, mutual learning helped the team ID1's students understand the motion capture technology and the design method. Therefore, they applied this technology to their design works and utilized digital technology to interact with the audience, which solved the problem of being unable to represent the Shadow Play movements in the traditional Shadow Play creative works. In the visual part, they followed the traditional pattern that "a picture must be intentional, and being intentional must have good meanings and good luck is on the way" to reconstruct the traditional graphics. The color elements of the traditional Shadow Play were also selected and recombined. They were assigned with 6.8. According to the experts, their design works followed the characteristics of traditional Shadow Play and presented the dynamics of Shadow Play figures through digital technology, which are very much in line with the cultural attributes of traditional Shadow Play and the requirements of the living ICH in the systems. VC1 was assigned with the lowest score of 4.0. The VC1 members used traditional colors in their design works but chose Japanese-style anime characters to design characters from traditional stories. The experts thought their design works did not reflect the traditional Chinese cultural connotations.

For creativity, the design work of ID2 combined digital technology to represent the Dragon Dance with a music video game. The Dragon Dance is a type of traditional dance, and the music video game is played through dancing. The students considered the most creative idea by combining the two through the same point—the dancing part. They received an average score of 6.8. The VC2 members received the lowest score of 3.7. They used their classroom knowledge to create several posters of traditional festivals and puzzles that contained Lion Dance elements. The combination of traditional festivals and posters was not considered innovative.

In terms of experience, the ID teams were all scored higher than the VC teams, and team ID2 was scored the highest with 6.7. The music video game, a combination of the Dragon Dance and digital technology, lighted up the dragon light strip on the top of the device by touching the sensor button at the bottom of the device according to the sequence of the dance steps. Experts agreed that this work was more participatory, experiential, and fun.

For diversity, team ID1 had the highest average score of 6.6. The team ID1 members designed shadow features for innovation, and they designed the characters and the patterns on the costumes using a modern style combined with traditional elements. The interactive animated short work expresses traditional culture in a modern and diverse way. The VC2 members had the lowest average score of 3.5. Their design work consisted of posters and puzzles that were presented without innovation and appeared monotonously.

In terms of scores, the ID teams were scored higher than the VC teams, indicating that the guideline was effective for the ICH design course that applied both pedagogical approaches. However, the application of an interdisciplinary approach with digital technology has had a more positive impact on these four criteria. Nevertheless, in terms of aesthetics criteria, team ID2 received a score of 3.7, which was the lowest among the four teams (Table 2). The experts felt that the final design work for ID2 lacked graphics and color. The scores of teams ID1, VC1, and VC2 were 6.7, 6.0, and 5.3, respectively. The experts believed that team ID2 emphasized more on the application of technology and ignored the performance of the visual design. It suggested that the guideline does not positively impact on aesthetics when applied to these two types of pedagogical methods.

5.3.1. Interdisciplinary Teams' Design Practice

The design work of team ID1 was considered to meet the requirements in the cultural fit criteria. It continued the color combination and pattern design of the characters and objects and the character styling of the traditional Shadow Play and used digital technology to show the dynamic part of the Shadow Play. Hence, this work carried on the traditional culture in both the visual and dynamic parts. Through understanding the traditional culture, ethnic beliefs, the history and development of Shadow Play, they learned that white, green, black, red, and yellow in northern traditional Shadow Play correspond to the five elements of gold, wood, water, fire, and earth, respectively, and are given symbolic meanings. By learning from each other in the mesosystem, the students learned that the color of Fuzhou Shadow Play has strong regional characteristics, with its high brightness and purity and bright colors. To make the color combination more harmonious and consistent with modern aesthetics, they weakened the color contrast. In terms of graphic design, to conform to the traditional Chinese custom of symbolizing good luck, they followed the expression "the picture must be meaningful, and the meaning must have good meanings and good luck is on the way" to redesign the traditional graphics. As for the shapes of the Shadow Play characters, they showed the more rugged and realistic shape of the northern Shadow Play. The design work of team ID1 was considered to be a creative and ingenious original design according to the creativity criteria. It utilizes digital technology (motion capture) to interact with the audience at story points and connects the stories in the short film through audience participation. Their creativity originated from discussion. In the microsystem, students from the three disciplines communicated, learned from each other, and generated many new ideas. Different from the previous creative product with flat Shadow Play figures, their creative point is based on the performers' manipulation of the Shadow Play figures, and they applied a new way of presentation by transforming the audience into performers to manipulate the animated short film, which completed the storytelling through the audience's participation. ID1's design work was regarded to be the best of the four works in the visual design section in terms of aesthetic criteria. Its design was based on symmetrical forms of traditional patterns and simplified complex traditional patterns, and the colors of the work were unified, harmonious, and beautiful. The design work of team ID1 was considered to be highly interactive and interesting in the experience criteria. The story in the short film was interspersed with interactive parts with the audience, making them characters in the story, which was both interactive and interesting. This design work was recognized in the diversity criteria as being diverse in both interactivity and expression. Its graphics were concise, with soft color contrasts and interactivity, making it more diverse compared to previous flat expressions.

The design work of team ID2 was considered to meet the requirements in the cultural fit criteria. It flattened the dragon shape and used digital technology to combine the steps of the Dragon Dance with the basic steps of a music video game, so both the visual and dynamic parts inherited the traditional culture. Team ID2 did not reconstruct the traditional pattern and therefore scored lower than team ID1. The idea of team ID2 was to change during implementation. Team ID2 scored 6.0 in stages 1, 2, and 4, which dropped back to 5.0 in stage 3. At one point in stage 3, team ID2 gave up on presenting the steps of

the Dragon Dance in favor of free stepping. The movements of the Dragon Dance are the core, and presenting the visual design part without showing the steps lacks the core part of the heritage. According to the teacher's suggestion and the students' discussion, team ID2 chose to show the steps of the Dragon Dance. It scored high in creativity, experience, and diversity. In particular, the design work was considered to be the most innovative and original design in the creativity criteria. The ID2 members used digital technology to combine the steps in the traditional Dragon Dance with a music video game so that the audience could learn about the steps in the Dragon Dance during participation. The design work of team ID2 was scored the lowest on the aesthetic criteria. The ID2 members designed the shape and pattern of the dragon but did not apply it to the final design work. The visual design part cannot fit with the behavioral design part. This design work was regarded to be highly interactive and interesting in the experience criteria. The audience stepped on a music video game according to the steps of the Dragon Dance, and the dragon-shaped light strip lit up simultaneously. It was more interactive and interesting than the other three design works.

5.3.2. Conventional Single-Disciplinary Teams' Design Practice

The average score of the design work of team VC1 in the culture fit criteria was 4.0, which was the lowest among the four teams. The score of team VC1 in the first stage was 3.7. The VC1 members combined Japanese cartoons with traditional Chinese stories, which did not reflect the heritage of traditional Chinese culture. In the second stage, the design style was changed gradually to a national style by adjusting the design according to the teacher's suggestions. The scores gradually increased from 4.0 at stage 2 to 4.7 at stage 3. In Stage 4, their score dropped back to 3.7 because they designed cards with English letters. Experts considered the presence of traditional cultural elements in the design work as a test of whether it meets the criteria of cultural fit. It was inappropriate to include English letters in a design work that was based on traditional Chinese culture. This design work was scored relatively high in the aesthetic criteria. The members designed graphics and colors for traditional images and redesigned ICH characters and scenes. The work of team VC1 was scored low in the creativity, experience, and variety criteria. Although this work is original, graphic illustration is a common form rather than being novel. This work was mainly a static design and lacked interactivity and interest. It combined traditional graphic colors with modern character styling design and partially met the diversity criteria. However, the members did not have diversity in the way of presentation.

Team VC2's design did not present traditional dance movements, resulting in a lower average score of 5.3 on the cultural fit criterion than teams ID1 and ID2. This design work scored lower than the other three teams in the creativity criteria because the experts considered it was more similar to previous designs and lacked originality. In addition, the poster is a traditional form of design and lacks novelty in terms of the presentation according to the experts. The work of team VC2 scored poorly in the experience and diversity criteria because it was mainly a static design, which was weak in interaction with the audience and fun through a single mode of expression.

5.4. Students' Perceptions of the ICH Design Course

The thirty participants provided open-ended responses about their perceptions of the course. We found mutual learning among students in the mesosystem influenced the process of idea formation and design implementation, especially in the two ID teams. The students mentioned 17 times that mutual learning among students from different disciplines was beneficial. The students mentioned 6 times that digital technology made innovative ICH designs more accessible to the audience (Table 3).

Table 3. Results of the interview.

Semi-Structured Interview	Frequency
Benefits of learning from each other	17
Digital technology makes ICH's innovative designs more accessible to the audience.	6

The students' opinions characteristically mentioned three kinds of actions. Under the guideline, students from different disciplines learned from each other in the mesosystem, which (Action 1: new idea) facilitated the generation of new ideas and (Action 2: change thinking) changed their way of thinking. For the design implementation, the digital technology offered students from art backgrounds opportunities to implement more physical design works (Action 3: design implementation).

SA018: As ISE students, communication with VC and DHT students can enrich our knowledge of product presentation. (Action 1: new idea).

SA022: The motion capture in our previous work was a simple light-effect modulation. However, after seeing the design work shown by the VC students, we had the idea of adding motion capture to the shadow-play animation short film, and we wanted to interact with the audience through this presentation. (Action 1: new idea).

SA023: The communication with VC students provided us with new ideas. I think we can present technology in a more artistic and accessible way to the audience. (Action 1: new idea).

SB012: I gained a lot from doing the project. VC students think differently from us, and they have more innovative ideas than us. (Action 2: change thinking).

SB013: We felt the collision of ideas in the process of combining art and technology, and we experienced different ideas in design implementation. (Action 2: change thinking)

SA003: We talked to VC students and found it better to utilize digital technology-motion capture technology to allow visitors to interact with the short film. (Action 3: design implementation).

SA019 Our work presentation may give the audience a rather dull feeling. With the help of VC students, we can present technology better through art and thus further enhance the audience's experience. (Action 3: design implementation).

SA021: The combination of art and ISE students' technology can facilitate physical design. (Action 3: design implementation).

SB016: Our biggest takeaway was the experience of interdisciplinary design implementation. (Action 3: design implementation).

SB017: We think about the practical aspects of design implementation. (Action 3: design implementation).

6. Discussion

6.1. Differences in Application between Interdisciplinary Approaches with Digital Technology and Ordinary Teaching Methods

For RQ1 (Are there differences in the application of ICH design guidelines in interdisciplinary approaches with digital technology versus conventional teaching methods? And what factors contributed to this result?), expert ratings of the students' design processes and final design works, as well as the results of the interviews, reveal that the ICH design guideline was better applied in interdisciplinary approaches with digital technology than in conventional teaching methods.

The two ID teams had higher average scores than the two VC teams in the four criteria of culture fit, creativity, experience, and diversity. This indicated that digital technology and interdisciplinary approaches are superior over conventional teaching methods in these four criteria. The mean score of team ID2 in the aesthetics criteria was 3.8, which is lower than in team ID1 and the two VC teams. This indicates that the interdisciplinary approach with digital technology has no advantage over conventional methods in terms of aesthetics.

As for culture fit, the scores of the ID teams are slightly higher than the VC teams in all four stages of design. The digital technology significantly impacted the ID teams, because digital technology combined with visual design better interpreted the behavioral part of ICH and achieved a living legacy of ICH. However, the VC teams embodied the representation identity of ICH in ordinary two-dimensional graphic design that did not reflect its behavioral component.

Creativity is reflected in the scores and the results of the interviews. The scores for creativity of the ID teams in all four design phases are higher than in the VC teams. The scores of 7.0 for both ID teams in the fourth stage sufficiently prove that the interdisciplinary approach has a positive impact on creativity. The results of the interviews also showed the students in the ID teams recognized such positive impact. Hence, the interdisciplinary approach plays a positive role in the generation of new ideas during ICH design. This finding is consistent with Kuusk's findings that interdisciplinary approaches positively impact on design creativity [18,40] and help students to "think outside the box" [18], breaking the research perspective of the discipline and seeing problems from new perspectives [56]. Through the understanding of the ISE in the course, and the communication and discussion among students from different disciplines in the mesosystem, students can recognize the connections between what they learn in different disciplines and ICH, which can initiate new thinking. Some students thought that the interdisciplinary approach facilitated the generation of new ideas and changed their way of thinking, such as "...provided us with new ideas", "...had the idea of adding motion capture...", "...felt the collision of ideas...", and "...experienced different ideas...".

In terms of experience and diversity, the ID teams had significantly higher scores than the VC teams, which was because the ID students and the VC students had different backgrounds. The ID and VC team's design works followed local visual culture, history, and ethnic beliefs. And they were influenced by the convention of safeguarding and living heritage. However, because the ID teams were made up of students from three different disciplines with different learning backgrounds, learning styles, and modes, their design work ended up being different from that of the VC teams. The VC students learn graphic design courses, such as poster design and museum memorabilia design; therefore, they are better at visual design of patterns, colors, etc. The ISE students are educated with information technology courses; therefore, they are better at presenting works through digital technology. The DHT students learn the theories, history, and trends of the design; therefore, they are more specialized in the study of the styles and characteristics of traditional patterns, as well as giving deeper connotations to their works. Students were inspired by the conversations and discussions that took place in the mesosystem. They paid more attention to human participation in their design works and tried to use digital technology to change the design work of ICH from "static" to "dynamic," and convert a single visual experience into an interactive communication mode with a multisensory experience. The ID team did not score much higher than the VC team, as we expected. This is because some factors in the microsystem and metasystem can affect the design process, such as classmates. The ID teams were composed of students from three disciplines, who were not familiar with each other. There were conflicts in cooperation and labor division. The second reason is that the ID teams needed to complete more work. ISE students did not understand visual design and or visual expression. They needed more time to communicate. The cooperation in team VC1 was very harmonious. First, VC1 students were classmates from the same class and were very familiar with each other. Second, their team leader played a good role in coordinating labor division among the members.

One unexpected result is that in the score of aesthetics, team ID2 was lower than both VC teams, indicating that the interdisciplinary approach did not positively affect aesthetics. There are several possible explanations for this result. First, ICH designs were based on the prior social experience of the authors and the shared cultural history behind the design work [10]. In the microsystem, the prior knowledge of the students affected the aesthetics of team ID2. The students in ID2 had less prior knowledge in the visual design section

than students in other teams. Hence, the design skills and prior experience of students more greatly influence aesthetics. The interdisciplinary approach does not improve the prior knowledge of students. In future research, it may be possible to explore and refine the design steps of ICH graphic restructuring and thus incorporate diverse design approaches into the guideline.

6.2. Factors Leading to the Difference between the Two Types of Teams

For RQ1, their design works revealed the factors that contributed to this result (Table 4).

Table 4. Characteristics of each ID and VC team in the design process.

	Stage 1 Divergent Thinking	Stage 2 Convergent Thinking	Stage 3 Design Implementation	Stage 4 Design Work Presentation
ID1	Understanding the basics of the lighting field digital technology	Developing a detailed design process and practicing arrangement Forming a preliminary design plan Designing the story of the animated short film Determining character movement Taking movement photos of people Starting to train artificial intelligence (AI)	Electronic sketches balance aesthetics and traditional culture AI and electronic sketching combination	Participating the design work experience Finding problems Adjusting design works
ID2	Understanding the basics of the lighting field digital technology	Forming of a preliminary design plan Conducting light source experiments	Redevelopment of the design plan	
VC1			Adjustment of electronic sketches that lack traditional cultural expressions	
VC2			Detailed design	

The design focus is different. The two ID teams utilizing digital technology focused more on human participation in the design works and started from the living transmission of ICH (Figures 4 and 5). The students combined their behavioral characteristics with those of ICH and focused on the interplay of human emotions in the interaction process. They considered the transmission of ICH in their design from multiple perspectives, including behavioral and visual perspectives. Specifically, they used the human body as a tool to guide the entire experience. This model allowed the audience to gain a sense of joy from physical actions and participate in presenting the design work. Instead of passively receiving information, such design work allowed the audiences to actively explore ICH information and disseminate ICH content. The interdisciplinary approach and the communication between students from different disciplines in the mesosystem provided the two ID teams with more ways to present ICH. Their design works were not only visual but also aural and behavioral, adding variety and interest to their works. However, the two VC teams leaned toward graphic design (Figures 6 and 7). The VC members focused on designing graphics and colors for traditional images and redesigned the characters and scenes of ICH. They passed on ICH from a visual perspective and neglected other aspects. Their works were static; and thus, they were less attractive and not particularly fun to the audience.

Different types of knowledge were used. The ID teams consisted of VC students, ISE students, and DHT students. The VC teams only involve VC students. Due to the different

areas of knowledge specialized in among different students, the types of knowledge used in the design processes differed. The ID team students expanded their knowledge and learned the basics of other disciplines in the microsystem and mesosystem before the divergent thinking stage. At the design implementation stage, the students learned how to use different technologies in the mesosystem. The acquired knowledge supported the students in integrating visual design with technology. However, the VC team students had no chance to acquire such knowledge and only used the knowledge of VC in their design.

6.3. Fulfillment of the Five Criteria of ICH by the ICH Design Course

For RQ2 (To what extent does the ICH design course achieve the five criteria?), the expert ratings of the design process and final design works reveal how well the design guideline of the ICH course fulfills the five criteria.

For the five criteria, the four teams had average scores of 3.5, and all achieved the teaching goals, indicating that the ICH design course is effective in ICH design for the students. With the aid of the design guideline, the participants clarified the knowledge areas involved in ICH design, and learned how to conduct research on ICH starting from the historical and cultural background investigation of ICH in the macrosystem. They focused on the initiatives for ICH protection in the exosystem and paid attention to the breadth and depth of data collection. Results suggest that the design guideline can be effective in facilitating students in analyzing and understanding the cultural characteristics of ICH and in achieving greater breadth and depth. The ID1 members focused on the requirements of the living heritage of ICH and on the development of digital technologies (Figure 4), which are the parts ignored by visual communication students in the previous classes. In the interviews, VC students mentioned that in the previous courses, they could only innovate at visual aspects to increase the novelty of their works. . .they achieved the combination of the visual design part with the technology in this course . . .

The design guidelines also facilitated the students in learning from each other in the mesosystem. In the interviews, students explained their perceptions of learning from other students in the mesosystem. “...interacting with VC and DHT students enriches our knowledge of product presentation. . .” and “...with the help of VC students, we can present technology better through art. . .”

This result is the same as Peppler et al., who utilized Bronfenbrenner’s EST to investigate the factors influencing the creation of drawings and paintings. EST-based artifact-oriented learning models enable interdisciplinary study of artworks and promote understanding of learning [36]. It is a good attempt by EST in art education. Our contribution is to introduce EST into the field of ICH design education. The EST-based design guideline extends students’ knowledge of ICH in broader areas and at deeper levels and leads to the emergence of new ideas. The system of multiple nested domains highlights the value of supportive relationships through students, teachers, classmates, and the university environment, the social environment, and so on. It highlights how an EST-supported design guideline can lead to the construction of new ideas and support students’ learning about ICH and innovative design. An EST-based design guideline uses ICH learning as a framework that can support the ICH design of new projects and ways of connecting communities to meet the needs of contemporary society, for example, by emphasizing the integration of ICH with other fields and outcomes and the development of modes of professional development that go beyond the teaching of ICH form itself, and that will lead to the development of ICH design into a wider space.

7. Conclusions and Future Studies

A new ICH course with a design guideline and evaluation criteria was designed. The practical differences between interdisciplinary teams in digital technology and conventional single-disciplinary teams in a new ICH design course were compared. This study has important implications for art educators.

The ICH design course is effective for students to design ICH works. Therefore, art educators may consider trying to add design guidelines to guide their students' designs. Additionally, the interdisciplinary approach with digital technology inspires students to be more creative, and plays a positive role in the implementation stages of ICH design. The interdisciplinary approach with digital technology positively affects the culture fit, creativity, experience, and diversity of ICH, but has fewer positive effects on aesthetics. Art educators may consider experimenting with interdisciplinary approaches with digital technology in ICH design courses to stimulate the generation of new ideas.

Art and design educators can improve the interdisciplinary ICH design course with digital technology by improving the design guidelines. As this study reveals, the interdisciplinary approach with digital technology does not have a positive impact on aesthetics. Therefore, educators who wish to promote aesthetics in students' design works need to provide various graphic creativity methods and color combination rules based on students' learning experiences. For example, educators can design thematic design tasks. Additionally, educators may want to consider the composition of student teams and create more appropriate portfolio models for students, because of the reported poor team communication across disciplines [57–59]. Our study also reveals that interdisciplinary teams take a longer time to communicate. Team configuration is another issue that cannot be ignored [60]. Before forming teams, we need a pre-course test to test each student's design ability, understand their personality, and distribute the team composition appropriately in a grouping.

This study has some limitations. The first limitation is that it is a small-scale study. Although the interdisciplinary approach with digital technology is useful in applying the design guidelines to the ICH design course, we only conducted this study with four teams, potentially limiting the generalizability of the results. In future studies, we will expect to involve more classes. The second limitation is that we did not conduct a comparative study of conventional ICH design courses without the ICH design guideline. In future studies, we will make comparative study an important work: we will focus on comparing the differences in student achievements, and expert opinions, between the new teaching methods of applying the ICH design guideline and the conventional teaching method. In addition, not only the visual communication department but also other design departments will be expected to identify some extensions of the new ICH design course on other design disciplines.

Author Contributions: Conceptualization, J.X. and T.Y.; methodology, J.X. and T.Y.; validation, J.X. and T.Y.; formal analysis, T.-Y.W. and E.K.; investigation, J.X. and E.K.; resources, J.X. and E.K.; data curation, J.X. and T.-Y.W.; writing – original draft, J.X.; Writing — review and editing, T.Y. and T.-Y.W.; visualization, J.X., T.Y. and T.-Y.W.; supervision, T.Y. and T.-Y.W. All authors have read and agreed to the published version of the manuscript.

Funding: JSPS KAKENHI Grant Number 21K11978.

Institutional Review Board Statement: All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The data presented in this study are available on request from the corresponding author.

Conflicts of Interest: The authors declare no conflicts of interest.

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