

A pedagogical Design Model of the Sustainable Development of Traditional Handicrafts in Design Education

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Abstract

Due to the strong influence of globalisation and consumerism in recent years, traditional handicrafts face complex issues of inheritance and development. Based on Stanford Design Thinking and Sensory Design, this study explores the possibilities and prospects for the sustainable development of traditional handicrafts in design education.

Firstly, a literature review and analysis were carried out to show the relationship between design thinking and sensory design, aiming to propose a pedagogical design model to improve the required method and research tool for the sustainable development of traditional handicrafts. It was then investigating the application of the pedagogical design model through didactic experiments to explore innovative applications of traditional handicrafts. Finally, the problems existing of students during the experiments were analysed and summarised to put forward three design strategies, aiming to propose setting up the teaching methods.

By analysing the problems found in the teaching and learning process, solutions and future problems are discussed and presented. The pedagogical design model emphasises student experiences and innovative design outcomes. This study explores the value and potential of interdisciplinary integration of sensory design and design thinking to develop traditional handicrafts in design education.

Keyword: Design Thinking; Design Education; Didactic Experiment; Interdisciplinary; Sensory Design

1. Introduction

In the development of traditional handicrafts, there are a lack of scientific methods, experimental and testing processes in producing products, and a lack of relevant education and practitioners' training (Norman, 2010; Liu & Hao, 2017). Traditional handicrafts are generally taught through apprenticeships, which in most cases are merely a duplication of traditional handicrafts and the artistic expression of traditional elements. Under the influence of globalisation and consumerism, handicrafts have become commercialised, and 'efficient production', centred solely on 'profit', has led to a shortened product life cycle and a culture of disposable consumer life. Moreover, the decline in intergenerational exchange and dialogue threatens the survival of traditional culture (Härkönen, Huhmarniemi & Jokela, 2018, p.1907). In particular, specific regions' cultural heritage has become separated from the country and the region, disrupting crafts skills and knowledge (Yang et al. 2018, p.1336). As a result, some handicrafts with high intrinsic value are becoming less popular (Zhan & Walker, 2018, p.1252). These factors have led to a lack of clarity about traditional handicrafts' values and direction, which has impeded their transmission and conservation.

Anying, C. (2019), a professor at Tsinghua University, proposed that traditional handicrafts should keep pace with the time to adapt to modern life constantly. Through innovative development, the fine works of times have remained. Under the new circumstance of culture and economy, traditional handicrafts should provide products and services that consumers need with the help of designers. For example, in 2019, the combination of embroidery with the design of the interior of the BMW 7 Series not only expands a new dimension of innovative development in the automotive industry but also expands the value of the application of embroidery and the spiritual needs of consumers who indulge in a particular atmosphere and continue to evolve towards art (Lin, 2005). For intangible cultural heritage, if it does not adapt to contemporary society's needs, it needs to be continuously adapted and reconstructed, as this will allow it to be passed on and developed. Otherwise, it will quickly solidify into "a collection that lacks social content in museums" (Ma & Zhou, 2018, p.1).

The Ministry of Education, Culture, Tourism, and Human Resources Security of China supports the intangible cultural inheritor's training program in universities. The purpose is to help inheritors receive advanced art education and find an effective way of inheritance and development of Intangible Culture Heritage. More colleges and universities implement collaborative projects between designers and inheritors to combine art and intangible culture adapted for current aesthetics and applications. For

example, Lili Zhang directs bamboo Waving Kaleidoscope (2017) and Bird Forest (2018). Similarly, many didactic case studies have focused on collaboration with companies to explore the practical innovations for traditional handicrafts, helping students explore and address the knowledge of the raw material and traditional handicraft with new eyes (Affinito, Maria Conti & Motta, 2017). The creative transformation of traditional handicrafts is the grafting of itself as an intangible cultural resource into modern life to enhance the cultural connotation of the design of traditional handicrafts, thus creating a derivative value of traditional handicrafts.

This study explores a new model for the sustainable development of traditional handicrafts, especially educating designers based on sensory design and design thinking. Firstly, a literature review and analysis were conducted to explore and propose important methods and research tools to develop traditional handicrafts. A design framework and teaching model for sustainable development are proposed, and it also incorporates three design strategies for teaching experimentation: Inquiry-based learning, Audience participation, Experiential design.

The pedagogical method was then used to explore the application and practice of traditional handicrafts in design while focusing on students' understanding and perceptions of traditional handicrafts. These methods incorporated practical action, student feedback analysis and work analysis to establish the critical elements of sustainable traditional handicraft design, namely sensory value, narrative value, cultural value, and economic value, communicated primarily through creative and interactive experiences. The study proposes a circular design approach and design templates applicable to design education, providing the most direct methodological and theoretical basis for the sustainable development of traditional handicrafts.

The research objectives of this study are as follows: (1) To propose a model for the sustainable development of traditional handicrafts in design education using design thinking and sensory design. (2) To explore the role of students in the sustainable development of traditional handicrafts through teaching experiment with the pedagogical design model. (3) Through the teaching experiment of the pedagogical design model, explores how to inherit and convey the cultural and craft inheritance and convey traditional handicrafts. As an exploratory and experimental study, this paper explores the role of design thinking and sensory design in the inheritance and development of traditional handicrafts and explore their future development.

2. Relevant Studies

2.1 The Application of Design Thinking in Education

Design thinking is a widely applied innovation practice to improve creativity and provides a process and method to put forward ideas that can be used to solve complicated real-world problems (Plattner et al., 2009), which is a process for seeking better solutions to existing conditions (Garbuio & Lovallo, 2018). Design thinking's primary goal is to elicit mindset changes that aid creativity (Royalty et al., 2015), consisting of five main stages: Empathise, Define, Ideate, Prototype, and Test.

By the end of the 20th century, education has become one of the most extensive and integrated artificial systems, and some of the fundamental problems in education can only be solved by design thinking (Koh et al., 2015). There are many applications of design thinking in education, such as integrating the design thinking model with teacher training to train teachers to solve complex problems in education (Henriksen et al., 2017) and integrating it into the design of creative educational activities to develop learners' abilities of collaboration, problem analysis and creative thinking skills (Chen & Huang, 2017). Meanwhile, there are many studies on the application of combining design thinking with other disciplines, resulting in new design thinking models suitable for the profession, promoting teaching and learning activities, helping teachers to improve the quality and efficiency of teaching and learning, as well as helping students to absorb and master knowledge and skills. For example, design thinking has been integrated with business (Glen et al., 2015), geography (Carroll et al., 2010), ideological and political theory (Sun & Shi, 2014), information technology (Zhu & Li, 2015), and online courses (Anderson et al., 2014) as well as combining design thinking models with the experiences of innovative education, to advancing the formal application of the design thinking workshop. Janis Norman (2001) points out that in art and science projects, the introduction of the design thinking teaching model into educational practice can help learners organise their thoughts and actions effectively and can serve as a framework and catalyst for teaching and learning strategies to promote innovation, advanced thinking, teamwork, and accurate performance evaluation.

Design thinking is primarily characterised by its human-centred, social, responsible, active, and experimental nature (Leinonen & Gazulla, 2014). The human being's value, clarification of problems, focus on experimentation, familiarity with the process, a propensity for action, and all-around collaboration are also emphasised (Plattner, 2010). The inheritance of traditional handicrafts is a social issue, with sociality and responsibility. Applying design thinking to the innovation and sustainable development

of traditional handicrafts in design education, therefore, develops the ability of students to identify and analyse problems to solve them and builds a future-oriented responsibility and confidence in students and constantly optimising and renewing their knowledge structures. Through a human-centred concept, focusing on the social research of problems and emphasise the non-linear iterations of solutions to inspire thinking and modification, culminating in the visualisation of traditional handicrafts.

2.2 Importance of Sensory Design in Design

Restoring the culture means forming the cultural value from the emotional memories generated by long-term use, rather than disposable culture, representing sustainable value (Zhang, 2004). The traditional handicraft includes:

- the physical objects are the carrier of emotional memories,
- the craftsmen are the producer of emotional memories, and
- the user is the recipient of emotional memories.

"In creative work, both the artist and craftsman are directly engaged with their bodies and their existential experiences rather than focusing on an external and objectified problem" because "creative work calls for a bodily and mental identification, empathy and compassion" (Pallasmaa, 2012, p.15-16). Sensory design is a bridge of communication between people and things, bringing pleasant emotions and experiences to our bodies by using all our senses. For example, Adi Toch's 2017 installation, *Talk to Me*, exploring how sound translates into gentle movement. Her explorations of object voicing and dialogue with objects can still be seen in her series of works, *"Hold Out Your Hands"* (2017) and *"Red Sand Bowls"* (2017).

All the sensory interactions need to be considered when performing certain functions by the designers (Riccò, 2014). Not only does the visual influence our perception, but other sensory can also create added value (Spence and Piqueras-Fiszman, 2012; Riccò, Belluscio & Guerini, 2003). The traditional handicraft is a "certain aspect of human experience are destined to remain incomprehensible to linguistic kinds of representation no matter how thick the textual description or how deep the textual analysis" (Cox, Irving & Wright, 2016, p.9). Therefore, the degree of communication and understanding of information can be enriched and enhanced through other forms of visual or tactile understanding into auditory/taste/smell one, aiming at evoking the interaction of the senses (Merleau-Ponty, 2000). Humans holistically perceive the whole (Merleau-Ponty, 2000), which can increase the integrity of the understanding and transmission of traditional handicrafts. Especially with the arrival of the experience economy era, the importance of sensory has been widely recognised by society, be-

called a new trend in design development. It is the time to explore the sensory characteristics of the body (Kurokawa, 2003).

Design thinking emphasises "perceptual analysis", emphasising such analysis and design concepts as people-centred (Li, Ho & Yang, 2019). The inheritance of traditional handicrafts still requires physical experience, making and conducting subtle behaviour and perception adjustment through a multi-sensory perception process to truly understand the critical points of handicraft production. Passing on and developing traditional handicrafts is copying information, which is not so much passively handed down as actively regenerated (Ingold, 2001, p. 140-141). Therefore, sensory design plays a vital role in the issue of sustainable development of traditional handicrafts. From three factors, first, it is necessary to think about the manufacturing methods and techniques of handicrafts and explore its materials' characteristics and properties. Meanwhile, it is also essential to think about emotion and narrative to achieve emotional resonance and transmission of the designers, following the empathy stage of design thinking. In addition, it is essential to think in terms of sensory experience to convey the feelings and meanings that the work expresses so that the viewers can have a deep understanding of the works.

3. Model

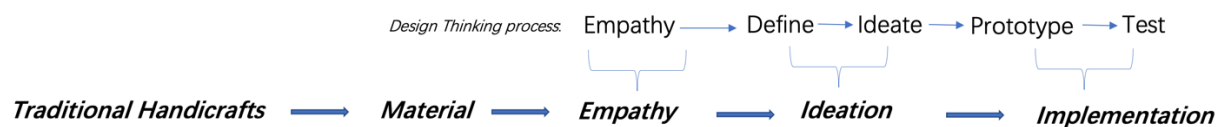
3.1 Model

The study explicates the sustainable development of traditional handicrafts based on design thinking and sensory design. To analyze the issue from two perspectives: exploring the internal factors of traditional handicrafts and the design expression of external factors.

The transmission of traditional culture should occur naturally, relying heavily on the transmission from person to person. Because traditional handicrafts contain the artwork and the craftsman and the user, the person is the subject of the handicraft (Li, Ho & Yang, 2019, p. 8). Therefore, people are central to the sustainable development of traditional handicrafts. In applying the pedagogical design model in design education, students are not only the creators, inheritors, or innovators. So, a sustainable approach to traditional handicrafts is proposed by applying the sensory design and design thinking methods, a pedagogical design model that eliminates the problems of traditional handicrafts in their current development through design and reuses traditional handicrafts and materials for redesign to achieve cultural sharing.

The pedagogical model includes two parts: internal factors and external factors. Due to traditional handicrafts composed of material and handicrafts themselves, internal factors have material and traditional handicrafts. While for external factors, the design thinking model has been adapted to help students with design expression (Fig. 1).

Figure 1: The Pedagogical Model



Source: Compiled by the research

3.2 Raise of Three Design Strategies

Coley (2013) believes that design thinking is a structured approach used to guide people to solve real-world problems, and these methods include research, analysis, brainstorming, innovation, and development to help people come up with creative solutions. The teachers need to provide methods to help learners find problems, generate empathy, thinking widely and define problems during the teaching and learning process. Such as the questionnaires and mind mapping can get to the heart of the matter and 'brainstorming' methods to divergent thinking problems.

The pedagogical model uses the UNESCO Education for Sustainable Development (ESD) enquiry-learning strategy (2), which proposes three design strategies:

- Inquiry-Based Learning: requires students to conduct first-hand and second-hand research methods to identify problems, expand their knowledge, e.g., literature review, case study, mind mapping.
- Experiential Design: requires students to conduct experiments to explore, discover more possibilities and broaden their thinking.
- Participation Action: requires students to engage in participatory learning to understand the main problems and possible solutions in the most effective way, as well as to the main issues for in-depth analysis and empathy with others, e.g., interviews, observation methods.

In the pedagogical model, the students are also required to work independently on their design to understand and experience the sensory experience brought by materials and handicrafts, then generate emotions and narratives.

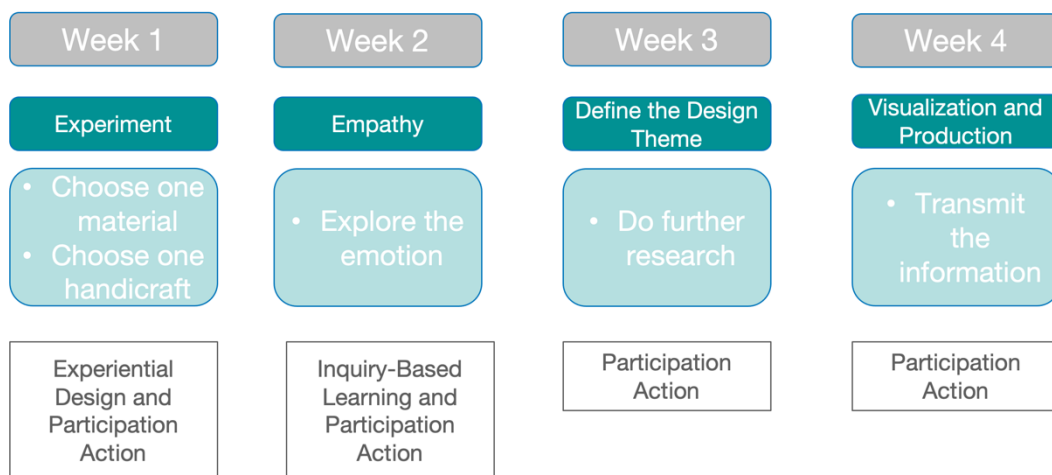
4. Method

4.1 Contents of Workshop Practice

(1) Experimental Subjects: The teaching experiment took place at the Sichuan Fine Arts Institute (China) with sophomores (27 students) majoring in jewellery design. They were divided into groups of 2-5 so that 27 students were divided into 11 groups.

(2) Practice Procedure: The teaching activity was conducted in "Jewellery Design and Composite Materials". This course aims to explore innovation in jewellery design and the technical craftsmanship of materials. As such, the students start by thinking about the 'handicrafts' part of the model and extend their thinking to the "materials" part while incorporating guiding questions to lead them to think about materials and handicrafts in the emotional, narrative, and sensory terms, identifying design themes, and design elements, and finally completing their work. The pedagogical method proposes three design strategies applied in the whole workshop (Fig. 2). The participation action was last from the first week to the fourth week. These four weeks asked students to participate in the progress as a group, research together, and discover and discuss their results. The first week required experiential design because the whole workshop required students to do material and handicraft experiments to figure out the innovation method. The second week needs inquiry-based learning to help students understand the relevant knowledge, enriching and enhancing emotional expression. As case studies, mind-map, sensory-related guiding questions, focus groups were used in this stage, guided students to study independently and thought more profound. The third week asked students to explore the design theme or concept and do further research, such as colour, textile and structure. The fourth week demanded that students translate the information into physical objects, such as sketches and modelling.

Figure 2: Proceeding of the Workshop



Source: Compiled by the research

(3) Design Theme: Sour, Sweet, Bitter, and Hot was a Chinese idiom that represents various flavours and implies life situations, such as happiness, pain, and others. So the experiment aims to require students to explore more sensory expressions from the taste while triggers more emotion and narrative content to enrich the expression form and identify design concepts more profound.

(4) Design form: The products were completed by teamwork and chose one of the four tastes, and the design products were necklaces.

4.2 Didactic Experiment

4.2.1 Designing the Task: One-day workshop

The aim of the workshop mainly helps students establish initial access to sources of design inspiration and how to extend it, extract design elements, complete the design draft, and finalise the production. It also helps students to develop an in-depth understanding of sensory and emotional expression.

The task is divided into four steps:

1. Consisting of a short lecture introducing the concept of sensory design, mainly through examples of art crafts designed by artists and researchers, to deepen students' perception of sensory expression.
2. Secondly, the students are asked to express how they feel when they hear the three sounds through geometric shapes and colours.
3. Thirdly, the students are asked to design jewellery according to their graphic drawings.
4. As the output, students need to make a piece of jewellery and a presentation to introduce their design concept. The students are asked to explain the connection between the emotions they have and the sensory expressions.

4.2.2 The Experimentation of material and handicrafts

According to the theme selected by the group and combined with the sensory guidance questions provided by the teacher, students select materials and handicrafts for experiments, exploring the unexpected possibilities of combining traditional handicrafts and materials to develop innovative ideas and enrich the sensory experience and enhance the narrative expression and emotional manifestation. In the process, students need to think and experiment with sensory-guided questions to explore more emotional and narrative content (Tab. 1).

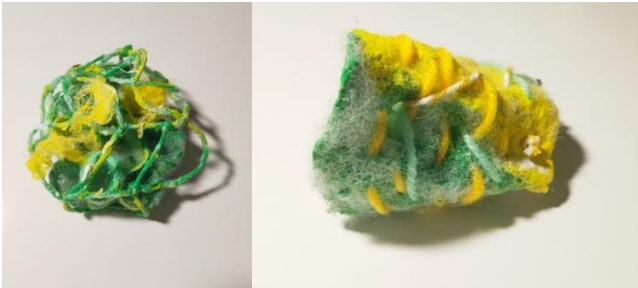
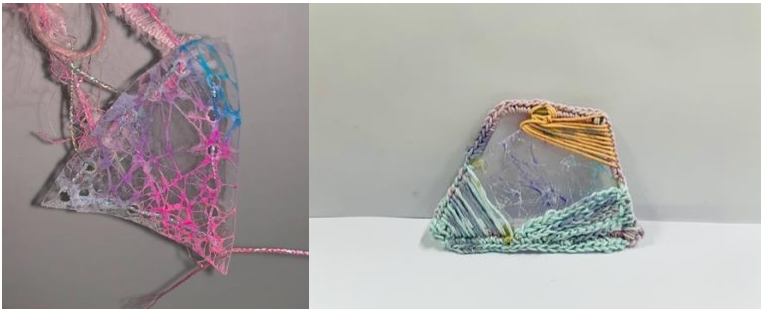
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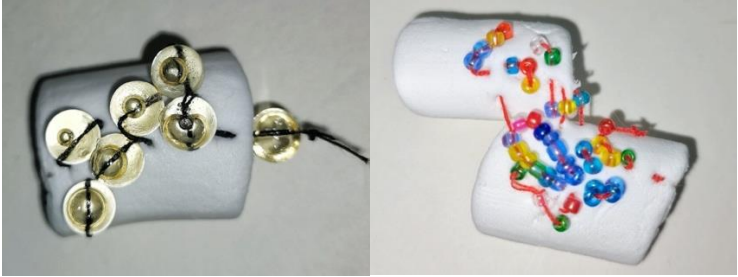
Here below there is a summary of five groups' work (Tab. 2): all groups are dedicated

Guiding Questions	1. What material did you choose? 2. What properties does the material itself have? 3. What sensory experiences do these properties give you? 4. What kind of feelings do these sensory experiences trigger/give/or make you associate with any specific things/stories? 5. Are these sensory and narrative content consistent with what your initial mind mapping was trying to convey? 6. What kind of sensory experiences does the samples present? (Vision/ Haptic/Taste etc.) 7. What sense/ story/ narrative content gave or triggered to you by the sensory experience of these experimental samples? 8. Before and after the experiment, the material changes, whether narrative content changes, triggered by the sensory experience changes? 9. Did the emotions also change in the process change? 10. Did your emotional change resonate?	1. Which handicraft did you choose? 2. Did the handicraft work well with your material to realize your design sketch? 3. Did the handicraft add new sensory experiences or enhance the existing ones? 4. Did the handicraft work with the material to reflect your design theme more fully and comprehensively? 5. How did the combination of handicraft and material better interpret the content and message of your work? Does the handicraft increase the emotional expression of your work? 6. Will the application of the handicraft increase the audience's understanding of your work? / How to convey the information of your work through this handicraft? 7. How does the audience understand the (traditional) handicraft and its history and production process through your work? 8. What is the relationship between handicraft and material?	1. How to present design elements/themes through a combination of handicrafts and material? 2. How to realize the form of design work through handicraft production?
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to the non-metal material, along with the crafts they selected.

Table 2: The Experimental Samples

Group	Material	Crafts	Sample
Group 1	Plastic Bottle	Knit	
Group 2	Clay	Knit	
Group 3	Gauze	Embr oidery and Tie- dye	
Group 4	Stalinite	Knit	

Group 5	Cotton Candy	Embr oidery	
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Source: Compiled by the research

4.2.3 Empathy and Ideation

The main aim of the Empathy stage is to identify problems and find inspiration from the senses, guiding students to think and find inspiration from the senses such as haptic and vision. In the Ideation stage, students are guided to have in-depth thinking about the senses, such as synesthesia, to clarify the designer's self-expressed emotions or intentions. The senses represent emotions, narratives, experiences, histories, and other specific and detailed information. Then finalise the design theme or concept. The main aim of this stage is to help students develop a design concept or theme.

Guiding questions helped students have a clear sensory experience of the materials and analyse the specific emotional and narrative content to clarify specific design themes. The collage method helped students broaden their ideas, find design elements, and optimise the innovative experimental samples. For example, in group five, the collage was used to analyse the artists and their works and extract relevant design elements to clarify the design content and redo the experiment with handicraft and material (Fig. 3).

Figure 3: Optimised Experimental Sample

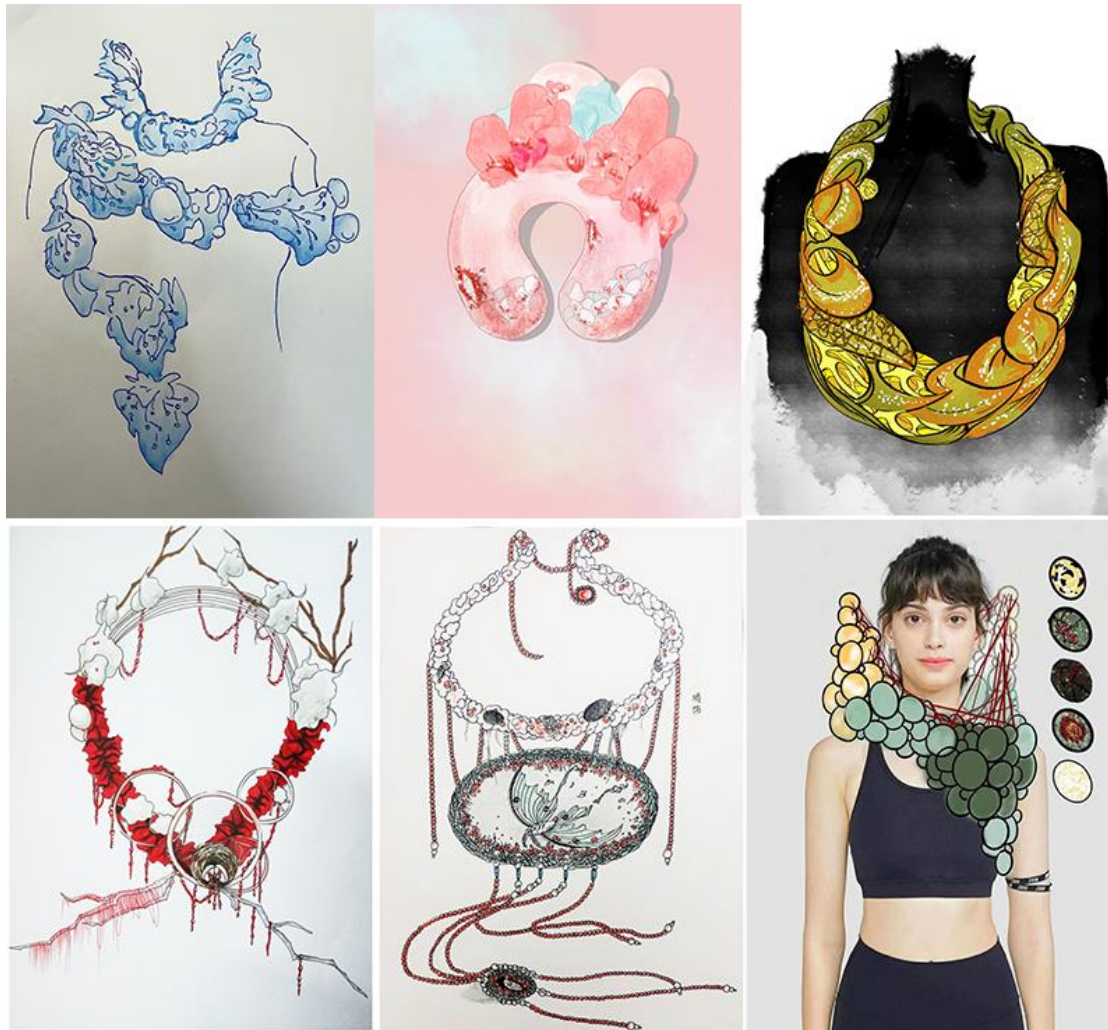


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4.2.4 Implementation

The main purpose of this stage is to require design groups to sketch (Fig. 4) and produce their designs based on their themes. In the process of design with hands and brain, students promote the ability in practice and observation. Participate action strategy was adopted to experience jewellery making and the interaction of materials and handicrafts. In this jewellery product design, each group of members tried their own best to make physical objects related to the Sour, Sweet, Bitter and Hot and strived to underline the sustainability development of traditional handicraft in contemporary design transformation through the theme, content, and design form.

Figure 4: Sketches of the Design



Source: Compiled by the research

5. Discussion

Applying the pedagogical model in the contemporary jewellery course enhances teaching efficiency and optimises the curriculum, but also students can produce relatively complete and expressive work during the workshop. In terms of materials, students select daily materials or materials commonly used in jewellery to gain a new understanding and discover other properties of materials by considering guiding questions and experiments. It helps students expand their design thinking and generates

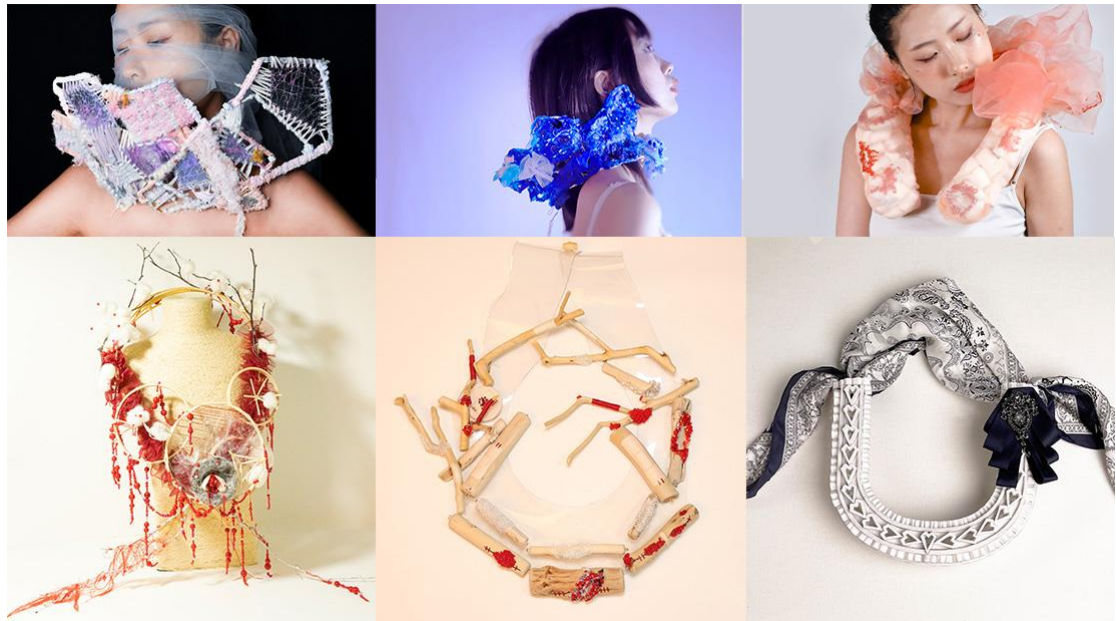
innovative ideas on raw materials. In terms of craft, the understanding and mastery of the craft itself and the process of making and experimenting with the combination of material and craft help students discover more possibilities and break through their perceptions. It also helps student's breakthrough thinking and creative design that generate new understandings of the craft. In terms of emotional expression and narrative content, guiding questions help students gain insight into their materials and crafts to discover their own emotions and the narrative content of their expressions. Students are further helped to clarify emotions. Students are helped express emotions and narratives through tactile, auditory, visual, and other sensory forms and communicate with audiences in terms of the sensory experience.

According to the course's content and purpose, the three design strategies are used and adapted to the actual situation of the students in the class, which is flexible. For example, in the teaching process, students were unfamiliar with inspiration and helped extend their thinking through mind mapping, and case studies were used to help students acquire knowledge and broaden their horizons.

To introduce the course's content and task arrangement were carried out in the teaching and learning process, and then the design and production were conducted through the discussion and cooperation of the group. During the four-week course, the students' thinking had changed, and they gained diverse knowledge at each stage. The following points can be analysed from the students' works:

1. Most students chose the theme of "Sweet" (6 groups) (Fig. 5), followed by "Bitter" (3 groups) (Fig. 6), with only one group chose "Sour" (Fig.7) and one chose "Hot" (Fig. 8).

Figure 5: Students' works under the theme "Sweet".



Source: Compiled by the research

Figure 6: Students' works under the theme: "Bitter".



Source: Compiled by the research

Figure 7: Students' works under the theme: "Sour".



Source: Compiled by the research

Figure 8: Students' works under the theme: "Hot".



Source: Compiled by the research

2. The materials chosen by the students were all non-metal materials.
3. The handicrafts chosen by the students can be categorised as embroidery, tie-dye, knit.

Through the three design strategies, appropriate teaching methods were arranged to help students better understand the role of craft and the purpose of combining materials and handicrafts in the teaching process. However, two problems were identified in the teaching process. Firstly, students have some problems with understanding the handicrafts in the experiment of combining materials and handicrafts. The students only repeated the making process of the first experimental samples but did not apply the features and skills of the handicrafts to the material to explore more possibilities. Also, they did not do an in-depth exploration of materials combined with the design theme and elements chosen by the group and hardly found the supporting role of handicrafts in this process of experimentation. Secondly, students lack an understanding of sensory design and are unfamiliar with related design methods, while they have difficulty

understanding emotions and narratives. Therefore, case studies and guiding questions were used to help students understand and complete the design, for example, by helping them gradually realise the visual expression and then transform it into a tactile experience.

To summarise the experiment:

1. In the workshop, the students were guided by guiding questions, thus discovering that vision is an attractive and intuitive experience. The students' work presented the design theme mainly through colours and structures. Secondly, some students also conveyed information through smell. For example, one group used the smell of Traditional Chinese medicine, and another group used the sweet smell of cotton candy. Haptic expressions and experiences are also sensory experiences that convey more information. For example, making U-shaped pillows through the softness of cotton candy gives people a comfortable feeling.
2. In the design process, students, as a designer-maker, play a role in information collection, integration, finding appropriate ways to convey the message, and ultimately complete production independently.
3. The theme and materials chosen by the students are used to determine the final handicraft to support their design concepts and complete works. Most of the students choose traditional handicrafts that are easy to operate, such as embroidery and knit. Moreover, those handicrafts apply to a variety of materials. For example, embroidery can be created on paper or leather, and the works can be recycled, dismantled, and redesigned.

6. Conclusion

Based on design thinking and sensory design, this paper proposes an approach that can address how to learn from traditional handicrafts in a contemporary world in a way that is lasting and takes that knowledge forward into the future. Specifically, an educational model is proposed to provide students with experiences and learning methods to think about how to learn from objects and not just how we learn skills, but how we learn to respond creatively to those traditional handicrafts and the learning those included. Meanwhile, the design education model is to help teachers design and optimise an innovative curriculum and meet the needs of society and students. Moreover, the model improves the effectiveness of teaching and learning.

In the experiment conducted, the students have a problem understanding and cognition of traditional handicrafts, such as the concept and categories of traditional handicrafts. Meanwhile, the students' minds were confined. For example, materials experiment was carried out in simple ways, such as burning and folding, which did not provoke deeper exploration and thinking. In addition, the students have difficulty bringing sensory and emotional expressions into the work.

As future work, we plan to flesh out three design strategies that can be adopted corresponding teaching methods for different problems and innovate teaching methods to address students' problems in the learning process. We also plan to develop curriculum design methods to guide teachers in applying the model, for example, to design relevant guiding questions through sensory design. Another issue that deserves attention is whether the model can be applied to design education in culturally diverse countries. Finally, another line of future work is the independent designer-maker who can use the model as a design method for independent creation.

This model leads the student/designer-maker to discover the value of sustainable development of traditional handicrafts and demonstrates and establishes a sustainable development model of design thinking and sensory design, providing sustainable development of traditional handicraft design.

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