Emotional Design from Research to Education
Based on the Case Study of Hill censers

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Doctoral Dissertation

Emotional Design from Research to Education
Based on the Case Study of Hill censers

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Abstract

Emotional design has been used to ensure that the intended users are offered a positive emotional experience. It is a design direction which is still mostly restricted to research and industry with limited tries to teach it to design students. Most of the professionals using emotional design slowly acquired the required skills by experience without direct education. Teaching emotional design to students has been overlooked due to its difficulty. This research explores the design of products based on the users' emotional requirements and how it can stimulate students to generate novel emotional design ideas in design education. To achieve these aims, multistage evaluation design in a case study was utilized in this research. In case study I, 23 selected historical samples (hill censers) were evaluated based on content analysis, semantic network and methodological triangulation methods. In case study II, 18 selected contemporary samples were evaluated based on an explanatory sequential design to learn how to design products that reflect the professional knowledge of the designers and according to users' emotional requirements. In case study III, an online course was conducted to stimulate the students in order to generate innovational emotional design ideas. Thematic analysis and high-frequency vocabulary analysis approaches were employed to study the positive influence of the students' designs.

Through the case studies conducted in this research the findings were used to propose the design theory about emotional design. Case study I discovered the important relation 'emotional experience and design style'. Case study II proposed the emotional design method from design trend and emotional experience aspects. The theory explains the designers' tacit and explicit knowledge in providing positive emotional experience. This three-sided design theory (user, design trend and emotional experience) could help provide positive emotional experiences in product design. Two findings were obtained from case study III. The first finding is that the second-person perspective enables the students to acquire better design ideas quickly. The other finding was the vital themes offering positive emotional experiences to the users; 'design method', 'emotional experience' and 'culture connotation'.

Finally, an emotional design procedure was built in this research to help the students get innovational design ideas when designing products according to users' positive emotional requirements. This procedure is general enough to be utilized to design different kinds of products. Furthermore, an emotional design appraisal model was built to evaluate the products from knowledge, skills and value perspectives.

Key words: Hill censer, Emotional design, Emotional experience, Emotional requirements, Positive

Contents

Acknowledgement i
Abstract ii
Contents iii
List of Figures vi
List of Tables vii
List of Publications and Presentations viii
Chapter 1. Introduction 10
1.1. Research Background 11
1.2. Purpose Statement 12
1.3. Research Questions 13
1.4. Research Originality and Novelty 13
1.5. Research Structure 14
Chapter 2. Literature Review 15
2.1. Emotional Design and Valence 16
2.1.1. What is Emotional Design? 16
2.1.2. What is Valence? 17
2.2. Methods and Data Sources 18
2.2.1. Cluster Analysis of Cited References 21
2.2.2. Burst Detection of References 24
2.2.3. Timeline of Terms and Keywords 28
2.3. Emotional Appraisal 30
2.4. Emotional Design in Education 31
2.5. Literature Map 33
2.6. Summary 34
Chapter 3. Methodology 35
3.1. Multistage Evaluation Design of Case Study 36
3.2. Research Methodology Based on Case Studies 40
3.2.1. Qualitative Design in Case Study I 40
3.2.1.1. Content Analysis 40

3.2.1.2. Thematic Network 41
3.2.1.3. Methodological Triangulation 42
3.2.2. Explanatory Sequential Basic Design and Research Hypothesis in Case Study II 43
3.2.2.1. Questionnaire 43
3.2.2.2. Grounded Theory 44
3.2.3. Qualitative Design in Case Study III 45
3.2.3.1. Thematic Analysis 45
3.2.3.2. Mixed Perspectives 45
3.3. Data collection and Procedure 46
3.3.1. Data collection in Case Study I 46
3.3.2. Data collection in Case Study II 48
3.3.3. Participants in Case Study III 50
Chapter 4. Case Study I 51
4.1. Overview of Case Study I 52
4.2. Hill Censer, Boshanlu 52
4.2.1. History of Hill Censers, Boshanlu 52
4.2.2. Origin and the Meaning of Hill Censer 53
4.2.3. Evaluated Samples 56
4.3. Emotional Evaluation of Samples by Multiple Methods 67
4.3.1. Content Analysis 67
4.3.2. Semantic Network Analysis 74
4.3.3. Design Guidelines from Users 78
Chapter 5. Case Study II 81
5.1. Overview of Case Study II 82
5.2. Evaluated Samples 82
5.3. Data Analysis 86
5.4. Obtain Findings by Mixed Methods 89
5.4.1. Obtain Findings by Open-ended Interviews 89
5.4.2. Obtain Findings by Grounded Theory 89
5.4.3. Constructing the Design Method 93
Chapter 6. Case Study III 96
6.1. Overview of Case study III 97

6.2. Process of the Online Course 97
6.3. Impact of Mixed Perspectives 98
6.4. Thematic Analysis Method 99
6.5. Evaluated Designs 103
6.6. Emotional Evaluation 112
Chapter 7. Discussion and Conclusion 113
7.1. Discuss the Findings of Case study 114
7.1.1. Summary and Discussion of the Findings 114
7.1.2. Conclusion Based on the Findings 116
7.2. Contribution to Knowledge Science 118
7.2.1. KM Cycle 118
7.2.2. Theoretical Implication 119
7.2.3. Practical Implication 122
7.3. Research Limitations 125
7.4. Recommendations for Future Research 126
References 127
Appendix 1 139
Appendix 2 141

List of Figures

Figure 2-1. The searching results of emotional product design from Web of Science 20
Figure 2-2. Nine clusters 21
Figure 2-3. 19 references with the strongest citation bursts 24
Figure 2-4. A timeline visualization for $T_{2000\ -\ 2020}$ is shown visualization of clusters and their labels based on term and keywords detection 29
Figure 2-5. Literature map 32
Figure 3-1. The research methodology conducted in the cases studies 38
Figure 3-2. Advanced mixed methods design/Multistage evaluation design of case study 39
Figure 3-3. Advanced design with explanatory sequential basic design of case study 43
Figure 4-1. A stone relief 54
Figure 4-2. A silver incense burner 54
Figure 4-3. Eight samples from the Han Dynasty 59
Figure 4-4. Nine samples were chosen from the Wei, Jin, Northern and Southern dynasties 63
Figure 4-5. Three samples from the Sui and Tang dynasties 64
Figure 4-6. Blue-white glazed porcelain hollow hill censer 65
Figure 4-7. Dragon and phoenix pattern colored glaze censer with three-color glaze 66
Figure 4-8. Blue-and-white hill censer 66
Figure 4-9. Semantic network of positive vocabulary 76
Figure 4-10. Semantic network of negative vocabulary 77
Figure 4-11. Design guidelines for proving positive feelings 80
Figure 5-1. Ceramic craft in the studios 83
Figure 5-2. Hand-made 83
Figure 5-3. Hand painting 84
Figure 5-4. 18 Samples of hill censers 85
Figure 6-1. The whole process of case study ||| 98
Figure 6-2. Nine themes 101
Figure 6-3. Written on the Wall at West Forest Temple 104
Figure 6-4. Hill-censer 105
Figure 6-5. Good smell 106
Figure 6-6. Spring Trees and Evening clouds 107
Figure 6-7. Auspicious Clouds 108
Figure 6-8. Suspension 109
Figure 6-9. Mr. Fool Wants to Move the Mountain 110
Figure 6-10. Japanese Garden 111
Figure 7-1. KM Cycle 118
Figure 7-2. Implication of three case studies 119
Figure 7-3. Theoretical foundation 121
Figure 7-4. Emotional design procedure 123
Figure 7-5. Emotional design appraisal model 124

List of Tables

Table 2-1. Highly cited references 23
Table 3-1. Five-point scale questionnaire to assess emotion 44
Table 3-2. Interview questions 47
Table 3-3. Participants in case study II 49
Table 4-1. Analysis of pleasant features in hill censers 67
Table 4-2. Analysis of unpleasant features in hill censers 69
Table 4-3. The codes, categories and themes associated with pleasant features in hill censers 72
Table 4-4. The codes, categories and themes with unpleasant features in hill censers 73
Table 5-1. Reliability statistics obtained from the 18 samples 86
Table 5-2. Test of homogeneity of variance 86
Table 5-3. Multiple comparisons from the Scheffé's method 87
Table 5-4. Repeated multiple comparisons from the Scheffé's method 88
Table 5-5. Mean evaluations of the 18 samples 89
Table 5-6. An example of coding 91
Table 5-7. Grounded theory obtained from positive emotional analysis 91
Table 5-8. Grounded theory obtained from negative emotional analysis 92
Table 6-1. The Transitions of Perspectives during the Design Processes 98
Table 6-2. The 30 emotional words 112
Table 6-3. Vocabulary ranking 112

List of Publications and Presentations

1. **Conference proceedings**

YU, Q., Nagai., Y., & Pei Zh. (2018). Utilizing Service Design Strategy to Improve the Marketing of Jingdezhen Ceramic Products. In T. P. Liang & T. Kaihara (Eds.), *Service⁺, Pursuing Excellence in Service Research, Joint International Conference of Service Science and Innovation, ICSSI2018/ICServ2018*, (pp. 95-102). Taiwan. With peer review.

2. **Conference proceedings**

YU, Q., Nagai., Y., & Pei Zh. (2018). A study on Utilizing Service Design Strategy to Enhance the Customer experience: Based on the survey of Helsinki Ceramic product selling. In K. S. Cho (Eds.) *International Service Innovation Design Conference, 2018 ISIDC* (pp. 141-149). Jeonju, Korea. With peer review.

3. **Conference proceedings**

Yu Q., & Nagai Y. (2018). Predicting user experience from tactile and visual perception: a case study of Scandinavian ceramic products. *芸術工学会誌 Design Research*, No. 77. Takaoka, Japan. Without peer review.

4. Journal paper

Yu Q., & Nagai Y. (2020). A New Approach to Teaching Emotional Design. *Social Sciences*. 9(11):210. https://doi.org/10.3390/socsci9110210. With peer review.

5. Journal paper

Yu Q., & Nagai Y. (2021). Mixed Perspectives and Thematic Analysis in Design Education. *Journal Space and Culture, India.* 8 (4), 78-88. https://doi.org/10.20896/saci.v8i4.966. With peer review.

6. Journal paper

Yu Q., Nagai Y., & Luo Y. (2020) Co-Creation with Ceramic Practitioner for Improving the Marketing and Enhancing the Customer Purchase Experiences. *Asian Business Research Journal*. 4(1), 44-53. https://doi.org/10.20448/journal.518.2019.41.44.53. With peer review.

7. Book

Yu Q. (2017). *British Ceramic Products Design*. Shanxi Normal university press.

8. Book

Yu Q. (2017). *History of Industrial design*. China Architecture Publishing & Media Co., Ltd.

9. Book

Yu Q. (2020). *Scandinavian Ceramic Products Design.* Shanxi Normal university press.

Remarks: Two published journal papers, one is titled: A New Approach to Teaching Emotional Design, the other is titled: Mixed Perspectives and Thematic Analysis in Design Education. Both papers are included in the contents of this thesis in several parts of Chapters: 1, 3, 4, 6 and 7.

Chapter 1.
Introduction

1.1. Research Background 11

1.2. Purpose Statement 12

1.3. Research Questions 13

1.4. Research Originality and Novelty 13

1.5. Research Structure 14

1.1. Research Background

In 2004, emotional design emerged as a product design concept trying to make products that would give the intended users a positive emotional experience (Norman, D. A, 2004). In 2006, emotional design became the focus of interest of both designers and researchers (Denton & McDonagh 2006). Emotion-focused design was the term used in the first conference of design and emotion (Desmet & Hekkert, 2009; Cupchik, 1999). Several studies have been trying to develop tools and techniques to improve emotion-focused design (Sacharin et al., 2012; Cowie et al., 2000; Watson et al., 1988). Van Group and Adams (2012) stated that emotions could deeply influence the overall user experience. Sáenz et al. (2019) added that understanding the users' feelings and emotions is vital in the design process. Recently, seeking to achieve positive users' emotional experience has been recognized as a crucial advantage in product design (Violante et al., 2019).

So far, the significance of emotional requirements to the customers has been recognized by researchers (Norman, D. A, 2004; Desmet & Hekkert, 2009; Cupchik, 1999; Van Group and Adams, 2012). However, there is almost no research about how to teach emotional design for achieving positive users' emotional experience. Specifically teaching emotional design to students has been widely overlooked. A recent academic design course briefly introduces emotional design to the students without training or indulging them much in emotional design methods. Interaction Design Foundation provides is an online course: "Emotional Design — How to Make Products People Will Love[1] ". It is based on Norman's three levels of emotional design theory (visceral, behavioral and reflective design). It tries to provide necessary information to students to embed such positive emotional experiences in their design. The contents of that course are not publicly available for a more detailed comparison.

This study aims to explore the invoking of emotional design in design research and education using a systematic approach. A case study of Boshanlu/hill censer (Boshanlu is a hill shaped censer, the name is based on its shape of fairy sea hills) was chosen here to generalize the emotional design strategies, build the emotional design procedure and emotional design appraisal model. Those design strategies, procedure and model will guide the researchers to study emotional design as well as help students get emotionally innovative design ideas quickly based on users' emotional requirements.

A systematic process was followed from design research to design education based on the KM (knowledge management) model to obtain the research goal (Awad & Ghaziri 2004; Agarwal, 2014). First, historical and contemporary samples (hill censers) were chosen in case study I and II, respectively. The samples were used to determine users' positive and negative emotional

[1] https://www.interaction-design.org/courses/emotional-design-how-to-make-products-people-will-love

responses. This was generalized into emotional design guidelines and further incorporated in the emotional design methods. The two case studies were conducted as the teamwork utilizing tools of interviews, questionnaires, shadowing, cultural probes, storytelling to create knowledge and capture tacit knowledge from the users and designers. Content analysis was then applied to the interviews in focus groups and grounded theory was used to refine and codify knowledge, which was taught to the students in case study III in an online course in a share and transfer knowledge manner. Finally, an emotional design procedure and emotional design appraisal model were built. The target audiences are designers, design students and researchers who will profit from using the knowledge of emotional design to get innovative emotional design ideas in their future work as they evaluate and reuse knowledge.

1.2. Purpose Statement

The purpose of this study is to explore how to design products based on users' emotional requirements and how students can be stimulated to generate novel emotional design ideas easily. So far, the importance of emotional requirements to the users has been recognized by researchers. However, what is the most crucial factor in product design is still vague. Case study I is used to explore the vital factor in product design from perspective of emotional experiences, having either pleasant or unpleasant effects on the users. The results obtained by the content analysis have been further discussed in a group to generalize the emotional design guidelines.

In case study II, long-term fieldwork was conducted in a Chinese ceramic city called Jingdezhen. The prominent problem of this city is that new products still closely follow traditional ceramic styles. Only a few of them try innovative design methods without much research or planning. The case study II is to explore how to design products that reflect positive emotions from their creators. This way, this research intends to advance the design method needed to elicit such emotions while considering the designer's intuition and experience. Existing studies suggest that positive emotional states can accelerate intuitive, integral information processing (Bless and Igou, 2006; Pekrun, 2009; Heidig et al., 2015). That genuine and positive emotion can enhance comprehension along with the designers' intrinsic motivation. The designers should rely on their intuition to create products eliciting positive emotions.

In order to facilitate design innovation, an explanatory sequential design was conducted to elicit the designers' tacit knowledge about emotional design strategies in products in case study II. The professional designers always know how to catch the users' requirements by their intuition (Landay & Hong, 2003; Burke & Miller, 1999). However, this kind of tacit knowledge is embedded in the designers' minds through work that stems from years of experience (Awad & Ghaziri, 2004). The tacit knowledge has been identified as hard to capture or transfer (Meyer

& Sugiyama, 2007; van Kampen, 2019). The goal is to capture that tacit knowledge of designers and transferring it to the design students. To obtain this goal, case study II applied fieldwork, questionnaires, interviews and grounded theory to evaluate designers' positive and negative emotions. The evaluation provided insights in improving products according to the users' positive emotional experiences. Finally, the results obtained in case study I and II have been shared with the students in an online course conducted as case study III to foster their design innovation. The students would be the new design force to improve the design situation and handle the existing problem in Jingdezhen.

Generalizing innovative design ideas for students is known to be difficult. The purpose of case study III is to stimulate the students to get innovative design quickly based on users' positive emotional requirements. The case study included two steps; First, the students took online lectures to learn how to design products from an emotional design perspective. During the lectures, the teachers also shared the results obtained from the previously mentioned two analysis case studies. In the second step, the students' survey reports were analyzed using the thematic analysis method to summarize emotional design knowledge. Finally, the results were shared with the students during the course period to help them get innovative design ideas.

1.3. Research Questions

This study was devised to address the following research questions:

1. what is the most crucial factor in product design for users?
2. To what extent are designers' attitudes related to acquire positive emotional experience, from users' perspective?
3. How could students design products according to users' emotional requirements?
4. How could students be assisted in quickly coming up with design ideas?

1.4. Research Originality and Novelty

In this research, design originality and novelty come from three aspects. As shown below:

According to van Gorp and Adams (2012), the ever-changing and ephemeral nature of emotions has led many to believe that it is impossible to trigger emotional responses through design consistently. However, the researchers have already continued to examine the relationship between design and emotion over the last four decades. Some tools (Geneva Emotion Wheel, Feeltrace), methods, frameworks, or emotional appraisal scales (PrEmo) have been using to test the emotional influence on the users or customers. Whereas there are no related emotional design models to help the students/designers to do emotional design work based on users' positive emotional requirements. This research built an emotional design

framework and emotional design appraisal model; it would facilitate the students and researchers to do their emotional design work in the future.

Second, this research focused on the designer's emotional evaluation to elicit tacit design knowledge considering the designer's intuition and experience. Most emotional design research focused on the customers' emotional evaluation, whereas designers' emotions have been scarcely addressed. (Ho, 2015; Donati et al., 2019; Heidig et al., 2015).

Lastly, there has been limited research into teaching emotional design to achieve a positive emotional experience for users. The case study III conducted an online course to teach emotional design, to help the students to generalize innovative emotional design ideas easily.

1.5. Research Structure

The remainder of this dissertation is organized as follows.

Chapter 2 presents the literature review of emotional design, a software called Citespace is employed to analyze and summarize the literature of emotional design.

Chapter 3 presents the research methodology; multiple methods have been utilized in three case studies. The process of data collection and procedure are also introduced in this chapter.

Chapter 4 presents case study I, 23 historical samples are analyzed based on content analysis, semantic network and methodological triangulation methods to identify the pleasant and unpleasant influences on users. Furthermore, the design guidelines are summarized, which will be shared with students in case study III.

Chapter 5 presents case study II, an explanatory sequential mixed methods design (5-point scale, One-way ANOVA, interviews, focus group and grounded theory) applied to evaluate the 18 samples to summarize the coding list, categories and themes. Finally, the design theory is summarized, which will be shared with students in case study III.

Chapter 6 presents case study III, an online course is conducted to teach students design products with positive emotional requirements of users. First, mixed perspectives are used by the students in their design process to catch users' positive emotional requirements. Second, thematic analysis method is leveraged to study the students' investigation reports and sort the design ideas from users' emotional experiences. Finally, the students' designs are evaluated by the emotional words to identify the positive emotional experiences.

Chapter 7 presents conclusion of this study. The findings, contribution, limitation and recommendation for future work are addressed in this section.

Chapter 2.
Literature Review

2.1. Emotional Design and Valence 16
2.1.1. What is Emotional Design? 16
2.1.2. What is Valence? 17
2.2. Methods and Data Sources 18
2.2.1. Cluster Analysis of Cited References 21
2.2.2. Burst Detection of References 24
2.2.3. Timeline of Terms and Keywords 28
2.3. Emotional Appraisal 30
2.4. Emotional Design in Education 31
2.5. Literature Map 33
2.6. Summary 34

This research studied emotional design based on the case study of hill censers. In this chapter, the definitions of emotional design and valence were clarified, and then, applied an application named CiteSpace to analyze the literature of emotional product design extracted data from Wos (Web of Science). Some functions of CiteSpace named 'Cluster analysis', 'burst detection' and 'timeline' were used to study the literature of emotional design. Furthermore, emotional appraisal and emotional design in education were reviewed based on the database of google scholar. Finally, a literature map was drawn to show the structure of the literature review.

2.1. Emotional Design and Valence

The concept of emotional design has a long-standing place in human engineering concerning how to design everyday things (Norman, D. A, 2004). As one of the earliest emotional design researchers, Donald A. Norman stated that a design is a success only when the final product is successful in making customers buy it, use it, enjoy it, and spread the word of the product to others. To obtain this goal, the products cannot limit to offer the functions to users. Norman realizes that elicit positive emotions is necessary to predict the target users' emotional responses in the design process.

The positive and negative were fundamental in our emotional life, which had been identified by some researchers (Shuman et al., 2013); positive and negative emotions are categorized to the valence (Pekrun, 2006; Russell, 2003; Park B. et al., 2015; Um et al., 2012). Valence is the concept at the heart of emotional experience, which could relate to some emotions, such as positive – negative, good – bad, or pleasure – displeasure, so it needs to be explained when defining the emotional design.

2.1.1. What is Emotional Design?

Emotional design is the concept of creating designs that evoke emotions, which results in positive user experiences (Norman, D. A, 2004). Donald A. Norman proposed his famous three levels of product design strategies in his book named "Emotional Design: Why We Love (or Hate) Everyday Things". He pointed out that designers should aim to reach users on three cognitive levels—visceral, behavioral and reflective, and the users could develop their positive associations with products, brands, etc. Norman's emotional design strategies are deeply influenced design development trends in the next ten years.

Emotional design occurs with the object to promote positive emotions or pleasure in users (Jordan, P.W, 2003; Green & Jordan, 2002) thanks to design properties of products and services (Triberti et al., 2017). Green and Jordan (2002) proposed the four kinds of pleasures influence on emotional design: 'Physio-pleasure', 'Socio-pleasure', 'Psycho-pleasure' and 'Ideo-pleasure'. Thereinto, Physio-pleasure is closely related to the pleasant experiences of sensory

organs, ‘taste’ – ‘touch’ – ‘smell’ – ‘sexual’ – ‘sensual pleasure’. Socio-pleasure implied facilitating social interaction by using products in several ways, such as a juicer can become a theme of talking at a family party. Psycho-pleasure is a concept about the product context that the products can help accomplish the tasks with pleasure experiences. Ideo-pleasure is referred that pleasure is from theoretical entities (Green, W. S., and Jordan, P. W., 2002); such as a product made of biodegradable material that could appeal to the wishes of someone to protect the environment (Green, W. S., and Jordan, P. W., 2002). Although it is hard to reach all standards of our pleasures into one product, the designers should make a product more than functional and/or aesthetically pleasing; it should elicit emotion through using pleasures.

2.1.2. What is Valence?

Human life always involves emotions; positive and negative emotions are fundamental in our daily lives (Shuman et al., 2013). The emotions can be categorized into two dimensions, valence (positive vs. negative) and activation (activating vs. deactivating) (Pekrun, 2006; Russell, 2003; Park B. et al., 2015; Um et al., 2012).

This research was to study the positive and negative emotional experiences of users based on evaluated samples. Hence, ‘valence’ is a crucial term that needs to explain. The term was first introduced by Lewin (1951), who used it in his field theory to refer to the forces that attract individuals to desirable objects and repel them from undesirable ones (Shuman et al., 2013, p. 1). The concept has been considering extending, not limiting to the emotions as positively or negatively valenced (Solomon & Stone, 2002; Colombetti, 2005). Charland (2005, p. 83) pointed out that valence is “one of the most important scientific concepts at the heart of emotion experience”. Valence refers to the ‘positive’ or ‘negative’ character of emotion, or the ‘positive’ or ‘negative’ character of some aspect of emotions (Colombetti, 2017). Some researchers agreed that valence expresses with bipolar terms such as positive – negative, good – bad, or pleasure – displeasure, which captures something essential about affecting (Ortony et al., 1990; Solomon & Stone, 2002; Frijda and Scherer, 2009).

The function of positive emotions is about activating (happy, hopeful) or deactivating (satisfied, calm) (Um et al., 2012). Likewise, negative emotions are related to activating (anxious, angry) or deactivating (hopeless) (Park B. et al., 2015; Plass et al., 2014; Pekrun et al., 2002; Pekrun & Jerusalem, 1996). Pekrun (2006) realized that positive emotions could be strengthened motivation, while negative emotions can be detrimental to learning (Um et al., 2012).

Emotion can deeply influence user experience in decision, affect memory and attention, and generate meaning making (van Gorp & Adams, 2012). That means emotion is the most vital factor in understanding the users’ feelings and emotions (Mcevoy & Cowan, 2016). Hence, the designers should learn the users’ emotional requirements in their designing process.

2.2. Methods and Data Sources

This research studied the emotional design in the product design field; the purpose was to explore the users' emotional needs and teach the students to design products according to obtained results. De Solla Price (2011) pointed out a systematic review plays a critical role in scholarly communication. In order to draw various knowledge maps and spectrum, show research trends, hot trends and key writers, a scientific analysis skill was applied. Some of the visual analytics applications, such as CiteSpace (Zheng et al., 2019), VOSViewer (van Eck & Waltman, 2010) and Action Science Explorer7 (Cobo et al., 2011), were specifically designed for understanding a knowledge domain from a large volume of scientific literature. This research chose Citespace as a tool of bibliometric to study the literature.

A comprehensive bibliometric analysis of a specific topic can help researchers to understand the field knowledge better. Bibliometric techniques are one approach of scientometrics. Scientometrics is a branch of informatics; it is used to analyze the quantitative data to figure out emerging trends and knowledge structure of research fields. (Ye, 2018). Furthermore, Bibliometric analysis is a quantitative method to retrospect and describe published papers, which is useful for researchers to evaluate academic studies in a focal field (Rey-Martí et al., 2016; Small, 1973).

CiteSpace is a freely available visual analytic application for users to analyze and visualize a knowledge domain based on relevant publications (Chen, 2004; Chen 2015); it is a Graphic User Interface (GUI) – based visual analytic tool (Ping et al., 2017). Moreover, a Java application for visualizing and analyzing trends and patterns in literature. One of the core functions of CiteSpace is to detect and analyze research frontier and knowledge relations. (Jia et al., 2019).

This research used the Web of Science (WoS) database by Thomson Scientific as the database source. The WoS is a high-quality digital database widely accepted among researchers and has become a common tool for retrieving and evaluating different types of publications (Thelwall, 2008; Ding & Yang, 2020). In this review, this research relied on scholarly publications in the Web of Science as a more rigorous and reliable representation of the literature (Chen et al., 2014).

The keywords were set as 'emotional product design', 'emotional design education'. The time span was set from 2000 to 2020. The document type was set article and review. There was no related article about 'emotional design education', the only category of 'emotional product design', which included 936 articles in the set. To further refine the search results, the category of article and review was set; 'Business' – 'Management' – 'Engineering Industrial' – 'Engineering Manufacturing' – 'Art' – 'Ergonomics' – 'Social Science Interdisciplinary' – 'Psychology multidisciplinary' – 'Education Educational Research' – 'Computer Science

Artificial Intelligence' – 'Psychology' – 'Humanities Multidisciplinary' (Figure 2-1). At last, 469 articles and reviews were selected for this research.

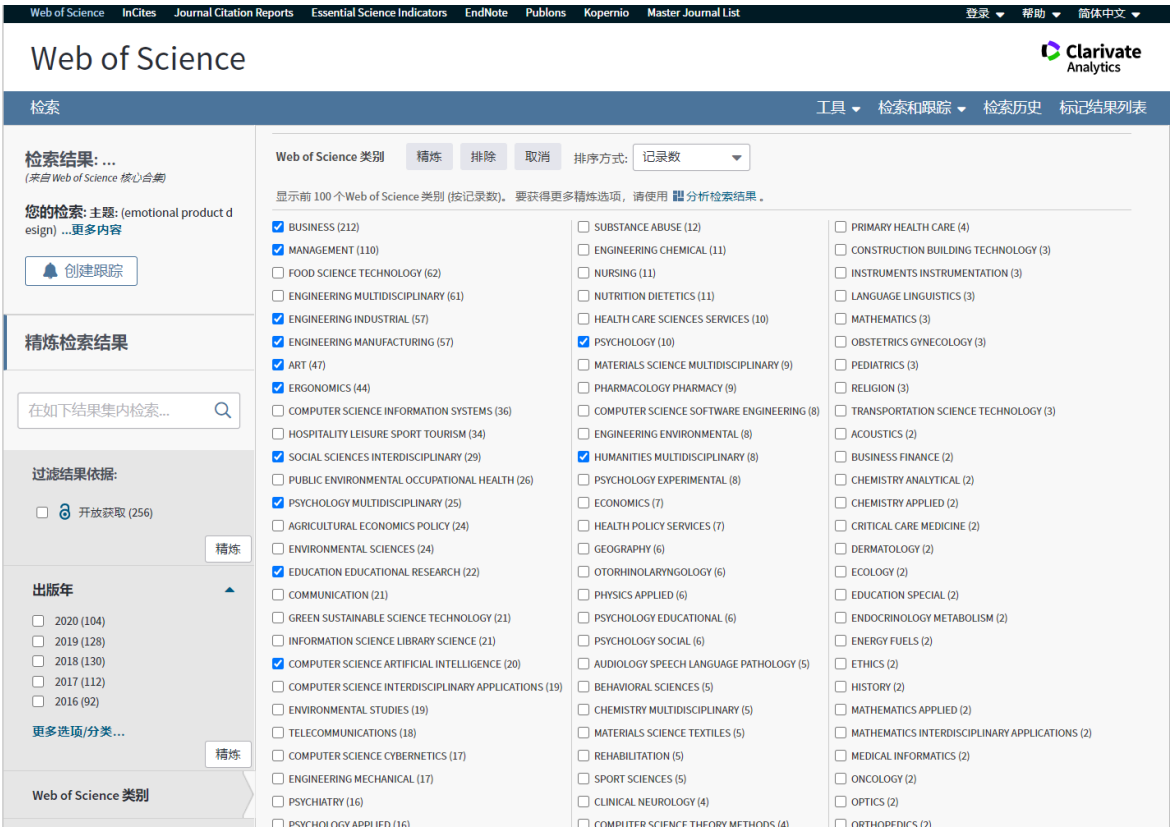

Figure 2-1. The searching results of emotional product design from Web of Science

2.2.1. Cluster Analysis of Cited References

CiteSpace offers the layout mechanisms of references based on the strengths of cocitation links (Chen & Song, 2019). A cocitation cluster in terms of salient noun phrases extracted from titles, abstracts, and index terms of citing articles (Chen et al., 2010). The goal of cocitation analysis is to determine the knowledge structure of the scientific knowledge field based on the grouping formed by the citation traces accumulated in the scientific literature (Chen et al., 2010).

The 469 articles were analyzed based on CiteSpace 5.6.R5 (64-bit), the timespan was from 2000 to 2020, selection criteria: g-index (k = 50); node type = Reference; term source was the title, abstract, author keywords and keywords plus. Nine clusters were obtained in this step, as shown in Figure 2-2.

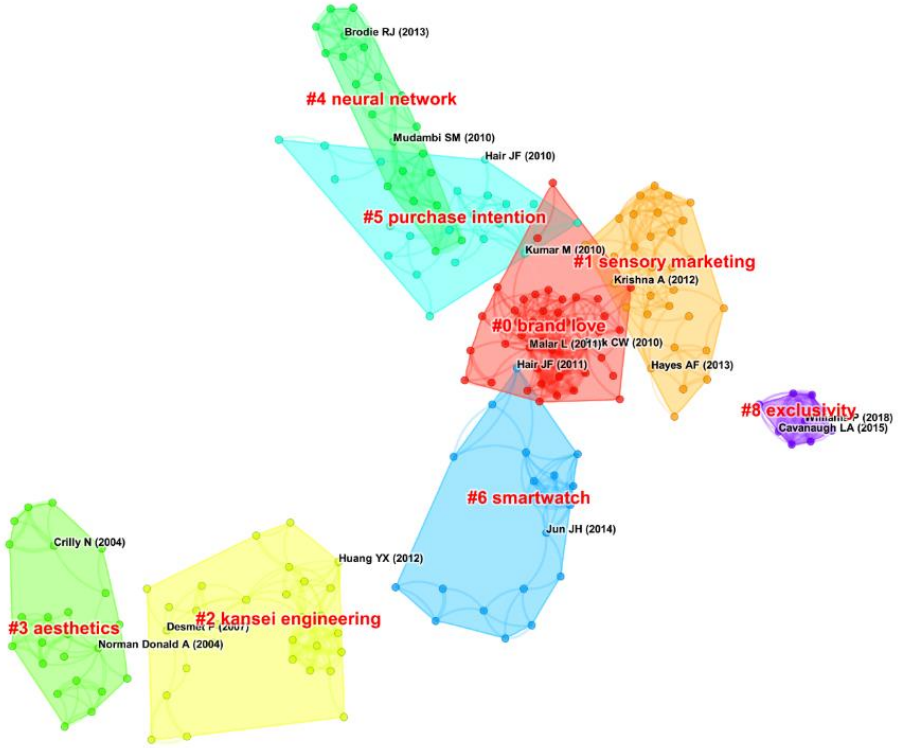

Figure 2-2. Nine clusters

CiteSpace provides two indexes, modularity (Q) and mean silhouette (S) metric, to evaluate the map rendering effect (Zheng et al., 2019). Modularity Q=0.9235 and Mean Silhouette=0.5448 were obtained in this step. In general, the value of Q is within [0, 1]; if Q > 0.3 means the organized structure is significant, the Q value is 0.9235 of the results, it is identified the more significant of the results. The value of S is utilized to estimate the uncertainty involved in identifying the nature of a cluster (Rousseeuw, 1987). According to Chen et al. (2010), the S score of a network measures the average homogeneity of derived clusters. The range of the S value is from -1 to 1; the higher the average S score is, the more meaningful a group is in terms of the cluster. The value 1 indicates perfect separation from

other clusters; the S > 0.5 means clusters are reasonable; hence, the clusters are rational in this research.

CiteSpace supports three ways, Latent Semantic Indexing (LSI), Log-Likelihood Ratio Test and Mutual Information, to select cluster labels. LSI was selected to extract clusters in this step. The calculation method is generally through cosine similarity, its algorithm principle is very simple, and a singular value decomposition can obtain the topic model. As shown in Figure 2-2, eight clusters were extracted based on their similarity to overview of the map of emotional product design.

1. The first cluster is the largest, numbered #0, named 'brand love'. The researchers realized that customers' emotional experiences are vital in the brand marketing process.
2. The second cluster is sensory marketing. The researchers focused on studying sensory emotional experiences in products and services.
3. The third cluster is Kansei Engineering[1](KE). The researchers studied how to elicit emotions from the customers, analyze customers' perchance intention, and propose the emotional design suggestion for designers, etc., from the product and service domains based on KE, Semantic Differential Scale or Kano model.
4. The fourth cluster is named 'aesthetic'. Aesthetic knowledge, design aesthetics those perspectives were studied in product, brand or service domains to learn customers' emotions, purchase intention, etc.
5. The fifth cluster is named 'neural network'. A growing number of studies were about online product reviews, product marketing, customer engagement or brand loyalty based. Researchers have been studied through different research methods, such as content analysis, grounded theory or mixed methods, etc.
6. The sixth cluster is 'purchase intention'. Some articles systematically studied the relationship between the purchase intention and customers from emotional experiences. To examine discrete positive place emotions as possible drivers of consumers' purchase intention, explore the role of emotions in B2B decision-making, to investigate the role that emotions play in organizational buying behavior.
7. The seventh cluster is 'smartwatch'. Researchers focused on studying the emotional stimulates or user experiences of wearable devices, such as a smartwatch.

[1] Kansei Engineering (KE)is one of the directions and disciplines in the Japanese design community, starting its research in the 1980s. "Kansei" is a Japanese word, in English it means consumer's psychological feeling and image (Nagamachi, 2003), which means consumer's feeling should be as a critical point to study and we need to transform the ideas from the producer point of view to customer point of view(Carreira et al., 2013). KE is a comprehensive research model involving a wide range of fields. The research model of KE is to decompose the individual elements based on the whole, to make judgment and treatment for each specific perceptual item and to summarize the essential perceptual features that meet the real needs of the users from the indefinable perceptual performance.

8. The last cluster is ‘exclusivity’. Some researchers studied emotional design from unique angles, such as how positive emotions differentially affect prosocial consumption.

Several articles with high cocitation rates have been shown in Figure 2-2 with the author’s names and published year. Table 2-1 is further to show the detail of these articles. Some indicators need to be explained in this table; the high frequency means that the articles have high cocitation rates. Except for frequency, the centrality is an essential value to appraisal revolutionary scientific publications by CiteSpace. The betweenness centrality metric is defined for each node in a network. It measures how the node is in the middle of a path connecting other nodes in the network (Ulrik Brandes, 2001; Freeman, 1977). High betweenness centrality values identify potentially revolutionary scientific publications (Chen, 2005). Two articles with high betweenness centrality, one is the paper of Donald A. Norman (Norman, D. A, 2004), titled “Emotional Design of : Why We Love (or Hate) Everyday Things”; other is the paper of Desmet (Desmet et al., 2007), titled “Emotional Design; Application of a Research–based Design Approach”. those two articles have most vital influences in emotional design research.

Furthermore, the Sigma (∑) values of those two articles were also higher than other articles; one is 4.01; the other is 1.98. Sigma (∑) value is introduced as a measure of scientific novelty (Chen et al., 2009); this is further identified the importance of those two articles.

Table 2-1. Highly cited references

Freq	Burst	Degree	Centrality	Sigma	Author	Year	Source
19	10.54	15	0.14	4.01	Norman Donald	2004	EMOTIONAL DESIGN WHY
9	3.70	12	0.20	1.98	Desmet P	2007	INT J DES
12		13	0.19	1.00	Hayes AF	2013	INTRO MEDIATION MODE
11		26	0.15	1.00	Malar L	2011	J MARKETING
11		25	0.06	1.00	Park CW	2010	J MARKETING
10		9	0.38	1.00	Hair JF	2011	J MARKET THEORY PRAC
8		11	0.07	1.00	Krishna A	2012	J CONSUM PSYCHOL
6		1	0.00	1.00	Hair JF	2010	MULTIVARIATE DATA AN
5		9	0.44	1.00	Huang YX	2012	INT J IND ERGONOM
4		14	0.27	1.00	Kumar M	2010	J CONSUM PSYCHOL
4		5	0.04	1.00	Crilly N	2004	DESIGN STUD
4		11	0.05	1.00	Mudambi SM	2010	MIS QUART
3		9	0.01	1.00	Brodie RJ	2013	J BUS RES
2		9	0.00	1.00	Cavanaugh LA	2015	J MARKETING RES
2		9	0.00	1.00	Williams P	2018	J ASS CONSUMER RES
2		8	0.04	1.00	Jun JH	2014	INT J HOSP MANAG

2.2.2. Burst Detection of References

"Burst detection determines whether a given frequency function has statistically significant fluctuations during a short time interval within the overall time period (Chen et al., 2010)". Burst detection was utilized to detect references assigned to publications in a citation-expanded collection of articles relevant to emotional product design.

The 19 references with the strongest citation bursts were detected (Figure 2-3); not all the articles were related to this research, such as the eighth article was less connected with this research (Park et al., 2010); hence, it was not introduced in this chapter. All the articles (nine articles) as shown below were related to this research:

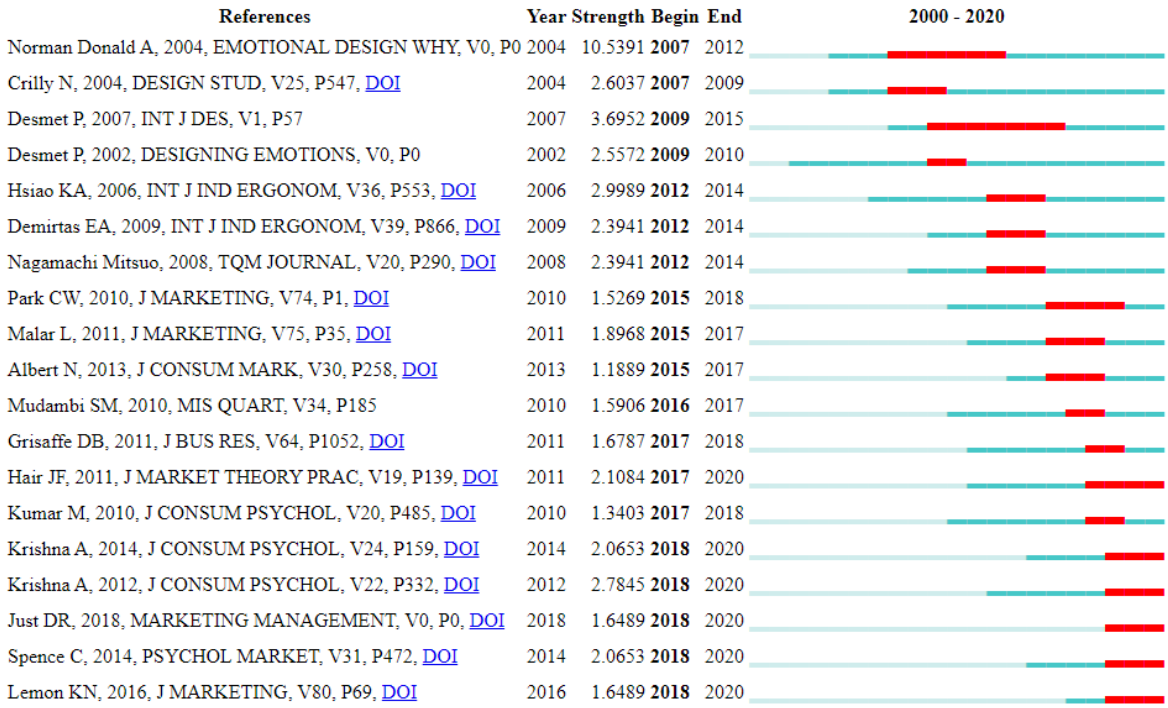

Figure 2-3. 19 references with the strongest citation bursts

The nine articles were divided into five categories:

The first category (1st article) is about positive emotional design.

- The article 1 is "Emotional Design: Why We Love (or Hate) Everyday Things" (Norman, D. A, 2004). Norman put forward three levels of views (visceral level, behavioral level and reflective level) on emotional design. He realized the importance of eliciting positive emotions of users in the design process.

The second category (articles: 3, 4) is emotional appraisals tools; some researchers have developed tools to evaluate emotions.

- The article 3 is “Emotional Design; Application of a Research-Based Design Approach” (Desmet et al., 2007). Desmet (1999) developed a product motion measure (PrEmo) tool with visualized cartoon characters, these cartoon characters with a range of 18 positive and negative emotions, subjects can express their emotions when they see a product by these cartoon characters. Desmet and other researchers continued to promote PrEmo. At last, they developed a prototype for the final design. Now, the users can utilize the PrEmo tool online to test (https://www.premotool.com/). The 14 different animations of facial, bodily, and vocal expressions were utilized to measure emotions in the tool. The respondents can report their emotions by selecting one of the animations, instead of doing it verbally. This approach has been identified the utility in evaluating all kinds of products.
- The article 4 is “The Basis of Product Emotions” (Desmet et al., 2002). This paper introduced a conceptual model/tool called emotion navigator to support designers in grasping the emotional potency of their designs.

The third category (articles: 2, 5) is about the relationship between emotion and product shapes/appearance.

- The article 2 is “Seeing Things: Consumer Response to the Visual Domain in Product Design” (Crilly et al., 2004). The authors argued the importance of products’ appearance from the perspective of consumer responses within an integrated conceptual framework. They pointed out according to Maslow’s hierarchy of needs, once issues of utility, safety and comfort have been satisfied, users may shift their emphasis towards the aesthetic, semantic and symbolic aspects of cognitive response to design.
- The article 5 is titled “Fundamental Dimensions of Affective Responses to Product Shapes” (Hsiao & Chen, 2006). This research studied the affective responses via the manipulation of product shapes based on the factor analysis approach. They summarized four fundamental dimensions, called the trend factor (T) – the emotion factor (E) – the complexity factor (C) – the potency factor (P) by the results of factor analysis. These fundamental dimensions serviced as a common framework to product shapes according to affective responses. At last, they extracted significant shape features that highly correlate to specific affective responses.

The fourth category (articles: 14, 16, 18) is to study human sensory experience to consume behavior.

- The article 14 is named “Aesthetic Principles and Cognitive Emotion Appraisals: How Much of the Beauty Lies in the Eye of the Beholder?” (Kumar & Garg, 2010). The authors identified the relationship between the aesthetic properties of a product and the emotional response of the consumers.

- The article 16 is titled “An Integrative Review of Sensory Marketing: Engaging the Senses to Affect Perception, Judgment and Behavior” (Krishna, 2012). The author put forward “sensory marketing” strategies from five senses of the human to research the emotion and cognition of the consumers, to understand sensation and perception as it applies to consumer behavior.
- The article 18 titled “Store Atmospherics: A Multisensory Perspective is also related to sensory experience and consumers’ behavior” (Spence, C. et al., 2014). This research based on a systematic review, which was related to visual, auditory, tactile, olfactory, and gustatory aspects of the store environment, and their impacts on the consumer’s shopping behavior to state how the multisensory retail environment shapes customer experience and shopping behavior.

The last category (19th article) is to research customer experience and customer journey.

- The article 19 is about “Understanding Customer Experience Throughout the Customer Journey” (Lemon & Verhoef, 2016). The author illustrated the importance of customer experience nowadays; the purpose was to develop a more vital understanding of customer experience and the customer journey to understand complex customer behavior.

The other ten articles are not strongly connected to this research which were divided into four categories:

The first category (articles: 6, 7) is about Kansei Engineering.

The 6th and 7th articles belong to the Kansei Engineering. The 6th article is about determining optimal product styles by ordinal logistic regression conjoint with the analysis of kitchen faucets” (Demirtas et al., 2011). This research explores user perceptions about kitchen faucets by Kansei Engineering. They tried to integrate strategies to put forward user perceptions about product styles and identify high-level product appearance parameters. The 7th article was a new trend of Kansei/affective engineering (Nagamachi, M, 2008). They used unique ergonomic technology to produce a new product according to consumers’ demands by *Kansei* engineering. The author found that all people want to enhance their quality of life with qualified products and services.

The second category (articles: 8,9,10 and 12) has the correlation between brand and emotion.

Brand recently is paying more attention to the research in the emotional product design field; the 8th, 9th, 10th, and 12th articles are related to brand and emotion. The 8th article explored brand attachment and brand attitude strength using two critical brand equity drivers (Whan Park et al., 2010). The author made contributions to confirm the heretical or practical value of brand attachment structure relative to the alternative structure, especially the strength of brand

attitude. The 9th article studied the correlation between emotional brand attachment and brand personality (Malär et al., 2011). Based on two empirical studies of 167 brands, the author confirmed the importance of self-congruence and self-esteem on emotional brand attachment. The 10th article tested a model of brand love to explore the role of brand love in consumer-brand relationships (Albert & Merunka, 2013). The results identified strong relationships between trust/identification and brand love. The 12th article studied the antecedents of emotional attachment to brands (Grisaffe & Nguyen, 2011). The author proposed using antecedents to evoke an exclusive buyback, based on emotional attachment to the brand.

The third category (articles: 11,13,15) is related to marketing and emotion.

The 11th article explored online customer reviews on amazon.com (Mudambi & Schuff, 2010). This research developed a model to test the perceived helpfulness of the review from review extremity, depth and product by analyzing 587 reviews from amazon.com for six products. The 13th article is about marketing and management; the authors researched the cause-effect relation between latent constructs by Structural equation modeling. They identified the significance of PLS-SEM path modeling in marketing (Hair, J. F., 2011). The 15th article studied the role of marketing and psychology on sensory experiences in judgment and decision (Krishna & Schwarz, 2014). The findings discussed key conceptual challenges under an embodiment, grounded cognition, or sensory marketing. They further identified the role of context sensitive perception in consumer behavior.

The last category is only contained one article (17th article). This article discovered the influence of food choices of SNAP consumers (Just & Gabrielyan, 2018). This research explored the behavioral economic from food consumers of all ages to healthier diets based on interventions. The possibility has been identified by using such nudge interventions as a part of SNAP.

Existing research (the previous nine articles) proves the importance of positive emotional experience for user experience research; so that the users would get a positive emotion by using those products. Furthermore, some researchers analyzed users' emotional needs by emotional scales. For example, Desmet developed a product emotion measure (PrEmo). The aspects mentioned above are fundamental in the research of emotional product design. The uncertainty of emotion makes it difficult for researchers and designers to evaluate the emotional requirements of users. Especially in product design education, there is currently no relevant research to explore how to create a research model to help students obtain the emotional needs of users. However, the rest ten articles identified have less correlation with this research; the findings do not make it possible to compare the findings of this research.

2.2.3. Timeline of Terms and Keywords

The function of a timeline in CiteSpace is to depict clusters along with horizontal timelines. Each cluster shows horizontally and advances over time from left to right; the time displays on the top, the label of the most cited terms and keywords place at the lowest position. The node selection is based on a g-index with a scaling factor of 50. In this visualization, the earliest work appeared from the left of the network, whereas the most recent ones appeared on the right side.

A timeline visualization for T2000 -- 2020 is shown in Figure 2-4 to visualize the clusters and the labels based on the detection of terms and keywords. Clusters were numbered in the descending order of their size. The largest cluster was numbered #0, named customer value. Followed by #1, and so on.

The nodes' size identified the importance of the terms or keywords; the larger node meant the more vital importance; those term-labels were under the chromatic lines. From Figure 2-4, four important nodes were identified; three belong to the KE cluster, which was 'design', 'model', 'perception'. The last node labeled 'emotion' to be part of 'emotion appeal' cluster.

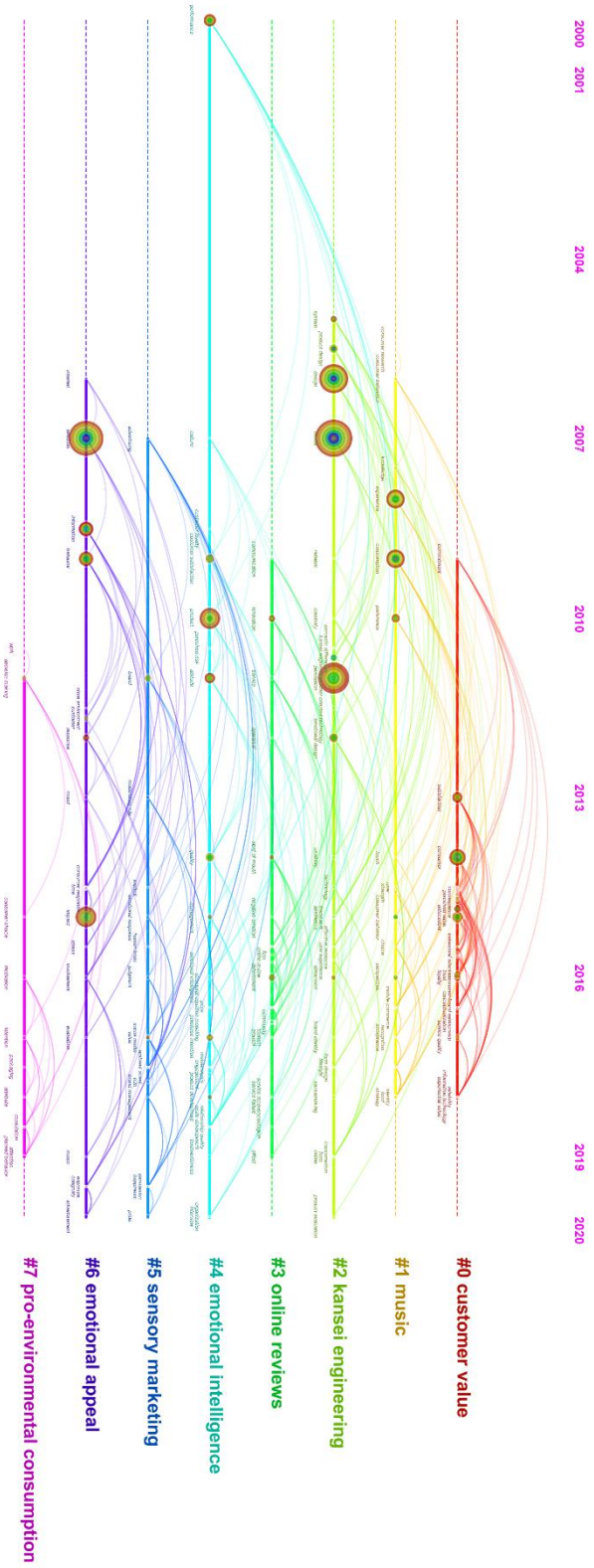

Figure 2-4. A timeline visualization for $T_{2000\ -\ 2020}$ is shown visualization of clusters and their labels based on term and keywords detection

2.3. Emotional Appraisal

The last chapter studied articles and reviews of emotional product design by Citespace based on the database of Wos. This research also selected Google scholar as the database to study the literature. The results in chapter 2.2.2 showed the 19 references with the strongest citation bursts; it had several vital references about emotional appraisal tools or frameworks. Hence, this chapter will summarize the literature about emotional appraisal based on the database of google scholar.

Some methods, tools or frameworks were related to emotional appraisal, which had determined in google scholar, including Geneva Emotion Wheel (Scherer, 2005; Sacharin etal., 2012), Feeltrace (Cowie et al., 2000) or scales and questionnaires measuring negative or positive emotions (Watson et al., 1988).

The Geneva Emotion Wheel consisted of 16 emotional terms that belong to an emotional family; those terms were divided into two dimensions (positive and negative) and four quadrants (Negative/low; control-negative/high; control-positive/low; control-positive/high). The Geneva Emotion Wheel was used to measure emotion, which the subjects experienced; so far, the Geneva Emotion Wheel had incorporated 20 emotion terms. The subjects were asked to express their emotional experiences by choosing intensities for a single emotion or a blend of several emotions by 20 emotional terms when the testing is conducting[1].

FEELTRACE is a utility system to track the emotional content of a speech sample; it is called activation-evaluation space. FEELTRACE has a long history in psychology; it always employed to evaluate the positive and negative feelings associate with an emotional state.

David Watson and Lee Anna Clark developed the Positive and Negative Affect Schedule (PANAS); they employed a five-point scale to collect data and utilized multi-analysis to choose10–item moods (‘interested’ – ‘irritable’ – ‘distressed’ – ‘alert’ – ‘excited’ – ‘ashamed’ – ‘upset’ – ‘inspired’ – ‘strong’ – ‘nervous’ – ‘guilty’ – ‘determined’ – ‘scared’ – ‘attentive’ – ‘hostile’ – ‘jittery’ – ‘enthusiastic’ – ‘active’ – ‘proud’ – ‘afraid’), to offer a reliable scale to test positive and negative moods.

Kouprie and Visser (2009) developed the process of empathy in design practice, including four steps: ‘discovery’ – ‘immersion’ – ‘connection’ – ‘detachment’. This framework showed the empathy process, including both affective and cognitive effects.

[1] https://www.unige.ch/cisa/gew/

2.4. Emotional Design in Education

There is no real research about teaching emotional design to students to get innovative design ideas based on users' emotional requirements. Most researchers did not consider teaching emotional design to students or restrict the application of emotional design education in narrow fields like multi learning (Um et al., 2012). Only one design course introduced emotional design to the students without indulging much or training. An online course organized by INTERACTION DESIGN FOUNDATION titled "Emotional Design — How to Make Products People Will Love" this course is based on Norman's three levels of emotional design theory (visceral, behavioral and reflective design) to provide the necessary information to the students helping them to elicit such positive emotional experience through their design. The contents of those courses are not made available for making detailed comparisons.

The students must understand the rules of positive emotional design to offer a unique experience to users to motivate them to indulge in positive word-of-mouth and improve the likelihood of repurchasing the product in their future design work.

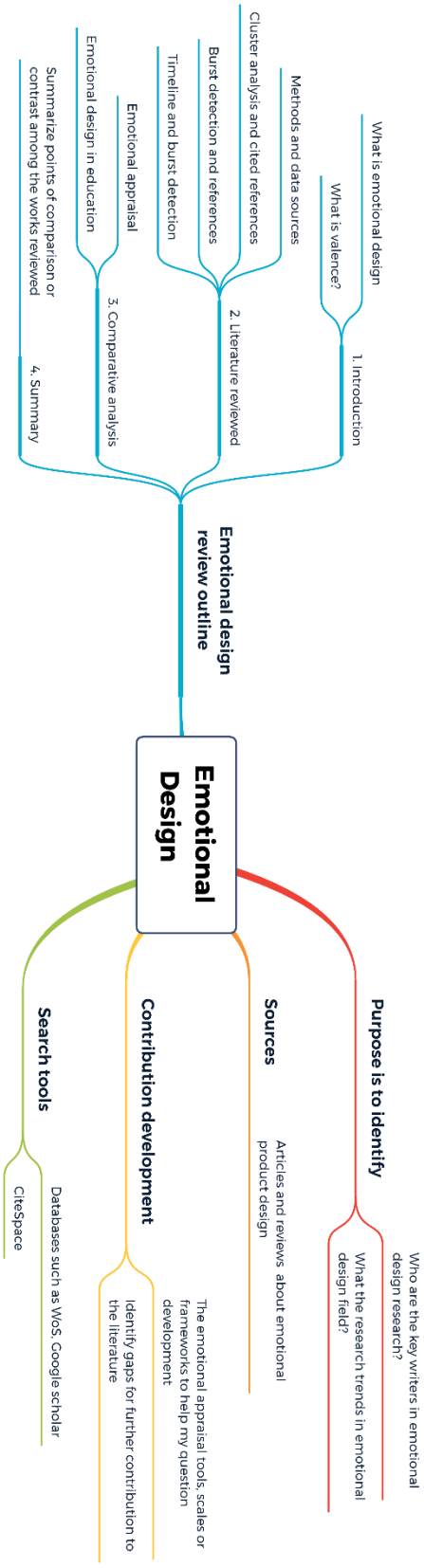

Figure 2-5. Literature map

2.5. Literature Map

A literature map details the emotional design analysis conducted in this research (Figure 2-5). On the left-hand side, the research process is shown, while on the right-hand side, purposes, sources, contribution and tools are shown.

First, the concept of emotional design and valence was defined. Second, the literature was investigated. Both the WoS and google scholar databases were thoroughly searched; the purposes were to identify the key writers and research trends in emotional design. Citespace was used to help sort out the vast literature retrieved. Third, the main trends in the investigated literature were analyzed. The different directions were compared to each other. Fourth, at the end of the literature review, the comparison obtained earlier was reviewed and summarized to identify the shortcomings for further contribution to this research.

2.6. Summary

A systematic approach was applied in this step to study the literature of emotional design. An important step was to clarify two concepts in this research first, which is about the concepts of emotional design and valence. A bibliometric analysis was then implemented based on CiteSpace to analyze the literature on emotional product design. And then, the literature of emotional appraisal and emotional design in education were studied by the database of google scholar.

In the emotional product design aspects, many researchers focused on developing emotional appraisal tools in the early days; however, the emotional experience of consumers triggered by product appearance was another critical issue to early researchers. In the mid-term phase of emotional product design research, some researchers focused on the relationship between emotional experience and consumer behavior. So far, the new trend is to utilize tools, such as customer journey, to find the users' needs in the field of emotional product design.

The emotional appraisal aspect has some methods, tools, or frameworks to evaluate users' positive and negative feelings. However, no emotional design appraisal model effectively guides students or designers to design products based on users' positive emotional requirements.

Emotional design has been becoming the focus of designers and researchers since 2006, the significance of emotion in design is gradually recognized and steady growth in design research has been published. Let the students know that users' feelings and emotions are vital, which can help them design products or services based on the users' needs in their future design work. This research was tried to put forward the emotional design strategies and built an emotional appraisal model to guide the students to learn the positive emotional design methods in design education.

However, going through the currently available research, the author did not find closely related studies to the education of emotional product design. That does not make it possible to compare the findings of this research with other previous studies. The findings of this research can be easily seen to complete the missing important gap in the previous literature. No conflicts were encountered other than variety in application or products considered in the studies, besides the complementing targets and interests.

Chapter 3.
Methodology

3.1. Multistage Evaluation Design of Case Study 36

3.2. Research Methodology Based on Case Studies 40

3.2.1. Qualitative Design in Case Study I 40

3.2.1.1. Content Analysis 40

3.2.1.2. Thematic Network 41

3.2.1.3. Methodological Triangulation 42

3.2.2. Explanatory Sequential Basic Design and Research Hypothesis in Case Study II 43

3.2.2.1. Questionnaire 43

3.2.2.2. Grounded Theory 44

3.2.3. Qualitative Design in Case Study III 45

3.2.3.1. Thematic Analysis 45

3.2.3.2. Mixed Perspectives 45

3.3. Data collection and Procedure 46

3.3.1. Data collection in Case Study I 46

3.3.2. Data collection in Case Study II 48

3.3.3. Participants in Case Study III 50

3.1. Multistage Evaluation Design of Case Study

A multistage evaluation design of case study was utilized (Advanced mixed methods design) in this research to study the emotional design of products. The research methodology conducted in the cases studies as shown below (Figure 3-1):

- Interviews, shadowing, cultural probes, storytelling and fieldwork methods were used to learn the situation in a ceramic city called Jingdezhen from 2010 to 2018; This was the first phase of this research (Figure 3-2). Those methods helped to learn the situations of ceramic design and manufacture in Jingdezhen. Such as through interviews with ceramic practitioners to understand how the ceramic censers' design. Moreover, phase 2 started from 01.2019 to 02.2020 to collect qualitative and quantitative data and analyze them. Test the results was conducted from 02.2020 to 04.2020. finally, an emotional design appraisal model was built.
- The qualitative design applied in case study I. A sub-structured interview technique was used to collect data; obtained data were analyzed by content analysis to extract the meaning units, condensed meaning units, codes and categories; to generalize themes. The qualitative content analysis method can help to find the latent meaning behind the interview transcripts, based on systematic analysis to discover the themes and finally obtain the design guidelines (Erlingsson & Brysiewicz, 2017). The semantic network was then applied to study the same interview transcripts (condensed transcript) by software ROST CM 6.0 to figure out the emotional vocabulary structures. The results were identified reliability by methodology triangulation finally.
- An explanatory sequential basic design (Mixed methods) applied in case study Π. Long-term fieldwork conducted in Jingdezhen, the researchers co-created with ceramic practitioners to learn the status of the private ceramic sectors industry from 2010 to 2018. A five-point scale was then applied to collect quantitative data; one-way ANOVA analyzed these data and obtained results explained based on interviews. The quantitative method helped to measure the choices of the designers of different ages; the results obtained by quantitative analysis have been studied by interviews to further learn why the designers hold different ideas to the evaluated samples. And then, the grounded theory was leveraged to generalize the theory accompanied by focus groups and open-ended interviews. Grounded theory is a valuable method in generalizing theory; the theory is grounded in data that have been collected by open-ended interviews (Paul & Ormrod, 2014).
- The qualitative design employed in case study III. An online course was conducted to test the feasibility of design guidelines and theory obtained in the previous two case

studies. The thematic analysis used to analyze students' survey reports; mixed perspectives was a tool to help the students acquire innovative emotional design ideas. Thematic analysis can identify the patterns or themes within qualitative data (Stranges et al., 2014; Nowell et al., 2017). The goal was to discover the themes in case study III. Mixed perspectives are useful to understand the users' desires from an emotional perspective. Finally, the design works were evaluated by the emotional words, experts and users to identify the positive emotional influence.

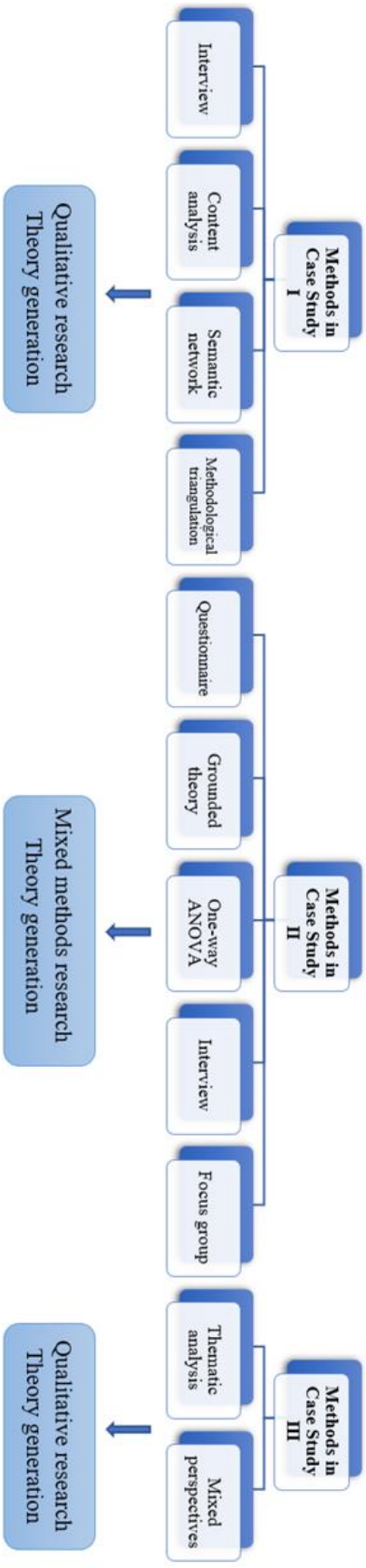

Figure 3-1. The research methodology conducted in the cases studies

Figure 3-2. Advanced mixed methods design/Multistage evaluation design of case study

3.2. Research Methodology Based on Case Studies

3.2.1. Qualitative Design in Case Study I

The case study I was chosen multi-method qualitative to study 23 historical samples (Hill censers) according to the advice from experts to learn the users' requirements from both positive and negative emotional experiences. Two stages were included in case study I: the first stage was to employ a content analysis method to analyze the 23 samples, which started from the interviews to collect data and applied focus groups to discuss the interview transcripts to extract meaning units, categories and themes. The second step was to analyze the interview transcripts (condensed transcript) by software ROSTCM6.0 to find the emotional requirements of subjects and further identify the reliability of the results obtained from content analysis by methodological triangulation.

3.2.1.1. Content Analysis

After the concept of content analysis was introduced in the 18th century (Rosengren, 1981); it took some time before it began to be used as an analytical tool (Barcus, 1959). Initially, researchers used content analysis either as a qualitative or a quantitative method (Berelson, 1952; Morgan, 1993; Graneheim & Lundman, 2004). Later, it was primarily utilized as a quantitative tool for coding textual data into categories before these were analyzed using statistical approaches (Hsieh & Shannon, 2005). So far, this method is widely used as a qualitative research technique (Hsieh & Shannon, 2005).

Content analysis is a systematic, flexible and replicable method. It is mainly used to condense many words from texts into fewer categories based on predefined explicit rules of coding (Berelson, 1952; Weber, 1990; Cavanagh, 1997; Stemler, 2001; Krippendorff, 2018). Weber noted that content analysis could be a useful method for discovering and describing the focus of an individual, group, institution or society. "It also allows inferences to be made, which can then be corroborated using other data collection methods" (Stemler, 2001).

Another issue in content analysis is inductive, deductive, and abductive approaches (Krippendorff, 2018). An inductive content analysis recognized data-driven or text-driven; the process looked for similarities and differences in the data or text, and extracted meaning units to categories and themes, explained the categories or themes by various levels (Ulla H. Graneheim et al., 2017). Inductive content analysis is always used to learn cases; no previous studies focus on the phenomenon or when it is fragmented (Elo & Kyngäs, 2008). Deductive content analysis is called concept driven (Schreier, 2012); it is always used to test existing theories or explain models, sometimes used to compare categories at different periods. Abductive content analysis is the third way defined by Eriksson and Lindström (1997); it is

usually employed “to discover meaningful underlying patterns that make it possible to integrate surface and deep structures (Ulla H. Graneheim et al., 2017).”This research conducted an inductive content analysis to study emotional effects elicit by hill censers to subjects.

“The objective in qualitative content analysis is to systematically transform a large amount of text into a highly organized and concise summary of key results” (Erlingsson & Brysiewicz, 2017). Text data can be in verbal, print, or electronic form and could have been gotten from interviews, focus groups, observations, open-ended survey questions, narrative responses, or print media such as articles, books, or manuals (Kondracki et al., 2002). In this research, qualitative content analysis was used to study interview transcripts (text data), generalized from meaning units, condensed meaning units, codes, categories to themes.

Ulla Hallgren Graneheim & Lundman (2004, p. 106) mentioned, “A basic issue when performing qualitative content analysis is to decide whether the analysis should focus on manifest or latent content.” Latent content analysis refers to interpret the underlying meaning of the text (Downe-Wamboldt, 1992). This research analyzed underlying meanings through study interview transcripts to find what subjects care more about hill censers.

After choosing the latent content analysis, the next step was to select the units; a unit refers to plenty of objects or things, such as a person, a program, an organization, etc. For this research, the features of the hill censers were the unit. A meaning unit is the set of words or sentences that correlates to the same central meaning (Baxter, 1991); the meaning units were extracted from two directions in this research: the character of the censers with pleasant and unpleasant features. After condensing the meaning units, this case study got codes from both sides and then divided codes into sub-categories and categories; creating categories is the core feature of qualitative content analysis (Ulla Hallgren Graneheim & Lundman, 2004). Condensed meaning units, codes and categories can draw more than one theme; a theme can also include several sub-themes.

3.2.1.2. Thematic Network

Users’ emotional requirements have been focusing by researchers and designers in product design for more than three decades. This research acquired the theme by content analysis; this has introduced in the previous chapter. The next step was to analyze the emotional needs from positive and negative sides by software ROSTCM6.0 (ROST CM is developed by Wuhan University, China) based on a thematic network. ROSTCM6.0 is a well-developed and proven content analysis package; it can analyze a series of text from offline or online sources.

Since the semantic network were introduced decades ago, it had been utilized in sociology, psychology, information science and computer science (Quillian, 1968). The semantic network is a basis for knowledge modeling and representation (Helbig, 2006); it offers an operable framework for developing scientific applications (Drieger, 2013). Several studies that used

semantic networks have recently focused on products, services, or branding (Han et al., 2017; Lee et al., 2019).

A semantic network presents highly connected nodes constructed using a tree of subgraphs with some degree thresholds (Drieger, 2013). A semantic network filters and counts high-frequency words based on the interrelations between those words. Further numeric processing of the relations between the words reveals structural relations. A semantic network structure diagram is then generated showing the hierarchical relations and the degrees of closeness of high-frequency words. Finally, the diagram can be analyzed intuitively.

The semantic network approach was applied to learn the relationship between emotional vocabularies by software ROSTCM6.0 in the case study I. The obtained relations could help the designers to easily learn the users' emotional requirements when studying the users' emotional experience from textual data. The hierarchical relationship and degree of closeness of high-frequency words can be analyzed intuitively based on such a semantic network structure diagram. Two semantic network figures were obtained from positive and negative aspects; it was easy to judge what factors are most care for by subjects.

3.2.1.3. Methodological Triangulation

Triangulation is a mathematical method used to determine the location of a fixed point based on trigonometry laws (Hales, 2010). In the 1970s, triangulation went beyond mathematics boundaries and was used as a social science method. Triangulation now refers to combining multiple methodologies with studying the same phenomenon to enhance confidence in results and develop a better research design (Goertz, 2016; Denzin, 1970; Mathison, 1988; Park et al., 2016).

Denzin (1970) defined four basic types of triangulations: data, investigator, theory and methodological. This research utilized methodological triangulation, which has also been given other names: multimethod, mixed-method and methods triangulation (Barbour, 1998; Greene & Caracelli, 1997; Polit & Hungler, 1995). By using methodological triangulation, the biases that are usually attributed to a single method can be eliminated (Tonkin-Crine et al., 2016). According to Tonkin-Crine et al., (2016), methodologic triangulation can easily combine qualitative and quantitative approaches in the same study (Lincoln & Guba, 2000; Mitchell, 1986).

The case study I was leveraged qualitative content analysis to analyze interview transcripts; at the same time, employed software ROSTCM6.0 to analyze the same interview transcripts (condensed transcript) to generate semantic networks. Using the methodological triangulation approach to combine both analysis methods can increase the reliability of the analysis findings.

3.2.2. Explanatory Sequential Basic Design and Research Hypothesis in Case Study II

In case study II, a long-term (eight years) fieldwork has been conducted in Jingdezhen, China, a famous city with a long history of over 1,700 years in ceramic manufacturing. The author interviewed local ceramic practitioners to learn the status of ceramic sector industry in the beginning.

Mixed method research is an approach to integrating quantitative and qualitative data and then draws interpretations according to both sets of data to understand research questions (Creswell, 2014). In the case study Π, an explanatory sequential design was used to study both quantitative and qualitative data in response to quantitative research questions and qualitative research questions (Figure 3-3). First, the five-point scale was used to collect quantitative data by 18 evaluated samples; then used one-way ANOVA to analyze the quantitative data; obtained results were explained by interview and followed a grounded theory to generalize the qualitative results. Finally, the last step was to interpret how qualitative results were to explain quantitative questions.

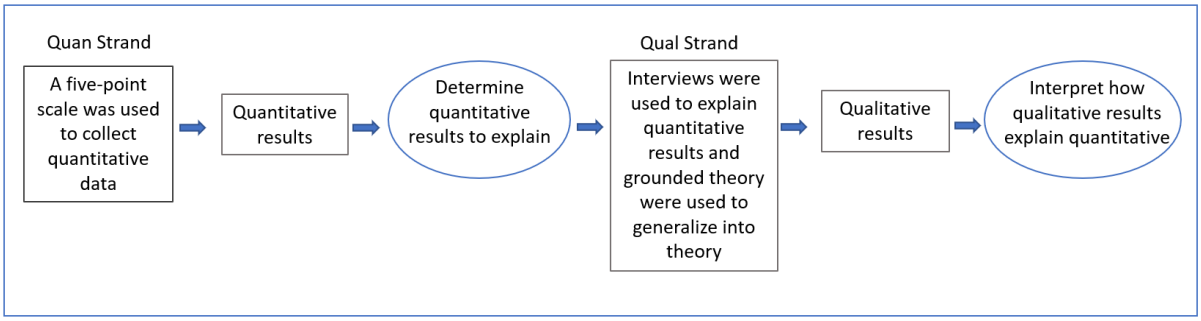

Figure 3-3. Advanced design with explanatory sequential basic design of case study

In case study II, a quantitative hypothesis devised to determine if different age groups have a significant difference on evaluated samples, the hypothesis is shown below:

1. There is a significant difference between different age groups (young, under 30 years old; middle age, 31–50 years old; elderly, over 51 years old) on 18 evaluated samples.

3.2.2.1. Questionnaire

A five-point scale of emotional words questionnaire designed using PrEmo (Emotion Studio, Rotterdam, Netherlands), which is a scientific tool used to evaluate all kinds of products by comprehending consumer emotions. 14 different animations of facial, bodily, and vocal expressions are utilized to measure emotions in the tool. The subjects can report their emotions by selecting one of the animations, instead of doing it verbally. This approach has been useful to evaluate all kinds of products; however, after an initial assessment, we found that some

emotions reflected in the animations were irrelevant to this research. Five subjects with background in design were interviewed to select the six predominant emotions form the original fourteen: ‘desire’ – ‘satisfaction’ – ‘fascination’ – ‘boredom’ – ‘disgust’ – ‘fear’ (Table 3-1).

Table 3-1. Five-point scale questionnaire to assess emotion

Emotion	5	4	3	2	1
Desire	□	□	□	□	□
Satisfaction	□	□	□	□	□
Fascination	□	□	□	□	□
Boredom	□	□	□	□	□
Disgust	□	□	□	□	□
Fear	□	□	□	□	□

3.2.2.2. Grounded Theory

The grounded theory established by (Glaser and Strauss, 1968) is a method to analyze and interpret qualitative data. As a qualitative method, ground theory used to explain social phenomena (Corbin & Strauss, 1990; Clarke, 2003). Actually, the grounded theory has not changed their form since it is first introduced in 1967 (Corbin & Strauss, 1990), however, (Cho & Lee, 2014) keep a different viewpoint is that the grounded theory is a system method can be used to analyze qualitative and quantitative data (Grounded Theory Institute, 2013).

The major purpose of a grounded theory approach is to begin with the data and use them to develop a theory. The term ‘grounded’ refers to the idea that the theory emerges from the research is grounded in data that have been collected in the field rather than taken from the research literature (Paul & Ormrod, 2016, p 256). The theory generation by grounded theory involves the “use of an intensive, open-ended, and iterative process that simultaneously involves data collection, coding (data analysis), and memo-writing (theory building)” (Groat and Wang, 2002, p.181). The data collection and analysis can occur simultaneously, as analysis and collection are usually independent and self-contained to obtain design guidelines (Cho & Lee, 2014; Strauss and Corbin, 1994). The truth turns out that the grounded theory, through open coding strategy, analyzing word by word, segment by segment, can catch the theme hidden in the conversation. As a systematic approach in generating theory from systematic research, grounded theory was used to develop the coding lists, categories, and themes for the theory based on interviews and focus groups on this research.

3.2.3. Qualitative Design in Case Study III

The teacher (author) co-created with students to study emotional design in case study III. This case study was conducted on students taking an online product design course (from Feb. 17 to Mar. 20, 2020) in Jingdezhen Ceramic Institute. All the courses held online to replace the planned initially regular courses attributed to the impact of COVID – 19. The course taught the students how to utilize multiple methods to stimulate the generation of novel ideas based on users' emotional requirements.

Mixed perspectives and thematic analysis methods are the main approaches utilized in this case. The students used the former in their design process; it is the most vital method employed to learn the users' emotional requirements. The teacher leveraged the latter to analyze the survey reports of the students. Aside from those two methods, the students applied interviews, questionnaires, cultural probes, storytelling, etc., methods to collect data to learn the users' emotional requirements. The designs of students were evaluated by the experts, users and questionnaire to identify the positive emotional influences finally.

3.2.3.1. Thematic Analysis

Thematic analysis is a process of identifying patterns or themes within qualitative data. (Stranges et al., 2014; Nowell et al., 2017). The researchers pointed out that thematic analysis is a method for identifying, analyzing and reporting themes found in a phenomenon (Boyatzis, 1998; Astuti, 2020; Braun & Clarke, 2006). Braun and Clarke (2006) further developed a six-step approach in psychology, teaching step by step how to get themes from data. That is widely considered clear and suitable for developing themes and generally influential in social science.

The goal of thematic analysis is to identify themes (Stranges et al., 2014); a theme is considered to be latent content in this method (Vaismoradi & Snelgrove, 2019). The case study III was applied a qualitative thematic analysis method to extract themes from data by systematic analysis to find out the latent content, which is much more than summarizing the data. The survey reports were read carefully, and a six-step and initial coding were utilized to generalize nine themes from the survey reports of the students methods (Braun & Clarke, 2006). The reasons for selecting themes were depending on the nature and goals of the study. The selected themes were related to the first and third research questions. The correlative themes, which would be the major influence factors in product design, were chosen.

3.2.3.2. Mixed Perspectives

Mixed perspectives are useful in catering product design to the users' desires from an emotional perspective. Tomic, Winthagen and Van Heist (2012) have defined mixed perspectives in terms of the first-, second-, and third-person perspectives. In this case, the first-person perspective is the designer's experience with the product and the users' needs. The designer is normally a

current or former user of a similar product. The second-person perspective is involved with a small group of people in the design process, with the group representing some of the stakeholders. The third-person perspective refers to the designer that she/he has no direct using experiences of the products or services and would start the design work from a broad online survey first.

Influenced by Tomico et al. (2012), in 2016, Smeenk et al. (2016) provided an alternative definition of mixed perspectives. They conducted a systematic study of mixed perspectives through the case of mourning rituals; this case study included perspective transitions and perspective clusters. A perspective transition is a process containing mixed perspectives, and precisely either a combination of different perspectives and/or a switch from one perspective to another. Considering different perspectives in design enabled in-depth investigation of users' requirements.

A mixed perspectives study was also conducted in case study III by recording all the transitions and combinations of perspectives in the design process. This study summarized the influence of each perspective and showed the transitions and combinations of perspectives in hill censer design. All these transitions and combinations of mixed perspectives brought new insights to the students in terms of how 'the whole' is not just 'the sum' of individual perspectives.

3.3. Data collection and Procedure

3.3.1. Data collection in Case Study I

The content analysis was used as a primary strategy to study text data in case study I, and chose subjects with censer using experiences to interview; the collected interview records were transcribed to text data. All the text data from each interview were to read carefully to discover useful messages.

1. Participants

The subjects to be interviewed were chosen carefully to ensure they had sufficient previous experience with the products. Designers or design professionals conducted interviews in person with the participants for an adequate time duration with well-prepared questions to determine the emotional experiences of the participants. In this case study, the teacher and the 10 graduate students interviewed 76 subjects and each interview lasted 45~60 minutes.

Eight of the students had a background in industrial design and two of the students had an engineering background. All students were registered in regular JCI graduate programs and had to take the course for credit. The students joined the graduate program right after finishing their bachelor's degrees. Seven of them were female.

The students went through searching online to choose their subjects. The subjects were chosen based on their having had regular long-term experience with using censers. The subjects' age range was 20–60 years. Out of 76 subjects, 51 were female. The subjects were first interviewed and then answered questionnaires. The interviews were conducted online or face-to-face depending on the situation.

Five experts with an industrial design background were also invited to participate in this case study who were the supervisors of those 10 graduate students. This is a course and research task; they need to understand and supervise the entire research process. Ultimately, these research results and methods will be used to teach students in the future. All five were from the JCI product design department (three associate professors and two professors; 2 females and 3 males; age, 35–60 years). The experts first picked the 23 evaluated samples with author. The experts chose them based on the classical form and historical influence of the samples. Later, they participated with the students in content analysis.

2. Procedure of Data Collection

In this step, designers or design researchers employed a sub-structured interview technique to collect data about the product to be designed. Based on emotional experiences, two kinds of questions were asked during the interviews; the first was related to pleasant emotional experiences and the second was related to unpleasant experiences.

The questions are shown in Table 3-2 as an example of the type of sub-structured interview carried out. The questions were prepared through group discussion with designers and professionals according to two basic emotional dimensions: like/dislike and pleasant/unpleasant. Questions in each group should first determine whether the subjects like each sample. The questions also check whether the sample is perceived as pleasant or unpleasant. Questions should further target the reasons for the subjects' emotional responses.

In the case study, the 10 graduate students prepared three similar primary questions for each of four possibilities in the two-dimensional emotional space. The questions were used to guide the conducted interviews with each of the 76 subjects about every product sample from the 23 selected samples.[1] The interviewers tried to induce the subjects to detail their emotional responses to the samples, ultimately obtaining 76 interview records.

Table 3-2. Interview questions

Emotion	No.	Questions
Like	Q 1	Which samples do you like?
	Q 2	Why do you like them?

[1] We interviewed 76 subjects to obtain the interview records in this case study, after reading all the interview records, which were summarized into 46 interview transcripts.

	Q 3	Could you talk more about each of these samples?
Dislike	Q 4	Which samples don't you like?
	Q 5	Why don't you like them?
	Q 6	Could you talk more about each of these samples?
Pleasant	Q 7	Do these samples give you a pleasant sense?
	Q 8	What kind of positive feelings do you receive from these samples?
	Q 9	Could you explain in detail why you feel that when you see these samples?
Unpleasant	Q 10	Do these samples give you an unpleasant sense?
	Q 11	What kind of negative feelings do you receive from these samples?
	Q 12	Could you explain in detail why you feel that when you see these samples?

3.3.2. Data collection in Case Study II

To begin with a long-term (eight years) field research in Jingdezhen, a city famous for ceramic making globally, it has another name called China ceramic capital. At the beginning of the investigation, limited ceramic studios made ceramic censers, only one studio special produced ceramic censers. Through 10 years developing of the incense culture, more and more people started to use censers; this trend further influenced ceramic censers' making in Jingdezhen. The initial survey stage utilized fieldwork to study the practitioners from the private ceramics sector and employed an open-ended interview, storytelling, shadowing, cultural probes approach to collect data and clarify the existing problems. Based on previous survey in Jingdezhen, to learn the situations of the whole ceramic private sector industry, which also include the ceramic censers manufacturing sectors.

The case study II selected 18 hill censers of nowadays to evaluate, which mostly made in Jingdezhen. This study designed a five-point scale to collect data and analyzed by one-way ANOVA method to learn the difference between the samples with each age group. And then, employed grounded theory, focus group and interviews approach to generalize the design framework from positive and negative aspects.

1. **Participants**

The case study II has numerous participants, the detail is shown below (Table 3-3):

- First, five subjects (4 females and 1 male; age, 20–30 years) with background in design were interviewed to select words for designing five-point scale.

- Second, the 105 subjects (64 females and 41 males; age, 20–60 years) evaluated 18 samples by five-point scale (Table 3-1). All the subjects had background in design and included undergraduate, graduate, and doctoral students, as well as professors and professional designers.
- Third, six subjects (4 females and 2 males; age, 20–60 years) from each age group of 105 subjects, selected for the open-ended interviews to evaluate samples 5, 15, and 17 to answer the quantitative results.
- Fourth, after analyzing the mean values of the 18 samples, the open-ended interviews were conducted again with the nine subjects (6 females and 3 males; age, 20–60 years) from each age group of 105 subjects. The interviews have been conducted back and forth 33 times till could not find new insights from the subjects. Another three subjects (2 females and 1 male; age, 30–40 years) were chosen as discriminant sampling to interview who were not the members of those 106 subjects. The purpose was to determine when categories were saturated or when the theory was sufficiently detailed (Creswell and Poth, 2016).
- lastly, eight graduate students (6 females and 2 males; age, 20–30 years), among four with a ceramic design background, the others have design work experience who selected to discuss in a group to develop the coding list, category, and theme by grounded theory.

Table 3-3. Participants in case study II

Participants	Tasks/Outcomes
5 subjects with a design background	Design a five-point scale
105 subjects with a design background	Evaluate on that five-point scale
6 subjects out of the 105	Prepare interviews for investigating the obtained quantitative results
9 subjects out of the 105	Prepare interviews for investigating the results obtained from the mean values.
3 subjects with a design background	
8 subjects (8 graduate students)	Develop the themes by grounded theory

2. Procedure of Data Collection

Through long-term investigating to learn the situation of design and the manufacture of ceramic censers in case study Π. The open-ended interview is a useful method to collect data at the beginning, for this case, a longitudinal element was embedded into the survey, the practitioners

from the private sector were interviewed over a period from 2010 to 2018 to explore existed questions in ceramic industry.

A five-points emotional questionnaire devised with 18 samples to collect data and got 105 valid questionnaires. This study evaluated designers' positive and negative emotions through this questionnaire, and conducted interviews, and grounded theory to obtain insights on the improvement of ceramic censer design from the perspective of the creators instead of the users.

3.3.3. Participants in Case Study III

An online course was continued for five weeks; 42 undergraduate students and 10 graduate students took this course, who divided into 18 groups and received course credits for their participation. All students were required to complete a design task about hill censer with five weeks in their groups' teams. The students needed to use mixed perspectives and other methods in the whole design stages and record each perspective's effect. 10 graduate students attended research in the case study I who took this online course to complete these two research and design courses.

The 10 graduates helped distribute the questionnaires (Appendix 2) to collect the data, 198 subjects (60% female and 40% male, age range was 20-60, including 76 subjects who were interviewed in case study I) in responding to the questionnaires.

Chapter 4.
Case Study I

4.1. Overview of Case Study I 52

4.2. Hill Censer, Boshanlu 52

4.2.1. History of Hill Censers, Boshanlu 52

4.2.2. Origin and the Meaning of Hill Censer 53

4.2.3. Evaluated Samples 56

4.3. Emotional Evaluation of Samples by Multiple Methods 67

4.3.1. Content Analysis 67

4.3.2. Semantic Network Analysis 74

4.3.3. Design Guidelines from Users 78

4.1. Overview of Case Study I

The 23 samples (hill censers) from the Han Dynasty to the Ming Dynasty have been evaluated in Case study I, to study the users' emotional responses to the samples. The history, origin and meaning of hill censer were studied first to learn the background knowledge of hill censers; this is an essential step in this research. Only by understanding the background knowledge of the product can we better design the product.

The purpose of case study I was to explore the most crucial factor in product design based on interviews and content analysis methods. According to interview transcripts, the users' emotional needs were generalized to codes, categories, and themes to find the critical factors in emotional design. The semantic network was then used to analyze the same interview transcripts (condensed transcript) by software (ROST CM6.0). That was to figure out the structure of semantic network vocabulary and identify the reliability of the results of content analysis according to methodological triangulation. Finally, this case study obtained the design guidelines by a group discussion about the theme of emotional experience and design style.

4.2. Hill Censer, Boshanlu

4.2.1. History of Hill Censers, Boshanlu

"Boshanlu"[1], was one of famous censers in ancient China, the hill-shaped lids originally show a scene of hunting and hiding in the hills (Lian, 2013). The most representative forms indicate auspicious beasts trying to hide while hunters with bows and arrows trying to find them. It originated during Emperor Wudi period (156-87 BC) of the Han Dynasty (206 BC-220 AD). The Han Dynasty[2] is considered the first development peak in Chinese incense culture. Hill censers were only used by the upper class in the beginning, later with the improvement of craft, the number of people using censers started to grow.

Hill censer represents a clear variation in the history of censers worldwide; it especially prevailed in the Han Dynasty (Lin, 2008); the farming civilization nourished the economic development of the entire Han Dynasty, which led to the booming of handcraft (Sun, 2011). Additionally, the rapid expansion of metallurgy supported the manufacture of metal hill censers and made them popular. It was evident from the exquisite bronze censers unearthed from the Han Dynasty that the metal industry was highly developed. On the other hands, the

[1] Boshanlu is a kind of hill-shaped censers, the name special used in Han dynasty. After Han, Some Boshanlu still use this name, and other Boshanlu have the hill-shaped shape, but they do not use the name of the Boshanlu anymore. In this research, the names of hill censer and Boshanlu will be used interchangeably, depending on the convenience of writing. Usually, the Boshanlu refers to the censer of the Han Dynasty.

[2] The Han Dynasty includes the Western Han Dynasty (206-8 BC) and the Eastern Han Dynasty (25-220 AD).

development of ceramic technology in the Eastern Han Dynasty improved the manufactory of ceramic hill censers. The craftsmen successfully produced low-temperature plumbic-glazed pottery in Han Dynasty (YU, 2012). Around that time, proto porcelain was evolving to porcelain. All of those contributed to the enrichment of the censer's manufactory.

According to written records and archaeological excavations, the early censers were only an elegant living appliance used for offering sacrifices as form of worship (Yu, 2012; Wang, 1991). The censer first appeared in the Han Dynasty; hill censer was one of the most epidemic items. After the Han Dynasty, the form of hill censer changed by multiple factors, especially, the Buddhist culture which introduced to China during the Wei, Jin, and Northern and Southern Dynasties (AD 220-589), some hill censers have been significantly impacted on their form by the Buddhist culture. More than that, comparing with the Han Dynasty, the form of hill censers in the Wei and Jin dynasties was simplified and abstracted, no longer a realistic imitation of the mountains like Han Dynasty. It is worth mentioning that the glory of hill censer is unsustainable in Wei, Jin, and Northern and Southern Dynasties, however, hill censer is still one of the mainstreams in the censers.

Since the Sui and Tang Dynasties (AD 518-907), censers have been mass-produced by major kiln sites as a plentiful commodity with the popularization of ceramic technology. A variety of carving techniques and glaze-decorated censers have emerged endlessly, and hill censer has become a niche category among them; the Buddhist culture influenced those hill censers in their forms, the hill shapes were replaced by a lotus and cintamani, but still retained the similar shape of the hills; however, the hill-shape has become more abstract and simpler.

During the Song (AD 960-1297) and Ming Dynasties (AD 1368-1644), hill censers were still produced; however, it cannot compare with other censers made in the Song dynasty. More than that, it also cannot be comparable to the painted-porcelain censers of the Ming Dynasty. Hill censers returned to the retro trend in the Qing Dynasty (AD 1636-1912); a hill censer of the Qing Dynasty collected by the Palace Museum (Beijing) is an example; this censer is a lifelike imitation of the hill censer in the Han Dynasty. The fall of incense culture in the late Qing Dynasty, the gradual decline of manufacturing of censers, the censers also withdrew from the scholar's study room, out of the daily life of the Chinese, and only existed as a "Gongqi" for the ancestral and temple.

4.2.2. Origin and the Meaning of Hill Censer

As to the origin of the hill censer, Chinese researchers, among others, have paid attention to this issue; among the researcher of Susan N. Erickson of the University in Michigan is relatively systematic, whose doctoral research was related to hill censer of the Han Dynasty （Erickson, 1992). Erickson pointed out that hill censer is related to ancient Chinese immortal

thought and embodied the emperors and aristocratic desire for immortality. The British scholar Rawson also put forward a unique viewpoint. She demonstrated that the censer with cover first appeared by the Assyrians and later by the Achaemenids (Rawson, 2006). The evidence was shown in the carved stone reliefs in the palaces of Nineveh and Persepolis (Nineveh was the capital of Assyria, and Persepolis was one of the capitals of the ancient Persian Empire). Such as a stone relief date from the 5th to the 6th century BC showed two thin and tall censers locating in the picture of the relief, which had the function of dividing space (Figure 4-1). This slender censer has a stepped lid and handle; such kind of stepped-shaped censers have been widely used globally; another silver censer with this type found in Turkey (Figure 4-2), which was stored at the U.S. Metropolitan Museum from 1980 to 1993 and then was shipped back to Turkey.

Figure 4-1. A stone relief[1]

Figure 4-2. A silver incense burner[2]

[1] Collected by Freer Gallery of Art and Arthur M. Sackler Gallery Archives in Washington D.C.
[2] Collected by Ministry of Culture/General Directorate of Monuments and Muséums in Republic of Turkey.

Jessica Rosen speculated that the stepped censer with a conical shape or a rooster on the top might affect to the hill censer in China. In the process of the influence and transformation of this foreign culture, hill censer incorporated the popular universe view and the immortal idea in the Han Dynasty, and the shape of "Boshan" was localized entirely. The viewpoint of Jessica Rawson broadened the research horizon of hill censer. However, this is subjective speculation by the author, and there is no direct evidence to identify the relation between these two kinds of censers.

Except above mentioned the standpoints of the origin of hill censer, Harper (2005) argued that Achaemenid appeared a thin and tall censer with a stepped shape in the mid-1000 BC, and then, the hill censer appeared in the Emperor Wudi period in the 2nd century BC with a mature shape from the beginning. Harper realized that the stepped censers appeared in the 5th - 6th century BC and had a wide range of distribution, some existing reliefs with the censers were belonging to this period. Such as the reliefs distributed from Persepolis in southern Iran to the palace of Darius (522-486 BC), the king of Persia, as well as the palace of Xerxes (486-465 BC). Not only that, the image of this kind of censers also appeared in Achaemenid's stamps and cylindrical seals; however, limited information was about the existence of such stepped-shaped censers in West Asia, only China passed down much information about the hill censers.

Harper realized that hill censer and Achaemenid censer have such similarities in shape, but the decoration of the Chinese hill censers was utterly different from Achaemenid incense burners. From the record of the historical records, Zhang Qian[1], as the envoy of Emperor Wudi, visited the Western Regions in the late 2nd century BC. Si Maqian[2] believed that the universe's concept was influenced by each other through trade, war, migration of artisans from the West to the East; it could conclude the impact may also happen on the incense burners.

As a particular category of the early censers, hill censer projected the ancient Chinese view of the universe, creation and aesthetics. Regarding the origin and meaning of the image of "Boshan", some scholars suggested that Boshan may be a crucial sacred mountain and Jessica Rawson mentioned that: "the image of the mountains on the island rising from the sea seemed to correspond to the East China Sea. If this is true, burning incense in a censer may evoke the desire to seek communication from the fairy on the fairy island". Besides, Jessica Rawson and Susan Erikson both agreed that the hill-shaped lid of the hill censer might play the role of the microcosm. The reason is that there are many concepts to express a miniature universe view in Chinese gardens, tombs, and utensils.

However, some Chinese scholars thought, the shape of the Boshan is an imitation of the legendary fairy mountains; however, it is not a miniature view of the universe. The shape of the hill censer is more expressing the pursuit of immortality in the Han Dynasty and yearning

[1] A statesman and diplomat in the Han Dynasty.
[2] The author of the historical records.

for fairy mountains, which conveys the religious beliefs and spiritual pursuits of peoples. The backbone of the Han dynasty is the 'Yin-yang and Five Elements', which implemented in politics, religion, and academia (Guang, 2001; Gao, 2009). Under this ideology's influence, the craft producing has also used five elements to match the five colors, focused on the harmony of Yin-yang, and emptiness and reality complement. The rising incense mist and the censer's body formed an emptiness and reality contrast while burning incense. Such a scene was in line with the spiritual concepts and aesthetics of peoples in the Han Dynasty.

Wu Hong is one of the earlier scholars who systematically studied the hill censers who researched the hill censers from auspicious culture (Wu, 2010). He pointed out that the popular of hill censer in the Western Han Dynasty is a hill-shaped censer carved with auspicious patterns and the smoky mist that surrounds the peaks and auspicious animals, which vividly shows the combination of spirit mountains, auspiciousness and clouds. In the whole Han era, regardless of the daily use of gharries, mirrors, incense burners, trousseaus, drinking vessels, water vessels, Or the house and the tomb were generally decorated with the auspicious patterns. Wu Hong believed that the decoration of the hill censer represents some natural phenomenon. The nobles of the Han Dynasty guided the pursuit of auspicious culture to nature. For example, the mountains and clouds are two manifestations of auspicious symbols; The towering lid of the censer and the incense mist expressed those two auspicious symbols.

Before explaining the evaluation sample, first introduce the history and origin of the product, which is necessary for product design. For one thing, this research selected hill censer as a case study because of the unique position in the censer's development history, which the hill censer has. The complicated decoration of the hill-shaped form has a unique meaning; the design students should learn the meaning behind the form to properly design new hill-shaped censers. For another, the analysis process is also vital for the students to have an integrated design thinking skill; the students can use those analysis methods in hill censer design and utilize them to design other kinds of products.

4.2.3. Evaluated Samples

In this case study, selected 23 samples to evaluate depending on the advice of experts; the selection standard is the importance and influence of the evaluated samples in Chinese censer history. At last, 23 samples with the highest popularity were chosen. Among, eight samples from Han Dynasty, nine samples belong to Wei, Jin, Northern and Southern Dynasties; the other six samples, three samples are from Sui-Tang Dynasties, one sample each in Song, Yuan and Ming Dynasty. After Sui-tang Dynasty, hill censers were not popular.

During the interview period, those 23 samples with their pictures and descriptions were showed to the subjects to help them understand the samples quickly.

- **Hill censers of Han Dynasty**

Eight samples were chosen from the Han Dynasty, as shown in Figure 4-3.

Samples	Description
 Inlaying gold hill censer	"Inlaying gold hill censer" is the most present one. The bottom is decorated with cloud patterns, and the cover is carved with fairy mountains of the sea. Various birds and animals appear in the mountains, and hunters hold bows and arrows in the mountains.
 Gilding silver Copper and Bamboo censer	"Gilding silver copper hill censer" is decorated with cloud patterns by spun gold and gold plaque. The handle carves into three dragons, and the heads of the dragons hold the hill censer's plate. The base of the censer's body carves with two dragons; the handle is a five-joints bamboo, the upper end of the handle cast with three dragons; the dragon's head lifts the censer. The upper part of the body has four embossed golden dragons; the total number of dragons is nine; the 'nine' symbolizes imperial power in ancient China, which implies the owner's noble identity.

 Bean-shaped hill censer	This censer's body is bean-shaped, there is a tray at the bottom of the body, and mountains are carved on the lid. Rare birds and animals appeared in the mountains, and in the secluded mountains of immortals, some people play the musical instrument and others listen to their performance.
 Phoenix copper hill censer	Most hill censers have unique decoration and form; it is particularly worth mentioning their buttons and handles' style. The buttons often adopted the form of a phoenix spreading their wings, such as the "Phoenix copper hill censer", The upper part of the bean-shaped body is made into a towering-shape, and a phoenix spread its tail stands on the top of the lid.
 Immortal ride dragon hill censer	Immortal is a typical image in bronze art. The Han Dynasty is the peak period of using immortal images. The immortal images are considered reflections of the Han people's pursuit of immortality (Sun, 2011; Wu, 2010). This censer has a unique shape with an immortal, who uses his hand to keep the censer's lid. The lid is carved with cloud patterns.

 Terra-cotta hill censer	The artisans invented the low-temperature lead-glazed pottery in the Han Dynasty, which was a significant achievement in ceramic development history. “Terra-cotta hill censer” is lead-glazed pottery; it has a bright-smooth green glaze; this style is popular in the Eastern Han Dynasty.
 Patterned hill censer	The scribing craft used on the lid made the three-dimensionally hills into abstract flat patterns, which shows the craftsmen had abstract artistic expression and modeling ability.
 Green-glazed hill censer	The “Green glazed hill censer” is well-preserved; the lid is simplified fairy hills. The body has undulating bow string patterns and holes.

Figure 4-3. Eight samples from the Han Dynasty

The bronze censers were popular at the beginning of the Han Dynasty because of the mature of bronze craft; however, in the late Eastern Han Dynasty, the ceramic industry completed the transformation to porcelain, which was regarded as a significant event in the ceramic development history of China. For more than a thousand years after that, porcelain became the mainstream of daily utensils, which profoundly affected Chinese living styles. As one of the ceramic products, Porcelain censers started to produce in the late Eastern Han Dynasty. Although porcelain censers did not occupy the mainstream in the Han Dynasty, ceramic quickly became prevalent in the upper-class with its unparalleled superiority and gradually turned into censer's mainstream material since then.

- **Hill censers of the Wei, Jin, Northern and Southern dynasties**

Nine samples were chosen from the Wei, Jin, Northern and Southern dynasties, as shown in Figure 4-4.

Samples	Description
 Celadon hill censer	The "Celadon hill censer" was collected in the Zhejiang Museum with a bean-shaped body made by Yue kiln. The hill-shaped lid has three layers of rolling hills and holes, a bird-button on the top, and the belly support by a columnar handle.
 Celadon hill censer	This censer consists of three parts: cover, body and tray. Three layers of the rolling hills engraved with line-shaped mountain patterns, ten perforations between the hills, and the top of the cover has a mushroom-shaped button.

 Celadon nipple shaped hill censer	In the Southern Dynasty, a new type of hill censer appeared. The main feature is the upper part of the cover decorated with nipple-shaped protrusions. The Victoria & Albert Museum collected such "Celadon nipple shaped hill censer" of the Southern Dynasty, which Fujian celadon kiln made.
 Lotus-lid celadon hill censer	The Fujian Museum has collected a "Lotus-lid celadon hill censer" lid, on the lower part of the cover is with a carved lotus pattern, and the upside is a three-layer lotus made of clay sheet, a fairy is standing on the top of the lotus. In the late Eastern Jin Dynasty, lotus petals started to appear on the censers. The censers with lotus petals' decoration in the Southern Dynasty are also popular. The lotus pattern is the most prevalent decoration during this period; this is related to the prosperity of Buddhism.
 Celadon hill censer	This censer's shape is tall and thin, and the lid is decorated with the hill's undulating shape. Birds are perching on the top of the mountain, and the censer's hole is at the bottom of the lid. The handle is decorated with three hooters who beat drums.

 Celadon flying phoenix lotus hill censer	The “Celadon flying phoenix lotus hill censer” is a distinctive one in the celadon hill censers made by Hongzhou kiln. The cover is a blooming lotus with a winging bird on the top.
 Celadon hill censer	The form of the hill censers changed their shape from complex to simple during the Southern Dynasty. Some of the hill censers’ covers are composed of vertical stripes scribed. Such as the Jiangxi Museum collected this kind of “Celadon hill censer”. The lid is made of abstract hills’ form instead of complex shapes in the Han Dynasty.
 Dragon hill censer	The “Dragon hill censer” has an abstract dragon button connected to the lid employing a tenon. Three layers’ undulating hills are on the lid, the belly decorates with eight lotus petals, and the tray connects to the belly by a thin handle.

 Phoenix hill censer	The “Phoenix hill censer” has a similar shape to the dragon hill censer; the main difference is the phoenix button.

Figure 4-4. Nine samples were chosen from the Wei, Jin, Northern and Southern dynasties

It is a porcelain era in Wei, Jin, Southern and Northern dynasties. Porcelain has many advantages; for instance, hard – wear – resistant – smooth – delicate - impervious to water; these advantages make it popular quickly. Hence, ceramic utensils gradually stepped into people’s daily life, and metal utensils retreated; the same things happened to the censer. The bronze censers were scarce, a primary reason for reducing bronze wares related to the prevalence of religion; bronze was mostly used to make religious statues. Another significant variation was the hill censers’ form changed their shape from complex celestial hills to petal lotus during the Southern Dynasty. The reason was also related to the prevalence of Buddhism.

- **Hill censers of Sui and Tang Dynasties**

Three samples were chosen from the Sui and Tang dynasties, as shown in Figure 4-5.

Samples	Description
 White Porcelain curled-up dragon hill censer	The Nara Yamato Museum collected a Ding Kiln “White Porcelain curled-up dragon hill censer” from the Early Tang Dynasty (7 AD). The censer has a unique form with exquisite craftsmanship and gorgeous decoration; the top of the lotus-shaped lid has three layers of finely carved cintamani.

 White porcelain lotus petal hill censer	The Honolulu Art Museum in Hawaii has a "White porcelain lotus petal hill censer" from the Sui to the early Tang Dynasty (7 AD). This censer has a very exquisite craft; the lower part of the body making to a lotus pedestal; the cover decorates with two gorgeous layers of Cintamani.
 Green-glazed celadon lotus pedestal hill censer	The "Green-glazed celadon lotus pedestal hill censer" is used two kinds of glaze colors, the cover is used copper-red glaze and the body is used green glaze. The lid of this censer stacks with lotus petals and the pedestal is a celadon lotus.

Figure 4-5. Three samples from the Sui and Tang dynasties

The ceramic industry in the Sui Dynasty[1] has limited development because of the short existing period (38 years); the Tang Dynasty replaced it in 619 BC. The development of the ceramic industry in the Tang Dynasty provided a more extensive space for manufacturing ceramic censers. Ceramic censers have become the main flow of censer categories since the Tang Dynasty, and the peoples used them in daily life.

The form of the lotus-like continued, hill censers often used various lotus-type types since Sui Dynasty. The censers with undulating hill-like covers were popular in the Han Dynasty, replaced by ceramic patches or "Cintamani, Stampa-pieces or slightly flame-shaped flaming stampa-pieces"[2].

[1] The Sui Dynasty (581-619 AD) ended the more than 360 years of melee and secession in the Wei, Jin, and Northern and Southern Dynasties; however, it only lasted 39 years, which is considered to be a dynasty that inherited the Northern and Southern Dynasties and opened the Tang Dynasty. Historians often called it the Sui Dynasty together with the Tang Dynasty.

[2] Edited by the Editorial Committee of the National Palace Museum: Catalogue of Incense Set of the Forbidden City, Taipei, 83, Republic of China, p. 55-56.

- **Hill censer after the Song Dynasty**

The Song Dynasty is the peak period in Chinese ceramic history. The porcelain kilns in the Song Dynasty were divided into six systems: Ding Kiln - Yaozhou Kiln -Cizhou Kiln - Jun Kiln - Longquan Celadon kiln - Qingbai kiln in Jingdezhen. The habit of using incense was prevalent in the Song Dynasty, which led to all kilns manufactured the censers, and each kiln's censers had a unique style as to the hill censers, which were mostly made of ceramics, but not famous. Limited hill censers were found; the "Blue-white glazed hill censer" is one of them (Figure 4-6); it was unearthed in 1973 in the Baoshou Tomb of the Northern Song Dynasty in Hefei, Anhui Province.

Samples	Description
 Blue-white glazed hill censer	This hill censer's lid is hemispherical; the top of the lid engraved with a chrysanthemum pattern, twenty-four overlapping hills engraved under the chrysanthemum pattern, and sixteen smoke outlets evenly distributed between the hills; two string patterns engraved underneath. The body is straight with three petal-shaped feet.

Figure 4-6. Blue-white glazed porcelain hollow hill censer

The Yuan Dynasty is an era while Mongolian culture, Han culture, Islamic culture, Tibetan Buddhist culture, European Christian culture, and Korean culture coexisted. The censers of the Yuan Dynasty also show a unique multicultural influence. For one thing, the cultural fusion happened between grassland and Han cultures; for another, the Islamic culture and Tibetan Buddhist culture were also part of the Yuan culture. Under the influence of multiculturalism, the censers emerge with different characteristics from the previous dynasties.

The most significant achievement of the porcelain industry in the Yuan Dynasty was the Jingdezhen Kiln successfully manufactured blue and white and underglaze red porcelain, which has epoch-making significance in the history of Chinese ceramics. Painting has become the mainstream of porcelain decoration since the Yuan Dynasty. The most distinctive censers in the Yuan Dynasty were the blue and white and the colored glaze ones; however, a little of blue and white censers were found; except for white and blue censers, colored glaze censers are particular in the Yuan dynasty, which is a kind of low-temperature censers with firm glass texture. The "Dragon and phoenix pattern colored glaze censer with three-color glaze" censer is an example (Figure 4-7).

Samples	Descriptions
 Dragon and phoenix pattern colored glaze censer with three-color glaze	The lid carved with hills, and the yellow dragon is winding in the blue hills. The censer's belly covers the interlocking branches of peony and clouds, and a dragon and phoenix fly among peony flowers and clouds.

Figure 4-7. Dragon and phoenix pattern colored glaze censer with three-color glaze

After the Song and Yuan dynasties, the censers' style changed a lot; many censers were produced in the Ming and Qing dynasties, hill censers were no longer fashionable. Only a hill censer's piece of Ming Dynasty was found in this research, as shown in Figure 4-8.

Samples	Descriptions
 Blue-and-white hill censer	The cover still retains the shape of hills and the hill-shaped pattern drawn with blue and white cobalt material.

Figure 4-8. Blue-and-white hill censer

Incense culture is an elite culture; the popularization of incense culture has gradually evolved into a popular cultural form since the Qing Dynasty. As a flourishing age culture, incense culture's development required a prosperous economic environment and a stable political situation; however, the political scene is turbulent in the late Qing Dynasty. The development of incense culture and the production of censers are influenced unprecedentedly. The incense

culture ended abruptly because of the war; censers' production was hugely reduced, and this trend continued until the early 2000s.

4.3. Emotional Evaluation of Samples by Multiple Methods

4.3.1. Content Analysis

The records obtained from the interviews are all summarized into one condensed transcript in the first step. In the second step, the content analysis is used to extract the meaning units, condensed meaning units and codes from the condensed transcript.

The condensed text (transcript) was generalized into 31 and 23 meaning units from the pleasant and unpleasant categories by line-by-line initial coding approach, respectively. After further analysis, the condensed meaning units and codes were determined. The most frequently mentioned meaning units chosen by the interviewed subjects are shown in Table 4-1 and Table 4-2. Both tables show the summarized meaning units and the corresponding condensed meaning units as well as the codes for both pleasant and unpleasant. Table 4-1 shows the results of the above analysis of pleasant features in hill censers, while Table 4-2 shows the analysis results for unpleasant features.

In the coding process, it is not only needed to extract meaning units from records but also needed to analyze the underlying meaning behind the words. A coding example is shown below:

This censer looks like a lantern or a lamp. Lantern

Traditional culture

The first meaning unit is: This censer looks like a lantern or a lamp. The lantern is related to traditional Chinese lamps, which are usually used in the spring festival. Several subjects mentioned it; it was to indicate they like the lantern-shaped censer. This point gives the idea is to design censer with lantern-shaped might be with pleasant feelings to the users.

Table 4-1. Analysis of pleasant features in hill censers

No.	Meaning units	Condensed meaning units	Codes
1	This censer looks like a lantern.	resembles lantern	lantern traditional culture
2	The censer gives the sense of calm and elegant.	the sense of calm and elegant	calm elegant
3	The hill shape of the censers is the most prominent; it should look like the hill.	resembles hills	hill-shaped

4	The color of the censer looks very graceful and brillante.	the color looks graceful and brillante	graceful brillante
5	The censer has rich decoration and bright color, which provides a pleasant experience.	rich decoration and bright color, gives a pleasant experience	rich bright pleasant experience
6	In terms of subjective experience, the censer gives people an exquisite and precious feelings.	exquisite and precious feelings	exquisite precious feelings
7	Although this censer was made thousands of years ago, it still looks modern and fashionable.	historic items with a modern feel	modern fashion
8	This censer is suitable for using in the tea ceremony, which can enhance experience of drinking tea and provide a pleasant visual and olfactory aesthetic experience.	enhancing the experiences and providing a pleasant visual and olfactory aesthetic experience	pleasant visual experience pleasant olfactory experience
9	The craft of the censer is superb.	the craft is superb	superb craft
10	The form of the censer is smooth and has richly decorated.	Smooth form with rich decoration	smooth rich decoration
11	The form of the censer is very concrete, which is to show a person holding a censer.	the form is very concrete	concrete
12	The censer has an ideorealm, gives a calm visual experience.	the form with ideorealm	ideorealm
13	This censer seems to be practical.	seems to be practical	practicability
14	The censer has a phoenix-shaped button, and the censer has been exquisitely crafted with a heavy influence on traditional culture.	exquisitely crafted body and a heavy feeling of history	excellent craft traditional culture
15	The censer adopts a concrete form and with solemn color.	a concrete form and solemn color	solemn
16	The incense mist rises from the censer when I use the incense burner; I feel I am in a fairyland.	feel being in a fairyland	fairyland
17	The color of the censer is bright and gives a comfortable visual experience.	bright color with a comfortable visual experience	comfortable
18	The censer has a fairy sculpture; I like the totem decoration of the god bird.	the totem decoration of the god bird	totem

			god bird
19	The details of the censer are exquisite, and the lid has a dragon button.	a dragon button on the lid	totem dragon
20	The censer has a hills mood, and a dragon soars over the hills.	hills mood, and a dragon over the hills	hills mood
21	I like the pure color of the censers.	like the pure color	pure
22	The form of censer is unique, sedate; the color looks very comfortable	unique and sedate shape, comfortable color	unique comfortable
23	I like the sense of handmade, although the form is very ugly, the ugly shape is unique to me.	the sense of handmade	handmade
24	The censer has an elegant color with Buddhist decorative elements.	elegant color with Buddhist decorative elements	elegant Buddhism
25	I like the lotus' form of the censer; the censer with a light hue make it looks nice.	lotus-shaped censer with a light hue	lotus light hue
26	The form of the censer gives smooth feeling.	smooth feeling	smooth
27	The style of the censer is straight and narrow, the decoration is meticulous, and the color is delicate.	straight and narrow; meticulous decoration; and delicate color	conventional meticulous delicate
28	The censer has gorgeous style, and the dragon and peony have typical Chinese cultural characteristics.	gorgeous style and typical Chinese cultural characteristics	Chinese culture
29	The censer gives a solid visual and psychological feelings.	solid visual and psychological feelings	solid
30	I think the most important character of the censer is that should be look like an incense burner.	it should be look like an incense burner	vivid
31	The form of the censer is very artistic, the shape is clear, and the color is very mild.	artistic and clear form with mild color	artistic lively mild

Table 4-2. Analysis of unpleasant features in hill censers

NO.	Meaning units	Condensed meaning units	Codes

1	The form of the censer's lid is a bit irregular; the color is also too dark.	boring form and dark color	irregular dark
2	I like the form of the bottom, but I do not like the lid, it is too cumbersome. The dull color is not suitable for using in the home.	the lid is too cumbersome	heavy
3	I think the upper part is messy, it looks crowded, and the color is dull.	the upper part is messy, looks crowded, and the color is dark	messy
4	The censer gives a feeling of ominous and tedious, looks like a funerary item, I am not feeling well when I see it.	look like a funerary item with bad meaning	Ominous tedious
5	The censer looks like a plant pot.	plant pot	old fashion
6	The form is too simple.	simple form	unattractive
7	The surface is rough; it does not look like a censer and gives a sense of shabby.	rough surface and shabby feeling	rough shabby
8	The form has no feature and looks like the head of Buddha.	the form has no features	ordinary unaesthetic
9	The censer has a little decoration, it looks like a commodity, not a censer at all, the censer should have its unique characteristics.	lacking decoration, and no unique characteristics	lackluster
10	The form is weird, cusps of the censer's lid make me feel uncomfortable.	weird shape with an uncomfortable feeling	weird uncomfortable
11	The surface of the censer looks rough, the form does not make sense of beauty, and the craft is also not nice.	rough surface and inferior craft	rough inferior
12	I do not like cusp shape, which feels a little strange.	cusp shape looks strange	eccentric spinous
13	I totally do not understand the meaning of the form, and I also do not know what it is.	misunderstand the meaning of the censer' form	meaningless useless
14	The shape of censer totally ugly, which maybe made it by accident.	the shape is ugly and maybe it made by accident.	ugly inexpensive
15	The color is pale, the form has no artistic conception.	pale color and without artistic conception	pale

			non-artistic conception
16	The craft is rough; the lid resembles a cave creating unpleasant ideas.	Strange-shaped lid creates unpleasant ideas	strange unpleasant
17	Styling of the censer looks like a sad person; it makes me feel depressed.	strange styling with a depressing feeling	depressive
18	The form does not look like a hill at all.	it does not resemble hills	non-hill-shaped
19	This utensil does not suitable as an incense burner, and the appearance is not good.	it does not suitable as a censer	Ill-suited
20	This censer used too much decoration, with a sense of bells and whistles, and gives restlessness feelings.	a sense of restlessness	restlessness
21	Several censers from the Wei, Jin, Southern and Northern Dynasties were very rigid in shape.	rigid in shape	rigid
22	The censer of Yuan Dynasty was too gorgeous in decoration style and too complicated in workmanship	gorgeous in decoration and complicated in workmanship	gaudy complicated
23	The censers in the Song Dynasty were too abstract and lost the romantic association that Hill censers should have.	lost the romantic association	not-romantic

After generalizing the codes from condensed meaning units, those codes were classified into sub-categories, then categories and themes. The teacher sorted out all the codes and generalized them into themes, according to the rules, causes and explanations. This analysis process was carried out using content analysis. The rules are similarity and correlation; the causes are frequency; and then explain how to sort all the codes into sub-categories and categories.

The sub-categories were defined based on the correlation with the codes, then those codes were divided according to the sub-categories. The codes were listed under the assigned sub-categories in a descending order according to the frequency of their appearance in the collected data. There is no specific ordering column wise though. In Table 4-3, the first column of sub-categories ‘emotional experience’ shows the code ‘elegant’ has the highest frequency over the other codes in the same sub-categories (column).

Next, the sub-categories were used to determine generalized categories. The important generalized categories were chosen and combined into the main theme that describes the data collected. This was used as the main guide for providing innovative design ideas. Group

discussion was used as the basis of this step. A similar content analysis process was used to build a table similar to the one shown in Table 4-3. Such tables are used to clearly guide designers seeking innovative ideas for new products.

The teacher organized discussions with the experts about the codes of both pleasant and unpleasant categories. The codes were sorted into sub-categories according to their similarity or correlation based on the content of interviews. Such as the 'Emotional experience' sub-category, which is included 11 codes, we summarized these codes into the category of emotional experience, because of the correlation among the codes and this category; after checking the interview transcript, we found these codes have the meaning to express subjects' emotional experience to the evaluated samples.

After a three-hour discussion, all the codes were divided into seven sub-categories as follows: 'emotional experience' – 'craft' – 'usability' – 'style' – 'form' – 'color' – 'decoration'. The sub-categories are shown in the middle part of Table 4-3. The seven sub-categories were generalized into four categories: 'emotional experience' – 'craft' – 'usability' – 'design style'. Out of these four categories, 'emotional experience', 'craft' and 'usability' were given the same titles as their corresponding sub-categories. While the other sub-categories ('style' – 'form' – 'color' – 'decoration') were combined into the 'design style' category, because of these sub-categories had correlation with design style. The four categories obtained are shown in the middle part of in Table 4-3. 'Emotional experience' and 'design style' were the essential categories chosen to form the theme "Emotional experience and design style" for this case-study (bottom of the Table 4-3). The obtained theme is explained the categories, the craft and usability are basic demands in product design; they were deleted when named the theme.

The Table 4-3 could guide the students when seeking ideas for designing products; they can focus on the important categories form the obtained theme, i.e., 'emotional experience' and 'design style'. The two categories with high frequencies mentioned by subjects were then chosen, namely: 'emotional experience' and 'form'. 11 codes fell into the 'emotional experience' category including 'elegant' and 'ideorealm'1, both of which had the highest or least frequency vocabularies. Accordingly, the hill censers with these features could easily elicit pleasant feelings, thus the future designs should adhere to those factors. Similarly, under the 'form' sub-category, the frequencies of the codes show that hill and lotus shapes elicit pleasant feelings. As for other sub-categories, 'bright color' – 'light hue' – 'modern' – 'fashion' or 'traditional culture' were characteristics that could increase pleasant feelings.

Table 4-3. The codes, categories and themes associated with pleasant features in hill censers

Codes

[1] This term refers to a state where the scene is described in a literary or artistic work reflecting the sense and sensibility intended. Ideorealm is a distinctive category in Chinese aesthetics.

Elegant	Superb	Practicability	Modern	Lantern	Bright	Richly
Ideorealm	Excellent	Valuable	Fashionable	Lotus	Rich	Totem
Calm	Handmade	Solid	Solemn	Hill	Light hue	Meticulous
Exquisite		Smooth	Conventional		Pure	Buddhism
Luxurious			Traditional culture		Mild	Clouds
Precious			Lively		Gradation	
Pleasant olfactory experience			Classical		Delicate	
Immortal			Vivid		Brillante	
Fairyland			Unique			
Comfortable			Concrete			
Graceful						
Sub-categories						
Emotional experience	Craft	Usability	Style	Form	Color	Decoration
Categories						
Emotional experience	Craft	Usability	Design style			
Theme						
Emotional experience and design style						

Similarly, Table 4-4 was used for the characteristics of the censers with unpleasant features. For both the categories and the theme, the results with respect to unpleasant features in hill censers were the same as those for the pleasant features. Under the sub-category ‘emotional experience’, shabby form could easily elicit unpleasant feelings. Additionally, under the sub-category ‘form’, irregular or spinous shapes could result in unpleasant (unsafe) feelings. The ‘non-hill shaped’ code under the ‘form’ sub-category showed low approval levels for non–hill shaped censers. Under the ‘craft’ sub-category, it is understandable that ‘rough’ is present, as this typically represents low quality.

Table 4-4. The codes, categories and themes with unpleasant features in hill censers

Codes						
Shabby	Inferior	Ill-suited	Old- fashioned	Irregular	Dark	Unattractive
Unpleasant	Rough	Useless	Rigid	Spinous	Pale	Gaudy
Unaesthetic			Messy	Non-hill-shaped	Heavy	Lackluster
Ordinary			Weird	Meaningless		Not-romantic
Uncomfortable				Ugly		Inexpensive

Strange				Heavy		
Restlessness				Complicated		
Non-artistic conception						
Ominous						
Depressive						
Tedious						
Eccentric						
Sub-categories						
Emotional experience	Craft	Usability	Style	Form	Color	Decoration
Categories						
Emotional experience	Craft	Usability	Design style			
Theme						
Emotional experience and design style						

4.3.2. Semantic Network Analysis

This part of the research analyzed the data collected from interview transcripts using tools such as ROST CM 6.0 to determine the semantic network structures for both the positive and negative emotional aspects. Nodes having a strong positive emotional sense are associated with the likelihood of offering a positive emotional experience to future users of the product being designed, while nodes having a strong negative emotional sense are associated with inducing negative feelings.

The semantic network shows the relation between the high-frequency vocabulary words. Those words are shown in the network as nodes connected by lines. The thickness of the lines reflects the co-occurrence frequency of the corresponding vocabularies. The thicker the line, the closer the relation between those two words. The density of the arrows around words shows that those words have high frequencies in the collected data.

Designers are advised to adhere to the nodes relating to positive feelings and avoid nodes relating to unpleasant feelings when designing future products. This is a key principle in emotional design. In this case study, Figure 4-9 and Figure 4-10 show the positive and negative emotional aspects, respectively. Obviously, in both figures, the subjects focused on the nodes; ‘form’ – ‘decoration’ – ‘emotion’ – ‘color’ – ‘craft’. In Figure 4-9, the central node structure is ‘emotion’ directly connected with the nodes; ‘form’, ‘color’ and ‘decoration’. The ‘color’ node is tightly connected to the nodes ‘style’ and ‘craft’. The node ‘emotion’ is additionally linked to other nodes, e.g., ‘comfortable’ – ‘exquisite’ – ‘elegant’ etc.

Figure 4-10 shows the semantic network associated with negative aspects, with the node ‘form’ in the center, unlike its position in the semantic network for the positive vocabulary. The central node is joined to other nodes, e.g., ‘vivid’ – ‘irregular’ – ‘rough’ – ‘weird’ – etc. Dark, heavy colors were found to have a negative influence on the subjects in the case study. Designers should therefore be careful to avoid such color combinations. Additionally, designers were advised to refrain from evoking uncomfortable, unpleasant or shabby feelings by their designs for future products.

To verify the findings obtained here, methodological triangulation was utilized. The results from both the content analysis and the semantic networks were compared according to methodological triangulation. The findings were reliable enough in the case study. The high-frequency codes associated with the theme obtained from the content analysis were found to be very similar to the center node structures in the semantic networks. From content analysis, the important category ‘emotional experience’ had 12 codes. Among these, ‘elegant’ and ‘ideorealm’ had the highest vocabulary frequency. In the semantic network, the central node (emotion) was linked with thick lines to both the ‘elegant’ and ‘ideorealm’ nodes on the right side of the network.

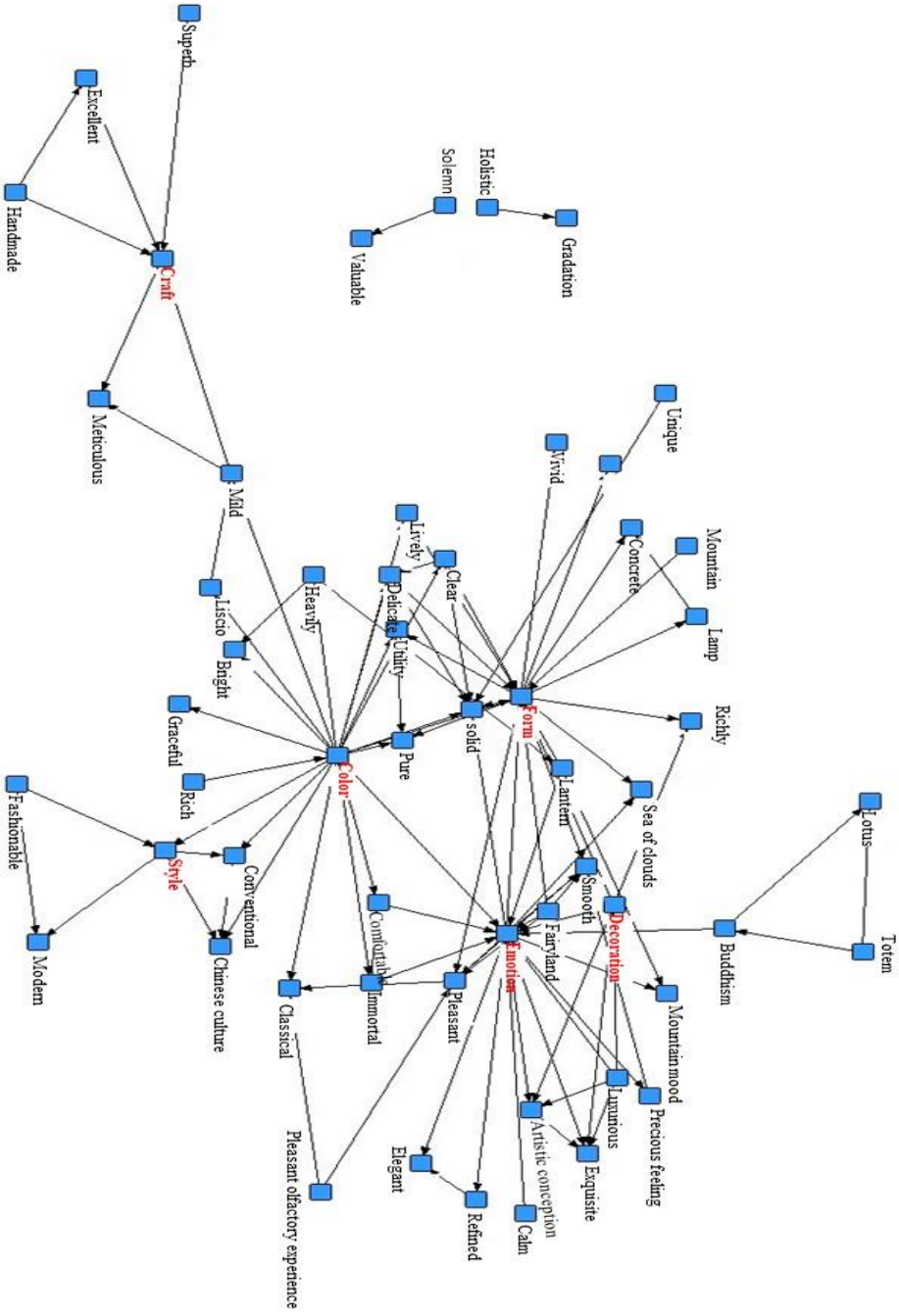

Figure 4-9. Semantic network of positive vocabulary

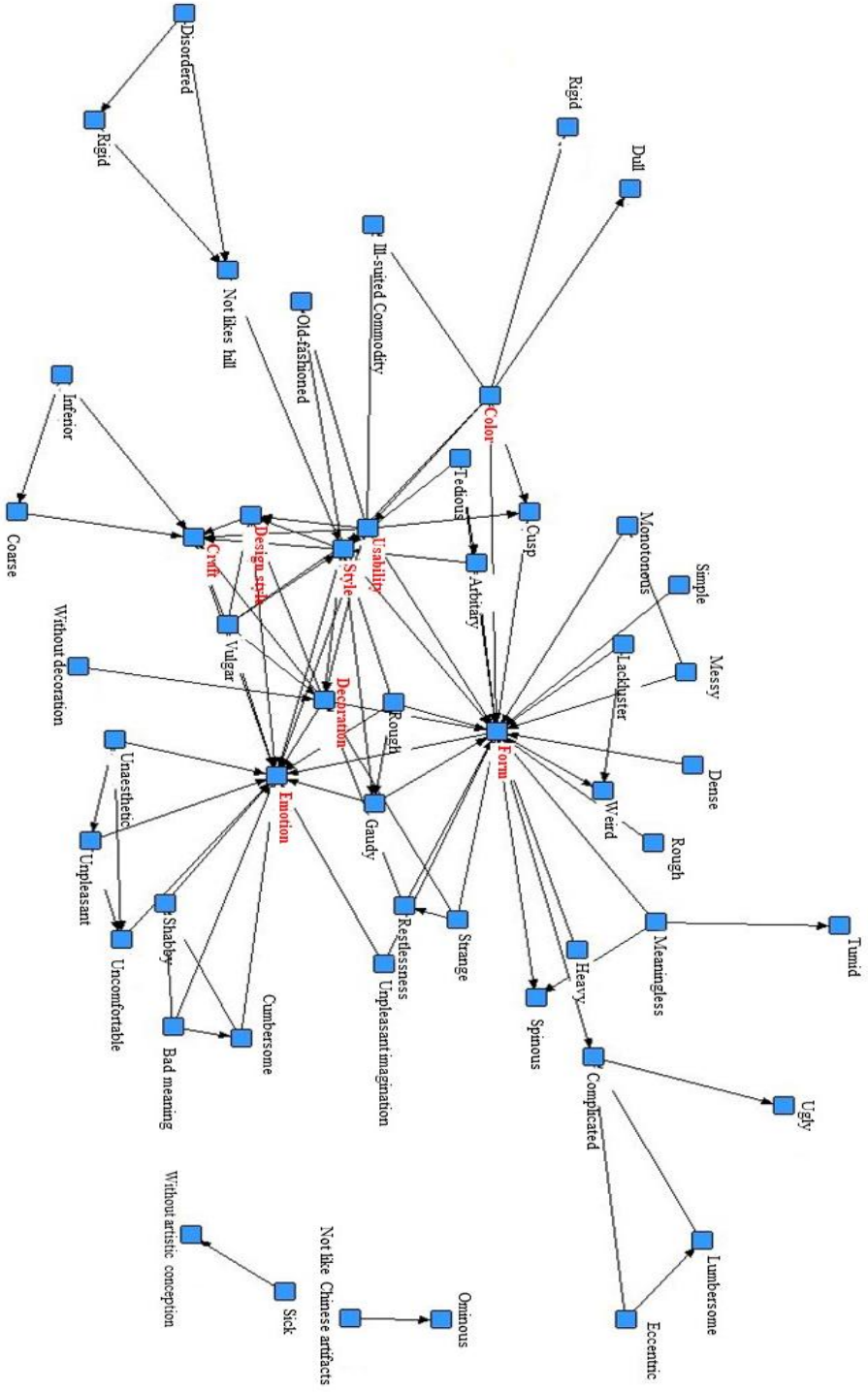

Figure 4-10. Semantic network of negative vocabulary

4.3.3. Design Guidelines from Users

The theme obtained from the content analysis was “emotional experience and design style’. A three-hour group discussion was organized by the research (author) to co-create with the design students. We talked about to what extent are users’ attitudes to emotional design based on the obtained theme in content analysis. Finally, the design guidelines about providing positive user feelings were extracted from emotional experience and design style aspects are set out below (Figure 4-11):

1. Design guidelines from the emotional experience:

- Traditional culture

The most vital design strategy is to learn in-depth about traditional culture; this finding is based on the high-frequency codes associated with the category ‘style’ and ‘decoration’ in the pleasant features. For example, the Buddhist culture highly influenced both samples 18 and 19; both were made in the Sui–Tang dynasties in the form of a lotus, which elicits positive emotions. The lotus has always been used as a decorative element in Buddhism. Furthermore, the totem and clouds patterns could provide positive emotional experiences to the users, identified by the subjects.

- Ideorealm

Ideorealm means a poetic scene in traditional Chinese aesthetics. For the hill censers, ideorealm refers to the poetic space in which the hills and incense mist blend. The incense mist would be surrounding the hill when using it to burn incense, giving a sense of fairyland. The subjects considered that such kind of using scene could elicit positive emotional experiences. Furthermore, combining the visual and olfactory experiences is also crucial in product design, especially for censers, because using a censer is a complex experience on visual and olfactory. Hence, multi-dimensional sensory experiences should be considered when designing products.

2. Design guidelines from the design style:

- Being fashionable

Good designs can still appear to be fashionable even after a century. Several subjects realized that Samples 1 and 23 are historical censers but still retain a fashionable appearance. Being fashionable has a similar meaning to modern, except this, the classical and unique design style of products could also provide the sense of fashion, which was learned from the interviews.

- Bright colors

The subjects thought well of the evaluated samples with a bright, light hue and pure color; they realized the samples 18 and 19 elicited positive comments for their pastel color. Samples 2, 5, 8 and 11 all have a dark tone and evoked unpleasant images.

- Form

On the one hand, the censer should be hill/lotus/lantern-shaped to avoid sharp edges. Both samples 11 and 12 have pointed protrusions on the lid, which elicited negative feelings of unsafety to the subjects. Oppositely, a round form was more likely to provoke a positive emotional association. On the other hand, the minimalist form is a geometrical aesthetic design method influenced by Modernism (the 1920s). Censer samples with a simplistic form are preferred according to the analysis results.

As to avoid negative influence, we summarized the design guidelines as shown below:

1. Design guidelines from the emotional experience:

The summarized design guidelines are based on the interview transcripts. According to the subjects, the products should avoid giving the sense of shabby, unaesthetic, ordinary, uncomfortable, strange, depressive, and such feelings. Three subjects talked about several censers that trigger negative emotional experiences. The lid of the censers had a pointed appearance and gave them an uncomfortable and strange feelings. That means the shape of the censers should be mellow that could provide positive feelings.

2. Design guidelines from the design style:

- Style

After a group discussion, we reached an agreement. Designing Products should avoid giving people a sense of obsolescence. For example, several samples from the Wei, Jin, Southern and Northern Dynasties with dull glaze and random shapes gave people a sense of old fashion.

- Color

The importance of color to product design has long been proven. Interviewees pointed out that avoiding dark, pale, or heavy feelings in the product design is very important. Those color perceptions will bring negative emotional experiences to users.

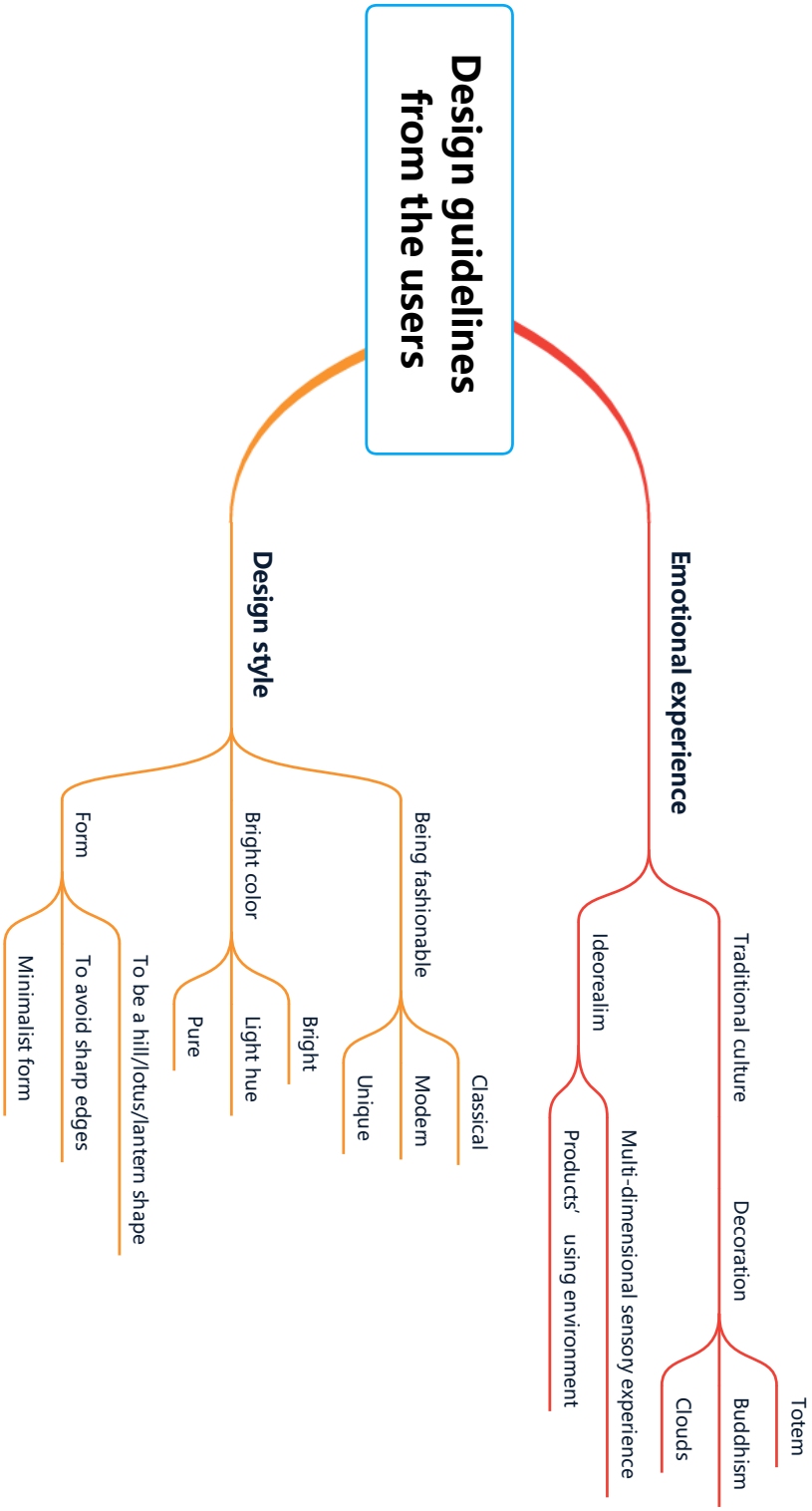

Figure 4-11. Design guidelines for proving positive feelings

Chapter 5.
Case Study II

5.1. Overview of Case Study II 82

5.2. Evaluated Samples 82

5.3. Data Analysis 86

5.4. Obtain Findings by Mixed Methods 89

5.4.1. Obtain Findings by Open-ended Interviews 89

5.4.2. Obtain Findings by Grounded Theory 89

5.4.3. Constructing the Design Method 93

5.1. Overview of Case Study II

This case started with a long-term (eight years) fieldwork in Jingdezhen, China, a famous city with a long history of over 1,700 years in ceramic manufacturing. The investigation and interviews allowed me to build friendships with some ceramists and censer makers, who kindly provided insightful advice, including the suitable selection of the ceramic hill censers to evaluate. Through long-term investigating to learn the situation of design and the manufacture of ceramic products.

This mixed methods study was addressed the design of ceramic censers that reflect positive emotions from their creators/designers. Convergent mixed methods in design are utilized in this research. That kind of design acquires and analyses qualitative and quantitative data independently before aggregating both.

This case study utilized a five-point scale to collect quantitative data, and those data were used to test if the subjects with a design background, each age groups hold different views on the tested samples. After getting the results, the qualitative interviews were conducted to explore the quantitative analysis results further. The reason for collecting quantitative and qualitative data was to learn how to design products reflecting positive emotions according to users' emotional requirements. The case evaluated and summarized designers' positive and negative emotions through questionnaires, interviews, focus groups and grounded theory to obtain insights on the improvement of product design from the perspective of the designers instead of the users. The designers' tacit and explicit design knowledge has been summarized in chapter 5.4.3, finally.

5.2. Evaluated Samples

Jingdezhen's ceramic manufacturing history goes as far as the Han Dynasty. This fieldwork is more about the status of the private sector ceramic industry rather than its history. In the Chinese planned economy era, the state owns ten porcelain factories in Jingdezhen have been undergoing major reforming. Around the same period, tens of thousands of workers were laid off, which mark a serious decline of the ceramics industry in Jingdezhen. The emergence of a private sector ceramic business was a cry for saving the business and reviving the long tradition. The main motive of conducting this fieldwork was to focus on small and medium-sized ceramic studios, factories and companies. The target ceramic censers' studios or factories were chosen as a representative sample to explore and study in depth the current issues (Yu, 2019).

Shadowing[1], cultural probes[2] and storytelling[3] were implemented to learn the ceramic practitioners, to determine the existing questions in the private sector industry. The private ceramics industry has achieved industry division of labor in Jingdezhen. Ceramic craft includes several types of work as rolling over, throwing, trimming, painting and firing, as shown in Figure 5-1. For the artisans, the primary problem is the lack of funding, which led to a low-end development model and made them challenging for surviving. The artisans have still used traditional methods to produce ceramic censers by hand (Yu, 2019), (Figure 5-2, Figure 5-3).

Figure 5-1. Ceramic craft in the studios

Figure 5-2. Hand-made

[1] A tool of Ethnography built by Lucy Vernile in 1991.
[2] A tool of Ethnography built by Bill Gaver in 1999.
[3] A tool of narratology.

Figure 5-3. Hand painting

In the ceramic censers' design and manufacture, ten years ago, few ceramists were creating ceramic censers in Jingdezhen because using incense was not popular. Then, over the years, more and more people started to re-discover incense, increasing the use of censers in their routines. This influence recently led to a boom in ceramic censer manufacturing. As hill censer is a traditional censer, it became attractive for ceramists to redesign, and ceramic hill censers are now widely available in markets. Despite the redesign, most hill censers closely resemble traditional models, with only a few of them being the result of innovative design methods.

The ceramists helped to choose these 18 samples (Figure 5-4), the selected samples have the common characteristic, is their hill shapes, those samples were popular in the selling market. The multiple decoration skills have been used on the censers' surface, such as black and blue, over-glazed decoration, pastel, gold drawing etc., as for the craft, except the sample 5, 9 and 13, other samples were made by throwing, cut and trim. The sample 5, 9 and 13 were made by slip casting.

Figure 5-4. 18 Samples of hill censers

These samples have strong influences from the traditional hill censers; the designers identified their design ideas were from the initial model of hill censers. 106 subjects evaluated these18 samples (In total, 105 valid questionnaire answers were collected), the next step is to analyze the data by one-way ANOVA, to explore the opinions form different aga groups of the subjects.

5.3. Data Analysis

One-way ANOVA was used to analyze the collected data, the purpose was to identify the quantitative research hypothesis; all the subjects with design background, each age groups hold different views on the tested samples, because of their diverse interests (Kim, 2017). After applying a one-way ANOVA, found that different age groups differ in opinion about samples 5, 15, and 17. This is partly identified the true of the research hypothesis.

The coefficient of internal consistency (Cronbach's α coefficient) was obtained before the one-way ANOVA, reaching 0.949 (Table 5-1). The reliability value of the coefficient is between 0 and 1, and values closer to 1 indicate higher reliability of the data. Therefore, the test results obtained from the questionnaire are highly reliable.

Table 5-1. Reliability statistics obtained from the 18 samples

Reliability Statistics		
Cronbach's α	Cronbach's α coefficient based on standardized items	No. of items
.949	.950	18

This case applied the one-way ANOVA to evaluate the emotions from the three age groups elicited by the 18 samples. The coefficient values of the homogeneity of variance for samples 5, 15, 17, and 18 are 0.010, 0.034, 0.000, and 0.009 ($p < 0.05$) (Table 5-2), respectively. Hence, subjects from different age groups have different opinions about these four samples. To compare the dissimilarity of their viewpoints, the multiple comparisons were used to identify the differences between the three groups. The Scheffé's method showed a significant difference between samples 15 and 17 (Table 5-3), whereas samples 5 and 18 did not retrieve a significant difference. The group of elders (over 51 years old) exhibited different opinions from the middle-age group in samples 15 and 17. Notably, the group of elders disagreed with the other two groups regarding sample 17.

Table 5-2. Test of homogeneity of variance

Test of Homogeneity of Variances				
Samples	**Levene's test**	**df1**	**df2**	**Significance**
Sample 1	0.214	2	102	.808

Sample 2	1.691	2	102	.189
Sample 3	1.290	2	102	.280
Sample 4	1.155	2	102	.319
Sample 5	4.842	2	102	.010
Sample 6	1.946	2	101	.148
Sample 7	0.554	2	102	.577
Sample 8	0.274	2	102	.761
Sample 9	0.480	2	102	.620
Sample 10	2.392	2	102	.097
Sample 11	1.909	2	102	.153
Sample 12	1.956	2	102	.147
Sample 13	0.285	2	102	.753
Sample 14	0.026	2	102	.974
Sample 15	3.498	2	102	.034
Sample 16	0.236	2	102	.791
Sample 17	9.314	2	102	.000
Sample 18	4.978	2	102	.009

Table 5-3. Multiple comparisons from the Scheffé's method

Multiple Comparisons							
Scheffé's method							
Dependent variable	(I) Ages (years)	(J) Ages (years)	Mean difference (I–J)	Std. error	Significance	95% confidence interval	
						Lower bound	Upper bound
Sample 15	Under 30	31–50	1.41795	0.68626	.124	-0.2868	3.1227
		Over 51	-3.13043	1.46993	.109	-6.7820	0.5211
	31–50	Under 30	-1.41795	0.68626	.124	-3.1227	0.2868
		Over 51	-4.54839*	1.52960	.014	-8.3481	-0.7487
	Over 51	Under 30	3.13043	1.46993	.109	-0.5211	6.7820
		31–50	4.54839*	1.52960	.014	0.7487	8.3481
Sample 17	Under 30	31–50	0.04301	0.71100	.998	-1.7232	1.8092
		Over 51	-6.06667*	1.52292	.001	-9.8498	-2.2835
	31–50	Under 30	-0.04301	0.71100	.998	-1.8092	1.7232
		Over 51	-6.10968*	1.58474	.001	-10.0464	-2.1730

	Over 51	Under 30	6.06667*	1.52292	.001	2.2835	9.8498
		31-50	6.10968*	1.58474	.001	2.1730	10.0464
*Mean difference is significant at 0.05 level.							
Test of homogeneity of variance							

This case conducted the test of homogeneity of variance and Scheffé's method twice (Table 5-4) and independently to analyze the positive and negative emotions elicited by the 18 samples. This research found that only sample 5 reached significance. In the negative emotion test, the group of elders obtained the highest negative emotion evaluation score, whereas positive emotions were prevalent on the youth group.

Table 5-4. Repeated multiple comparisons from the Scheffé's method

Multiple Comparisons							
Scheffé's method							
Dependent variable	(I) Ages (years)	(J) Ages (years)	Mean difference (I–J)	Std. error	Significance	95% confidence interval	
						Lower bound	Upper bound
Sample negative 5	Under 30	31–50	-0.28004	0.18938	.339	-.7505	0.1904
		Over 51	-1.37681*	0.40564	.004	-2.3845	-.3692
	31–50	Under 30	0.28004	0.18938	.339	-0.1904	0.7505
		Over 51	-1.09677*	0.42210	.038	-2.1453	-0.0482
	Over 51	Under 30	1.37681*	0.40564	.004	0.3692	2.3845
		31–50	1.09677*	0.42210	.038	0.0482	2.1453
Sample positive 5	Under 30	31–50	0.48792*	0.18554	.035	0.0270	0.9488
		Over 51	1.22126*	0.39742	.011	0.2340	2.2085
	31–50	Under 30	-0.48792*	0.18554	.035	-0.9488	-0.0270
		Over 51	0.73333	0.41355	.213	-0.2940	1.7606
	Over 51	Under 30	-1.22126*	0.39742	.011	-2.2085	-0.2340
		31–50	-0.73333	0.41355	.213	-1.7606	0.2940
*Mean difference is significant at 0.05 level.							

5.4. Obtain Findings by Mixed Methods

5.4.1. Obtain Findings by Open-ended Interviews

An open-ended interview was a useful tool to explore the quantitative results have been acquired in chapter 5.3 in this case study. Turner (2010) stated that "interviews provide in-depth information about the participants' experience and point of view regarding a particular topic". This case conducted open-ended interviews to promote participants' storytelling to answer the quantitative research hypothesis (the second research question) (Evans, 2019). Six subjects from each age group were selected for the open-ended interviews to discuss samples 5, 15, and 17 emphatically. The obtained findings as shown below:

1. The youth group provided the highest score of positive emotion to sample 5. These subjects perceived the sample as stylish by the clear white glaze, simple modeling, and fantastic hill shape cover. Thus, they found the piece attractive, and the details of the cover with lines resembling clouds around the mountain appeared to be the landscape of a fairyland.

2. Sample 15 also shows a simple design, and the group of elders disagreed with the other groups regarding this piece. From the interview, the elders found that the bright blue and brown colors and simple decoration elicited feelings of happiness in them, being their preferred sample. In contrast, the other age groups considered the colors as unappealing and a negative influence on their mood when seeing the censer. Moreover, they found the shape, material, and glaze decoration to express low quality, giving sample 15 the lowest scores.

3. The elders also gave sample 17 higher scores than the subjects from the other groups, as the latter considered the color of the sample as gorgeous, but the traditional decoration made it less attractive. However, the elders found the traditional style of the Chinese culture along with the red and green colors with traditional decoration of dragons and auspicious patterns typical from the Chinese culture very appealing.

5.4.2. Obtain Findings by Grounded Theory

By analyzing the mean values, this research found that the top three samples eliciting positive emotions of the designers were samples 5, 9, and 10, whereas those eliciting negative emotions were samples 17, 16, and 18 (Table 5-5). The open-ended interviews were conducted again with the nine subjects of 105 subjects; 33 interviews were back and forth to the subjects to determine why the subjects like or dislike these six samples. And another three subjects out of 105 subjects were interviewed with the same six samples to determine if the categories were saturated or the theory was sufficiently detailed.

Table 5-5. Mean evaluations of the 18 samples

Item	Desire	satisfaction	Fascination	Σ	Boredom	Disgust	Fear	Σ
Sample 1	3.03	3.18	3.13	**9.34**	2.19	2.05	1.76	**6**
Sample 2	3.29	3.39	3.52	**10.2**	2.14	2.07	1.88	**6.09**
Sample 3	3.69	3.71	3.67	**11.07**	1.98	1.9	1.82	**5.7**
Sample 4	3.49	3.52	3.44	**10.45**	1.99	1.93	1.84	**5.76**
Sample 5	3.95	4	3.9	**11.85**	1.83	1.79	1.7	**5.32**
Sample 6	3.47	3.5	3.47	**10.44**	2.07	2.04	2	**6.11**
Sample 7	3.36	3.38	3.34	**10.08**	2.14	2.02	1.92	**6.08**
Sample 8	3.52	3.57	3.53	**10.62**	2.12	2.04	1.93	**6.09**
Sample 9	3.8	3.82	3.81	**11.43**	1.86	1.81	1.74	**5.41**
Sample 10	3.74	3.73	3.8	**11.27**	1.92	1.79	1.7	**5.41**
Sample 11	3.46	3.49	3.39	**10.34**	1.95	1.86	1.77	**5.58**
Sample 12	3.51	3.48	3.38	**10.37**	1.94	1.94	1.87	**5.75**
Sample 13	3.32	3.3	3.24	**9.86**	2.12	2.09	2	**6.21**
Sample 14	3.72	3.72	3.64	**11.08**	1.96	1.88	1.79	**5.63**
Sample 15	3.64	3.59	3.53	**10.76**	2.06	1.96	1.82	**5.84**
Sample 16	3.17	3.16	2.96	**9.29**	2.25	2.14	2	**6.39**
Sample 17	3.16	3.28	3.3	**9.74**	2.33	2.44	2.1	**6.87**
Sample 18	3.27	3.26	3.22	**9.75**	2.19	2.12	2.11	**6.42**

Some representative opinions of the subjects are summarized below: the subjects expressed their opinions about these samples (5, 9 and 10) on why these samples elicited more positive emotional responses than the others (17, 16 and 19).

Sample 5 and 9 received high ratings for eliciting positive emotions. The subjects thought that the elegant glaze decoration of the censers offers a pleasant visual experience, and its simple and compact shape conforms with the traditional Boshanlu. This style is a classic category more readily accepted by people. In the glaze, after firing, the edges of the censer appear to be of a crystal white glaze color, while the other parts of the censer are translucent cyan. In the decoration, the lotus pattern on the lower part of the censer and the cloud patterns on the cover echo each other, creating a harmonious visual effect. The phoenix bird on the top of sample 10 also complies with traditional Boshanlu, but its shape is simplified. It also combines modern design to provide innovation, giving an overall positive emotional experience

Samples 16 and 19 obtained a high score of their negative influence. Subjects thought the shapes of samples 16 and 18 were insecure (giving the sense of fear) for their pointy shape, and the color of sample 16 was dull and looked a little outdated. As to sample 17, the subjects commented that the old-fashioned decoration gave negative feelings, and the color matching was also horrible.

The interview transcripts were analyzed based on the approach of grounded theory. Eight graduate students were selected to discuss in a group (a one and half hour's discussion in a meeting room). We utilized the grounded theory approach to develop the coding list, category, and theme for the theory according to open coding and axial coding methods. We generated 42 codes, 26 related to positive and 16 to negative emotions.

Those codes were generalized from interview transcripts; an example is to show the coding process of positive and negative emotional analysis below (Table 5-6):

Table 5-6. An example of coding

Interview transcripts	Codes
I think the elegant glaze decoration of sample 5 and 9 offer a pleasant visual experience, and its simple and compact shape conforms with the traditional Boshanlu/hill censers.	Simple Compact Lively
The samples 16 and 18 have pointy shape of the lids.	Conical shape Sharp Fear

Table 5-6 identified the process of extracting codes from interview transcripts. Such as the codes 'simple' and 'compact' were taken directly from the text, while the code 'lively' was summarized based on what the subject said; the subjects commented that samples 5 and 9 have a similar shape to traditional hill censers, which means the samples had lively characters. Hence, the code 'lovely' generalized in this step.

As to the negative emotional analysis, the subjects talked about the samples 16 and 18 have the pointy shape of their lids, the codes of 'conical shape' and 'sharp' took directly from the text, whereas the code 'fear' expressed the feelings from the subjects which elicited by the pointy shape of the samples.

The summarized codes were divided into seven categories and five themes based on their correlation and the content of interviews, as shown in Table 5-7 and Table 5-8. Category of 'style' contains 'codes simple' – 'plump' – 'compact' – 'modern' – 'lively' – 'conventional' – 'classical' as 'design trend'. Category of 'visual experience' incorporates six codes, 'intricate details' – 'fresh colors' – 'delicate' – 'smooth' – 'vivid' – 'unique' which also conform to design trends. Category of material includes 'textured' – 'bright texture' – 'smooth' – 'superb', which can be associated with the glaze configuration, and category emotional experience includes nine codes.

Table 5-7. Grounded theory obtained from positive emotional analysis

Themes			
Design trend		Glaze configuration	Positive emotional experience
Categories			
Style	Visual experience	Material	Emotional experience
Codes			
Simple	Intricate details	Textured	Peaceful
Plump	Fresh colors	Bright texture	Comfortable
Compact	Delicate	Smooth	Stylish
Modern	Smooth	Superb	Elegant
Lively	Vivid		Graceful
Conventional	Unique		Cultural
Classical			Artistic
			Calm
			Precious

This case obtained 16 codes belonging to three categories and two themes from the top three samples eliciting negative emotions (Table 5-8). Category of style contains four codes establishing design trends, as the three codes of category visual experience. Category of emotional experience includes eight codes. As expected, all these codes have negative implications.

Table 5-8. Grounded theory obtained from negative emotional analysis

Themes		
Design trend		Negative emotional experience
Categories		
Style	Visual experience	Emotional experience
Codes		
Conical shape	Obsolete	Sharp
Bulky	Gaudy	Psychological stress
Messy	Unattractive	Fear
Old-fashioned		Conservative
		Boring
		Antiquated
		Vulgar
		Strange
		Ordinary

Codes selection criteria are their high frequency; more codes were obtained during the data coding process; some codes have deleted those codes that had similar ‘stories’ with the codes in the case study I. The rest of the codes were summarized to identify the correlation between the codes, categories to the themes. In the perspective of ‘design trend’ from both sides, which is contained ‘style’ and ‘visual experience’ categories, those two categories named based on

the interview transcripts, such as the subjects mentioned that they like the samples have the style of 'simple' – 'plump' – 'compact' – 'modern' – 'lively' – 'conventional' – 'classical'. An opposite example is that the subjects do not like the samples with the style of 'conical shape' – 'bulky' – 'messy' – 'old-fashioned'. We generalized all the codes into their corresponding categories and themes in the same way. In the category of 'visual experience', those codes are related to the subjects' experiences of their eyes; when they saw the samples, what kind of visual experiences were obtained. In the emotional experience category, all codes correlate with subjects' emotions. We judged it by interview transcripts; some subjects talked about 'peaceful', 'comfortable' or 'sharp'; such kind of feelings elicited their positive or negative emotional experiences. In the glaze configuration category, the designers gave advice from their professional ceramic design knowledge; they told us some glaze configuration methods could help make the different textures, such as the orange peel glaze could provide special tactile experiences.

5.4.3. Constructing the Design Method

After the group discussion, we obtained the seven categories from both positive and negative emotions, including 'design trend', 'visual experience', and 'emotional experience', which agreed between positive and negative emotions. The theme of 'glaze configuration' only appeared in the positive emotion aspect. The next step was to establish the design method using the five themes according to the interview transcripts. The design method from 'design trend' – 'emotional experience' perspectives were generalized with design method from the designers, finally.

1. To learn design trend

The design method generalized based on the codes, in the category of 'style' and 'visual experience'; the codes are related to the form, function, decoration and cultural background, or 'intricate details' – 'fresh colors' – 'delicate' – 'smooth' – 'vivid' – 'unique' such kind of visual experiences.

- According to subjects (designers), they pointed out that **Form, function and decoration** are essential knowledge that must be learning for novice designers. First, the form of the product is the container used to wrap the product, which is used to protect the internal structure and have an appointment aesthetic experience in terms of decoration. Some characters about 'simple' – 'compact' – 'plump' – 'lively' (codes in style category from positive emotion analysis) of products could give the sense of happiness. Second, the product's function includes using function, aesthetic function, entertainment function, cultural function, etc. Products have different functional attributes. For example, a censer needs to have the function of burning incense; it also should have an aesthetic function; that is, the censer's shape and decoration could give

users a pleasant visual experience. The way of getting the aesthetic function to obtain pleasure feelings is to provide the decoration with elegant, graceful, or artistic sense (codes in emotional experience category from positive emotion analysis). Lastly, some tips we summarized by group discussion could help novice designers to design the products eliciting positive emotional experiences. Regarding the designer's intuition, products should be designed with a simple style, avoiding bulky and complicated shapes, as these shapes elicit negative emotions such as fear and disgust.

- **Cultural background** of a product is crucial to learn before starting the design task. Designers should learn about the traditional products when designing the new style of products. In fact, they can find useful knowledge accumulated over the centuries of the traditional products. In other words, the products' cultural background could help the designers to acquire the design strategies. Some codes were summarized by the interview transcripts, shown that the significance of cultural backgrounds, such as the code 'classical' means the influence of traditional culture on contemporary product design. The subjects mentioned that the market recognizes hill censers because it retains the traditional hill shape. The enlightenment for other types of product design is to let designers understand the background culture of products.
- **Intricate details, fresh colors, delicate, smooth, vivid and unique,** those 'visual experiences' have been summarized in the Table 5-7 could elicit positive emotional experiences. According to interview transcripts, the subjects mentioned the products should have intricate details with delicate, vivid, or unique shapes, such as the samples 5, 9 and 10, those three samples have complex carven decoration on the lids, which provided a sense of delicate, vivid and unique. Furthermore, the fresh colors also are vital in product design, the subjects like the products with fresh colors, such as samples 5 and 9. The smooth is about the surface of the products; the coarse surface would not accept by most of the users.

2. To learn emotional experience

- The subjects gave the advice from their professional design background to provide positive emotional experiences and avoid negative emotional experiences, as summarized in Table 5-7 and Table 5-8**.** According to designers, the products should offer the sense of 'peaceful' – 'comfortable' – 'stylish' – 'elegant' – 'classic' – 'cultural' – 'artistic' – 'calm' – 'precious', and avoid 'sharp' – 'psychological stress' – 'fear' – 'conservative' – 'boring' – 'antiquated' – 'vulgar' – 'strange' – 'ordinary', such kind of feelings, such as, the sample 5 and 9 with white glaze and celadon glaze, which have a sense of peace. Nevertheless, samples 16 and 18 with a sharp form elicited feelings of fear.
- The different age groups have differed emotional experiences on evaluated samples, regarding design strategies of different age groups, the one-way ANOVA showed

disagreements between the groups for several samples. Through the in-depth interviews, we determined that the design strategy of elder, the designers should integrate more traditional cultural elements into the design, such as samples 2, 7, and 17. Those kinds of censers have traditional decorations and shapes, and elder find them appealing.

- For young age group, it should use a fashionable design language. For example, elegant adornment style provides two characteristics: use glaze with fresh and lucid visual effects such as a transparent glaze that serves as adornment and pay attention to the collocation of adornments and modeling to obtain a harmonious visual effect. In terms of avoiding the negative emotions, gaudy decorative colors and traditional decorations should be avoided for young consumers. Although the preservation of tradition is very worthy, it should not obscure innovation.

Chapter 6.
Case Study III

6.1. Overview of Case study III 97
6.2. Process of the Online Course 97
6.3. Impact of Mixed Perspectives 98
6.4. Thematic Analysis Method 99
6.5. Evaluated Designs 103
6.6. Emotional Evaluation 112

6.1. Overview of Case study III

This research employed multi-method qualitative in studying emotional design through the case study of designing products (hill censers). The case study was conducted with students taking an online product design course at the Jingdezhen Ceramic Institute[1]. Specifically, this study aimed at helping students design products based on users' emotional requirements and stimulating them to quickly generate novel ideas. It has been shown that emotions can deeply influence the overall user experience (Van Gorp & Adams, 2012); and understanding the users' feelings and emotions is vital in the design process (Sáenz et al., 2019). In addition, the generation of novel ideas is a vital and challenging part of the creative design process (Shroyer et al., 2018).

This online course taught the students to utilize multiple methods to learn the users' emotional requirements and the built emotional design framework proposed here can also be used in future design courses to guide students in quickly coming up with innovative design ideas based on the users' emotional requirements. To achieve this goal, this case study focused on answering two research questions. The first question asked how products could be designed according to users' emotional requirements, and the second asked how students could be assisted in quickly coming up with design ideas.

6.2. Process of the Online Course

The schematic process followed in this study is shown in Figure 6-1.

1. In the first step, the teacher prepared the material for live online lectures, which the students were required to attend. During these lectures, the students learned multiple methods in product design.
2. The second step consisted of the analysis and evaluation shown in the yellow rectangle, which started with giving assignments to the students. For the first assignment, the students had to interview the censer's users and write a survey report after interviewing. The teacher analyzed the collected survey reports and provided feedback to the students about the nine common themes summarized from all the survey reports. The second assignment required that the students design a product (hill censer) based on the survey report they had prepared using the techniques they learned in the online lectures. Design professors and users of the product (censer) evaluated the final designs of the students.

[1] All the courses held online to replace the planned initially regular courses attributed to COVID–19.

3. In the third step, design professors (including the researcher) built an emotional design framework, which will be utilized in the students' future designs to help them to quickly generate innovation design ideas based on the users' emotional requirements.

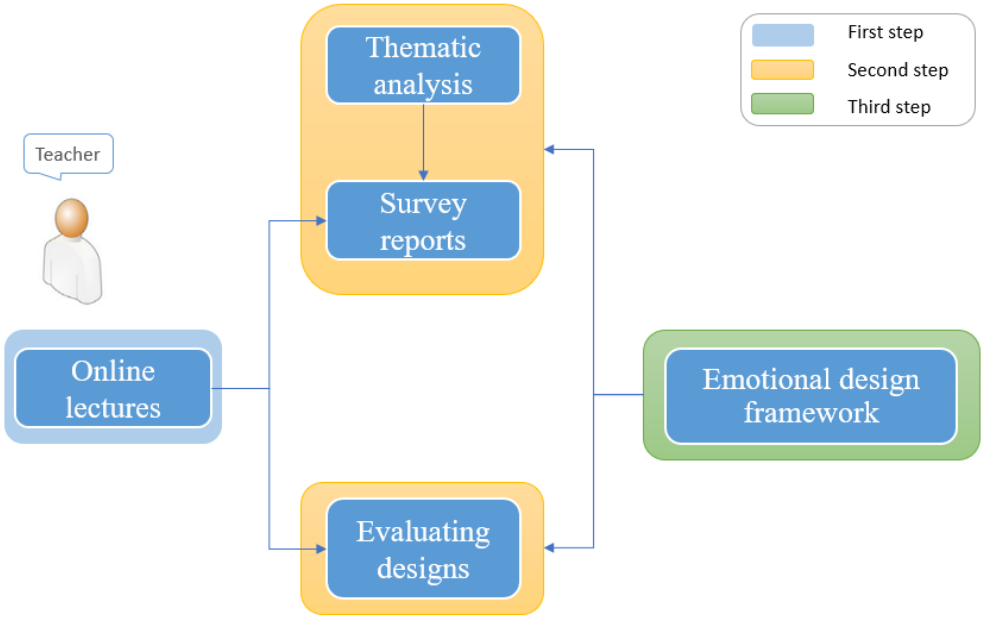

Figure 6-1. The whole process of case study III

6.3. Impact of Mixed Perspectives

Mixed perspectives method was utilized, it helped the students develop new design ideas. The teacher had online meetings with each group in the third week to get insights about the impacts of each perspective in the students' design process. Thematic analysis method was leveraged by the teacher to analyze the survey reports. The themes and sub-themes were generalized from the students' survey reports, which directly related to the users' opinions, thus, nine themes were obtained. Each theme included several sub-themes, the interdependence between the sub-themes and the corresponding themes were discussed in depth for confirmation. Finally, the themes were further filtered to reach the core themes.

Through online meetings with the 18 students' groups, the teacher observed how the students made the transitions below to change their perspectives during the design processes (Table 6-1), which according to Tomico et al (2012)'s three perspectives are outlined below:

Table 6-1. The Transitions of Perspectives during the Design Processes

The Transitions of Perspectives during the Design Processes	
$3^{rd} – 2^{nd} – 3^{rd} – 2^{nd}$ (six groups)	$2^{nd} – 3^{rd} – 2^{nd}$ (One group)
$3^{rd} – 2^{nd}$ (three groups)	$1^{st} – 3^{rd} – 2^{nd}$ (Two group)
$3^{rd} – 2^{nd} – 3^{rd}$ transitions (three groups)	$3^{rd} – 1^{st} – 2^{nd} – 3^{rd} – 2^{nd}$ (One group)

2nd – 3rd – 2nd – 3rd (One group)	1st – 3rd – 2nd – 1st (One group)

It is worth mentioning that only four groups used first-person perspective; those groups included students who have experiences in using censers.

The teacher conducted online meetings with each group to determine the impact of each perspective on the group design.

- Thirteen groups involved the third-person perspective at the beginning of the design process; it was useful for them in such an early design stage to survey the internet to collect data.
- As for the second-person perspective, the students co-created with stakeholders. Specifically, they investigated the stakeholders and learned how to design hill censers from a users' perspective.
- Four groups used the first-person perspective (designer perspective) to design hill censers; only a few students have the censers' using experience, they designed products based on their own experience.

Most groups considered that the second-person perspective was the most influential. The students reported that they did not know how to design hill censers at the beginning of the course, and most of them had no experience in using censers. In order to understand the users' emotional requirements, the students conducted interviews and questionnaires to co-create with stakeholders to learn their emotional requirements. Through using these methods, the students could obtain design ideas from the users quickly, and they learned how to design hill censers based on the users' perspectives (second-person perspective).

The students conducted interviews, questionnaires, shadowing, personas, storytelling methods to learn the emotional requirements of the users. Through using these methods in the process of changing perspectives, the students obtained design ideas from the users and they learned how to design hill censers based on the users' perspectives.

The five invited professors evaluated the designs besides 10 censers' users. It is worth mentioning that the four groups with students having experience with using censers got the higher score than other groups. This finding signifies that designer need to be familiar with the product before designing.

6.4. Thematic Analysis Method

The researcher employed the thematic analysis method to study the 18 survey reports by initial coding approach. Nine themes were obtained: (1) design method, (2) visual design, (3) function, (4) using occasion, (5) emotional experience, (6) cultural connotation, (7) living style, (8) symbolism and (9) consumer (Figure 6-2). Among, three were selected as the core themes in

hill censer design: (1) design strategy, (2) emotional experience, and (3) cultural connotation. The other themes were found to be related to these three core themes during the online discussions with the invited professors.

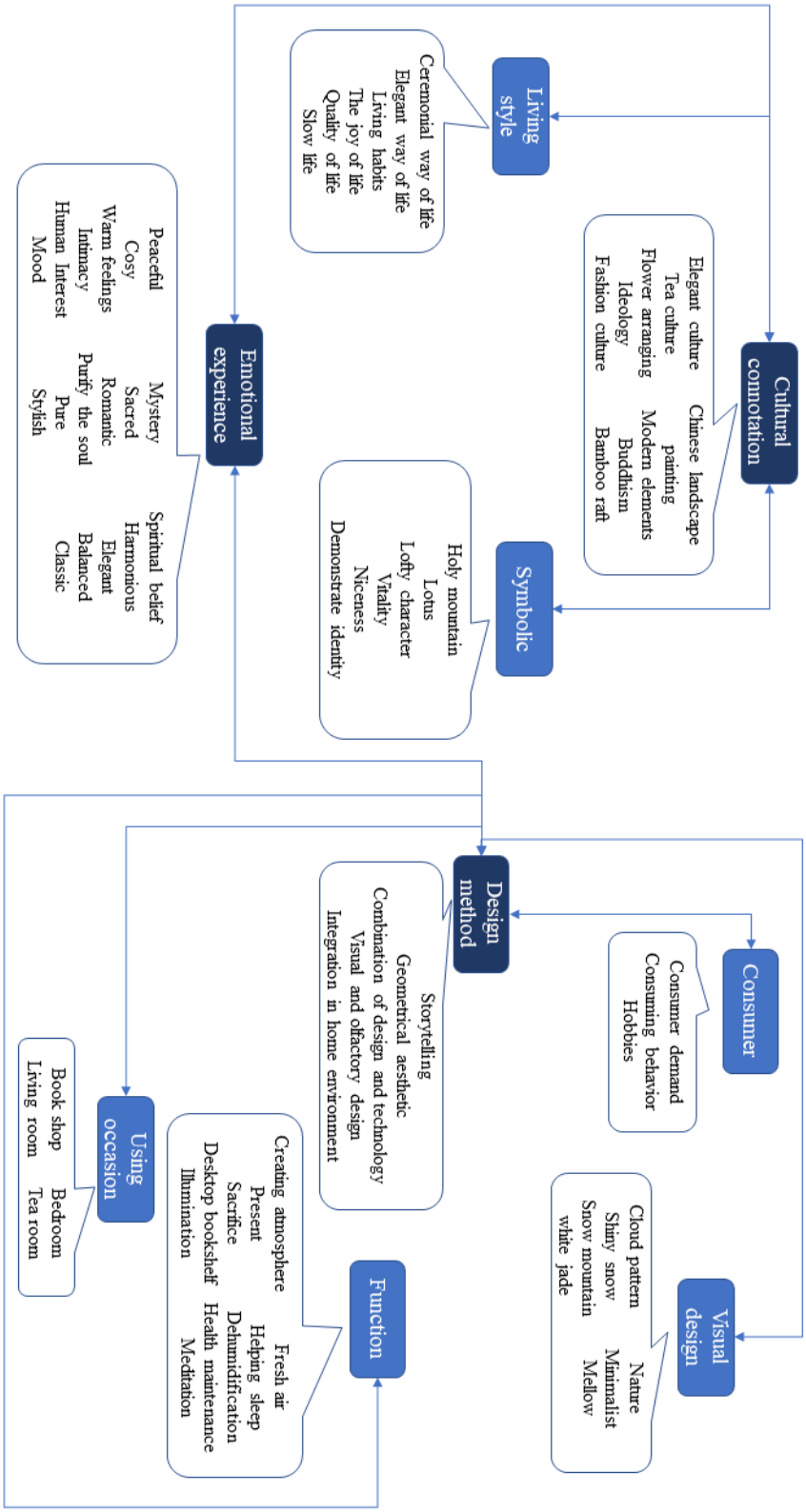

Figure 6-2. Nine themes

The ‘design method’ theme included the following sub-themes; ‘storytelling’ – ‘geometrical aesthetic’ – ‘combination of design and technology’ – ‘visual and olfactory design’ – ‘integration of home environment’.

- First, storytelling is used as a tool of narratology, which is leveraged to illustrate a scenario where the service is being offered. The students utilized this tool in the hill censer design; it is a new strategy for designing traditional products. Through storytelling, the students understood the censers’ using stories; it is useful to design the censer based on users’ emotional needs.
- Second, a geometrical aesthetic design method was used, which was influenced by Modernism originating in the Bauhaus design school in the 1920s. In the interviews, some interviewees mentioned they liked censers with a simple form.
- Third, the combination of technology in design was found to be crucial; technology can enhance the positive emotional experience in using products, for instance, by combining interactive technologies with electronic aromatherapy products.
- Fourth, visual and olfactory design was found to be a vital method in censer design; the process of using a censer is an especially visual and olfactory experience.
- Finally, the integration of the home environment is a new design trend; this means the products should be designed tailored to the home decor trends, such as the censer could be design according to the latest fashion in interior decorating to make the censer more fit to use in the home environment.

The users’ ‘emotional experience’ theme was found to include complicated feelings from the collected data. For instance, sub-themes included ‘peaceful’, ‘cosy’, ‘warm feelings’, ‘intimacy’ and ‘human interest’; these experiences represent users’ emotional needs. For example, for users seeking warm feelings, the censer should have been warm-toned to give the users positive feelings. All these sub-themes of emotional experience are related to positive emotions, which means the designers sought out censer designs according to whether they would deliver such positive feelings.

The ‘cultural connotation’ theme included the following sub-themes: ‘elegant culture’ – ‘tea culture’ – ‘flower arranging’ – ‘ideology’ – ‘fashion culture’ – ‘Chinese landscape painting’ – ‘modern elements’ – ‘Buddhism’ – ‘bamboo raft’. The incense culture included a kind of elegance, which is closely related to tea culture and flower arranging in ancient China (Yu, 2012). Additionally, fashion culture and ideology were also found to influence the design trends of the censers. In the developing history of Chinese censers, the censers of each dynasty were always the embodiment of the fashion and culture of the era; it clearly reflected the ideology of ancient times and conveyed it over time (Shao, 2016). For example, hill censers embodied the auspicious culture and reflected the ruling class’s desire to pursue immortality in the Han Dynasty. The other four sub-themes— ‘Chinese landscape painting’ – ‘modern

elements' – 'Buddhism' – 'bamboo raft'—have typical Chinese culture characteristics and are also related to censer design. From the perspective of users, they realized that the censers are the embodiment of cultural connotation, if the censer has those influences, as mentioned above, could give positive emotional experiences to them.

The themes of 'visual design', 'function', 'using occasion' and 'consumer' are closely related to the 'emotional experience' theme. The visual design theme is more important than the others, incorporating sub-themes like 'cloud patterns', 'shiny white snow', 'snow mountains', 'white jade', 'nature', 'minimalist' and 'mellow'. These sub-themes induce users' emotional interaction, as indicated by the survey reports.

The last two themes, 'living style' and 'symbolism', are both related to the 'emotional experience' and 'cultural connotation' themes, respectively. Users have their own living styles and need products that satisfy their emotional requirements. Symbolism refers to how the form of a product conveys some meaning (Aktar Demirtas et al., 2009). For instance, hill censers symbolically expressed Chinese cultural connotations and signified the immortal desires of the ancient Chinese.

6.5. Evaluated Designs

The teacher shared the resulting nine themes and sub-themes to the students in the fourth week. Some students were inspired by new design ideas based on these themes. For the remaining two weeks, each group designed a hill censer based on their survey report. The students drew sketches individually and exchanged them with the group. Online group discussions were held to settle on one design for the group and modify the final drawing for submission. The designs submitted were analyzed and evaluated against the submitted survey report. Feedback was later given to the students. All groups finished the designs in the fifth week.

A total of 18 designs were finally chosen from the drafts to build models and rendered by software (Rhinoceros 6, a commercial 3D computer graphics and computer-aided design application software). Those 18 designs are shown in Appendix 2. Five professors evaluated the final submitted designs collaborated with 10 users of censers; the evaluation was based on their professional design knowledge and censer-using experience. The following eight designs received the highest scores.

It shows each design with its given name (by the students) and the main design strategy utilized in that design or comments from the professors and users.

1. **The design of group 13**

The given name: Written on the Wall at West Forest Temple（Figure 6-3）

Design description: This design utilized a well-known Chinese short poem about “mountain Lu” as a creative idea. The title is Written on the Wall at West Forest Temple by the famous poet Sushi during the Song Dynasty. The abstract form of the censer is used to symbolize Mountain Lu.

Comments from the evaluators: The students abstracted the famous Chinese Mountain Lu to create an atmosphere of poetic space. The simple hill shape constituted the body of the incense burner. In the artistic design, the disc-shaped incense and the abstracted shape of the censer form the sunset scene behind the peak of Mountain Lu. The scene of using incense could offer a feeling of poetic space. The design utilized a Chinese poem as an inspiring idea to express an ideorealm of censer using. The poem illustrates a poetic mountain.

Figure 6-3. Written on the Wall at West Forest Temple

2. **The design of group 16**

The given name: Hill-censer (Figure 6-4)

Design description: The ancient Chinese used joss-sticks to calculate time as early as a thousand years ago. This censer obtained the idea from it. The censer can be used as a timing tool when using it to burn a joss-stick under the sunlight.

Comments from the evaluators: This design uses a simple hill shape, and three hills with different heights make up the censer's body. The pure white glaze color further complements the beauty of the simple shape of the censer.

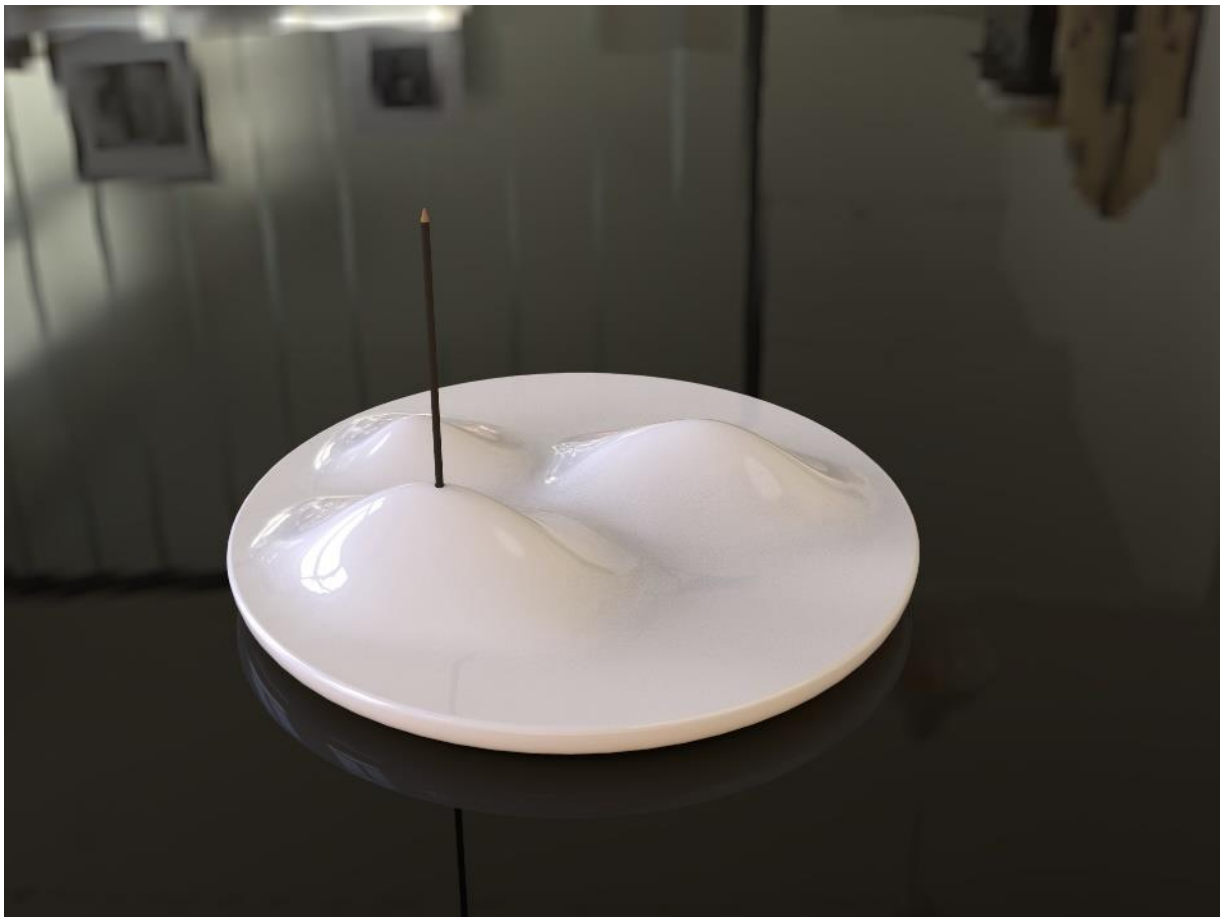

Figure 6-4. Hill-censer

3. The design of group 6

The given name: Good Smell (Figure 6-5)

Design description: Mountain/hill has an eternally beautiful meaning in Chinese culture, and the eternal meaning was expressed in a mathematical concept such as the circular Mobius ring (those golden balls) in this design.

Comments from the evaluators: All the subjects like bright colors; they realize the bright colors could elicit a pleasant feeling. This design's color was bright pink; moreover, the designers use glass as a material to give an even brighter sense.

Figure 6-5. Good smell

4. **The design of group 7**

The given name: Spring Trees and Evening clouds (Figure 6-6)

Design description: This censer combines its hill shape with the function of a bookstand. The top is a geometric censer that is easily removed for cleaning. The other part is a four-slot bookstand for storing books. This design was to express the fashion of incense life through this poetic scene.

Comments from the evaluators: Using a fashionable design style is one of the significant design strategies found in this study. The design expresses the living style of a slow life, which is a fashionable lifestyle in modern society. Furthermore, integrating of a product with the home environment has been a relatively popular design trend in recent years. This design effectively integrated the product and the home environment since the censer would typically be used in the study.

Figure 6-6. Spring Trees and Evening clouds

5. **The design of group 11**

The given name: Auspicious Clouds (Figure 6-7)

Design description: The design used a simplistic hill-shape to express the characteristic of geometrical aesthetics. A traditional hill censer is used and engraved with auspicious patterns (clouds).

Comments from the evaluators: The design idea is inspired by the traditional Chinese pattern of auspicious clouds; those clouds were abstracted in the design.

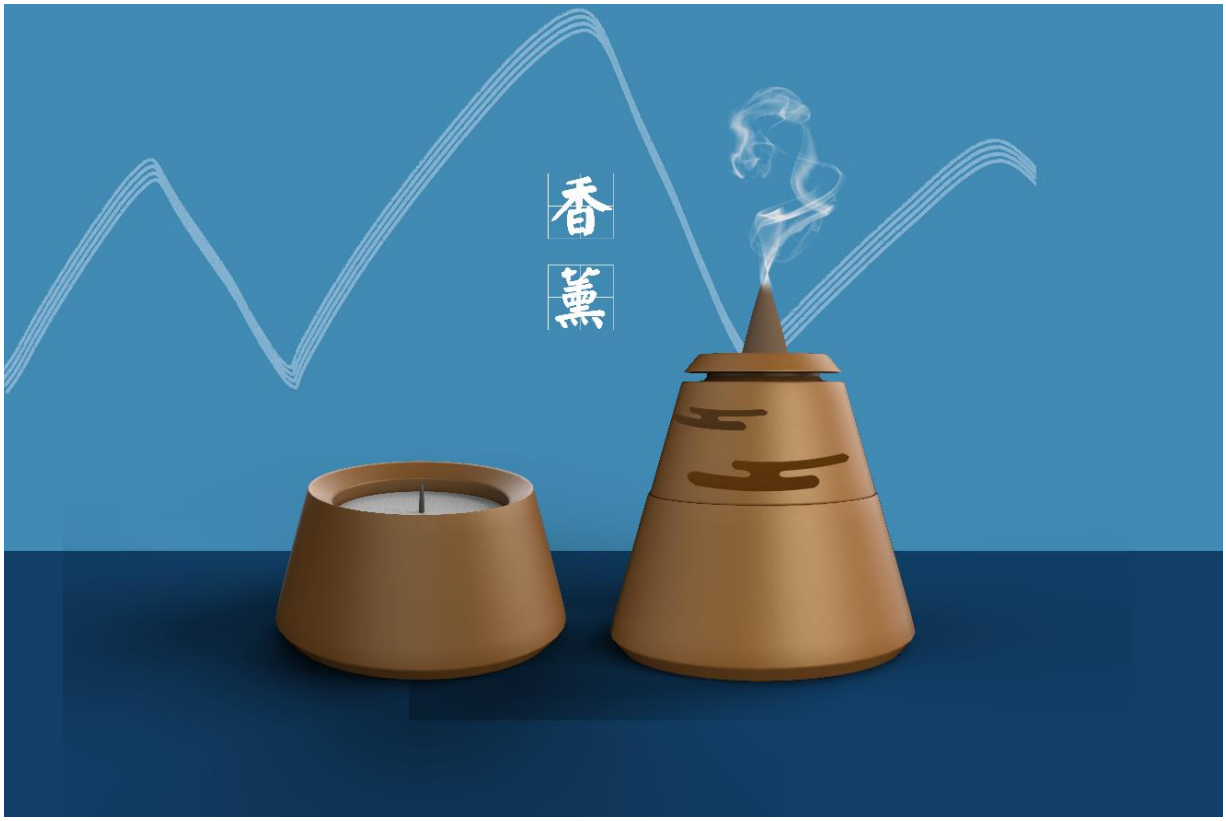

Figure 6-7. Auspicious Clouds

6. The design of group 14

The given name: Suspension (Figure 6-8)

Design description: The censer is suspended on the wood base, as shown. It utilizes the principle of magnetic levitation. The incense mist flows down through the lotus petals' body, which creates the feeling of fairy hills in the sea.

Comments from the evaluators: This design employs technology. The lotus petals' form expresses a sense of perfume. Magnetic levitation technology is utilized to suspend the censer on the base, which gives the sense that a lotus leaf is holding a flower.

Figure 6-8. Suspension

7. **The design of group 15**

The given name: Mr. Fool Wants to Move the Mountain (Figure 6-9)

Design description: The title of this design is Mr Fool Wants to Move the Mountain. It is a Chinese folk story in which an older man named Yu Gong, who is almost 90, tries his best to move two high mountains in front of his home. The story tells us that as long as one is persistent, anything can be done.

Comments from the evaluators: This design is based on a creative idea from an old folk story. Embedded within it is a compound design idea: traditional culture blended in a storytelling approach. The censer takes the form of a person who is carrying a heavy object on his back. The hands of the person extend backwards to keep the 'heavy object' (incense) from falling. The censer is used as a form of a person; Yu Gong is carrying the stones (incense here) in the process of moving the mountains.

Figure 6-9. Mr. Fool Wants to Move the Mountain

8. **The design of group 17**

The given name: Japanese Garden (Figure 6-10)

Design description: This design utilizes the Japanese rock garden as a creative idea. A rake is designed to pick up the burning incense ashes and make them look like neatly combed sand in a Japanese courtyard, with the ‘sand’ and black stones mimicking the scene of a Japanese rock garden.

Comments from the evaluators: The process of using a censer to burn incense is a compound experience based on a visual and olfactory experience. This design utilizes a Japanese rock garden to visually express minimalist aesthetics. Additionally, the scented mist will give the user a pleasant experience in terms of smell when using it to burn incense.

Figure 6-10. Japanese Garden

6.6. Emotional Evaluation

The students leveraged these strategies to design hill censers. The users' emotional experiences with the new designs were tested in this phase. The purpose was to identify and confirm the positive influences of the obtained design strategies on users.

In this research we evaluated the 18 designs based on the emotional code words obtained in the case study I and II (Appendix 2). During a group discussion the teacher and the students evaluated the code-words for both the pleasant and unpleasant aspects. The code-words were selected based on the following two rules:

(a) Code-words from the emotional experience code type since this research is about the emotional design.
(b) High-frequency code words found in the collected data.

Table 6-2 shows the 30 code-words that were chosen to evaluate the designs. The left three columns show the positive code-words while the right three show the negative. These code-words were used by the evaluating subjects to express their feelings towards the new designs.

Table 6-2. The 30 emotional words

Positive			Negative		
Elegant	Pleasant	Exquisite	Shabby	Unpleasant	Strange
Fairyland	Smooth	Classical	Uncomfortable	Ominous	Depressive
Comfortable	Bright	Vivid	Old-fashioned	Dark	Rigid
Fashionable	Conventional	Solemn	Complicated	Messy	Pale
Unique	Mild	Lively	Rough	Arbitrary	Tedious

A total of 198 evaluating subjects (118 females and 80 males of ages from 20 to 60 years) were asked to fill in questionnaires. In total, 190 valid questionnaire answers were collected. Each subject was asked to use only 15 code words out of the 30 originally prepared in the questionnaire to describe the 18 new design samples collectively rather than individually. The eight most frequently used words are shown in Table 6-3, which all were positive words. This further proves that utilizing these design strategies can provide users with a positive emotional experience.

Table 6-3. Vocabulary ranking

Words ranking							
Bright	180	Unique	176	Fashionable	170	Exquisite	170
Pleasant	157	Classical	150	Unique	142	Vivid	126

Chapter 7.
Discussion and Conclusion

7.1. Discuss the Findings of Case study 114
7.1.1. Summary and Discussion of the Findings 114
7.1.2. Conclusion Based on the Findings 116
7.2. Contribution to Knowledge Science 118
7.2.1. KM Cycle 118
7.2.2. Theoretical Implication 119
7.2.3. Practical Implication 122
7.3. Research Limitations 125
7.4. Recommendations for Future Research 126

7.1. Discuss the Findings of Case study

7.1.1. Summary and Discussion of the Findings

This research devised three cases to show leveraging a systematic procedure from design research to design education in emotional product design. Among them, case studies I and II were summarized design guidelines and design methods; those were shared with students by an online course in case study III. Using such a systematic method to learn users' emotional requirements in helping design students to master emotional design knowledge. The research findings corresponding to each purpose of case studies are discussed in detail here:

1. The findings of case study I

The case study I is dedicated to exploring the vital factor in product design from users' emotional experiences. The analysis results showed that emotional experience and design style is the most critical factor in providing positive feelings from the users' perspective. The design guidelines extracted from the theme of emotional experience and design style could explain the crucial factors in providing positive users' feelings and avoiding negative emotional experiences:

First, two design guidelines were obtained in the emotional experience theme; one is traditional culture, which is crucial for providing a positive emotional experience to the users. The products influenced by Chinese traditional culture, elicit emotional resonance and provide a positive emotional experience to the users.

Second, Ideorealm is the second design guideline of the emotional experience theme. As an aesthetic standard advocated by traditional Chinese aesthetics, ideorealm expresses the user's emotional needs for the state of the product in their using environment through the products and the user environment to create an elegant atmosphere to provide users with a positive emotional experience. In chapter 2.2.1, the cluster analysis function was used to analyze the data. One cluster named 'aesthetic', the researchers focused on aesthetic knowledge, design aesthetics in product, brand or service domains to learn customers' emotions. As a traditional Chinese aesthetic, ideorealm is an integral part of the aesthetic system; it is more suitable for designing products with traditional Chinese cultural influence.

Multi-dimensional sensory experience is a helpful approach to creating ideorealm; it could help combine the visual and olfactory experiences in product design to enhance the ideorealm to create a poetic scene for the users. Some tools, such as Semantic Differential Scale or Kano model, used in Kansei engineering, could help to evaluate users' multi-dimensional sensory

experience. In Chapter 2.2.1, Kansei engineering was one of the extracted clusters; the researchers studied how to elicit emotions from the customers, analyze customers' perchance intention, and propose emotional design suggestions for designers. Compared with Kansei engineering, the research of multi-dimensional sensory experience mainly focused on combing visual and olfactory experiences in product design, the purpose is to create a poetic scene for the users to enhance the user experience.

Three guidelines were obtained from the design style theme. Fashionable, bright colors and appropriate forms could provide the positive emotional experiences, we learned it from the interviews:

- Users always like fashionable products, and the designers should consider the influence of the fashionable culture on product design when designing products.
- Bright colors can also bring the positive emotional experiences. Generally, users do not like products with dull colors.
- As for product form, it should avoid sharp form; such styling can cause negative emotional experiences such as fear. Users also like products that with simple form, this kind of form could provide a clear visual experience.

2. The findings of case study II

Case study II is to explore designers' attitudes related to acquire positive emotional experiences. This case study intends to extract the design method needed to elicit such emotions while considering the designer's intuition and experience.

The importance of designers' tacit and explicit knowledge has been identified by marketing. Through a mixed methods to learn the designers' attitudes related to acquire positive emotional experience based on evaluated samples in this case study, the summarized design methods could help in emotional design education. In Chapter 5.4.2, we summarized the designers' opinions and listed them in Table 5-7 and Table 5-8; those codes from two tables could guide designing products positively and avoid negative influence. For example, the 'visual experience' is crucial in offering positive emotional experiences. The designers put forward intricate details (fresh colors – delicate – smooth - vivid – unique) into their design of the product to provide positive users' experiences. The students' design identified the positive influence of these characters by products in case study III.

According to the interviews, some subjects pointed out that the designers should integrate more traditional elements into the design, several samples with traditional decorations and shapes, and elders find them appealing. Hence, the cultural background could help the designers design products in providing a positive emotional experience to the users.

For the younger age group, a fashionable design style is vital, as the theme found on the positive side; ‘glaze configuration’. The subjects recommended using glaze with fresh and lucid visual effects such as a transparent glaze that serves as adornment and focus on the collocation of adornments and modeling to obtain a smooth visual effect.

3. The findings of case study III

The Case study III is to stimulate the students to get innovative design ideas quickly based on the users’ positive emotional requirements. First, the students need to learn the users’ emotional requirements; they investigated the subjects in the second week to learn the users’ needs and submitted their survey reports; the teacher analyzed it based on thematic analysis approach to explore how students could design products according to users’ emotional requirements.

After analyzing the survey reports, the ‘design method’ and ‘emotional experience’ themes obtained by the thematic analysis were useful in the product design. Designs with these characteristics received high scores from the users and experts (professors). This means that these two themes are more important than others in product design. The ‘design method’ theme in this study can guide students in designing from innovation design perspective. Specifically, this theme includes five sub-themes that can help students obtain novel design ideas. The ‘emotional experience’ theme can guide students to understand the emotional needs of users in detail. This theme incorporates 17 sub-themes, and designers can learn more about the users’ emotional requirements through its implementation.

Second, this case study was dedicated to exploring how students could be assisted to come up with design ideas quickly. After analyzing all the transitions of perspectives during the design processes (Table 6-1), the findings are that all the group-designs involved the stakeholders, the second-person perspective has the most apparent influence on the students’ designs than other perspectives. The students with stakeholders co-created based on users’ emotional requirements after learning about censer and incense use. As it turned out by this case study, adopting the second-person perspective (stakeholders’ perspective) can allow the students to quickly generate design ideas.

7.1.2. Conclusion Based on the Findings

This research included three case studies; it shows a systematic process from the design research to design education. The historical hill censers and censer’ users were chosen in case study I; contemporary hill censers and designers were selected in case study II; case study III is about teaching product design to students. The reason for selecting samples in case study I; on the one hand, is to learn the users’ emotional needs. On the other hand, we should learn the history of products, especially for some products with profound influence from their tradition. Furthermore, the influences and continuation from the traditional products to contemporary

products, should also be clarified; so, the contemporary samples were chosen in case study II, based on the designer's knowledge to find out why the samples could have different emotional influences on the users.

The researcher co-created with the graduate students and professors in the case study I to explore the vital influences in product design and got the themes and design guidelines. The most vital factor is 'emotional experience and design style' in product design. We got this finding (theme) according to users' opinions. The design guidelines were summarized based on this theme; those design guidelines could help design to provide positive emotional experiences.

The case study II was related to using mixed methods to research up-to-date hill censers according to designers' ideas, determine the designers' tacit and explicit knowledge, and generalize the design theory based on designers' knowledge from users' emotional requirements. The designer's professional knowledge helps learn users' emotional requirements. The obtained design theory could also help to provide positive emotional experiences in product design.

The emotional design knowledge obtained from the previous two case studies has been shared with the students in case study III to guide the students to get the innovative design ideas quickly based on users' emotional requirements. In case study III, it was summarized design themes by thematic analysis from the students' survey reports; this process belongs to new knowledge generation. The themes of 'design method' and 'emotional experience' were identified can provide positive emotional experience to the users through students' designs, which have been evaluated by emotional words in chapter 6.6. Furthermore, the second-person perspective is vital in designing products; it could help students learn users' emotional needs from users' perspectives.

Finally, an emotional design procedure has been constructed; it is shown as a systematic way to do emotional design, and an emotional design appraisal model has been built too; it will be used to test the value of design in future work. However, this research still has the knowledge gap that needs to be addressed, which is also an opportunity for future research.

7.2. Contribution to Knowledge Science

7.2.1. KM Cycle

KM is a newly emerging approach by 'capturing/creating' and 'sharing/transfer' knowledge to effectively 'using/applying' organizational knowledge (Dalkir, 2013). This research built a KM Cycle model based on Awad and Agarwal' research to guide the whole research process logically (Figure 7-1).

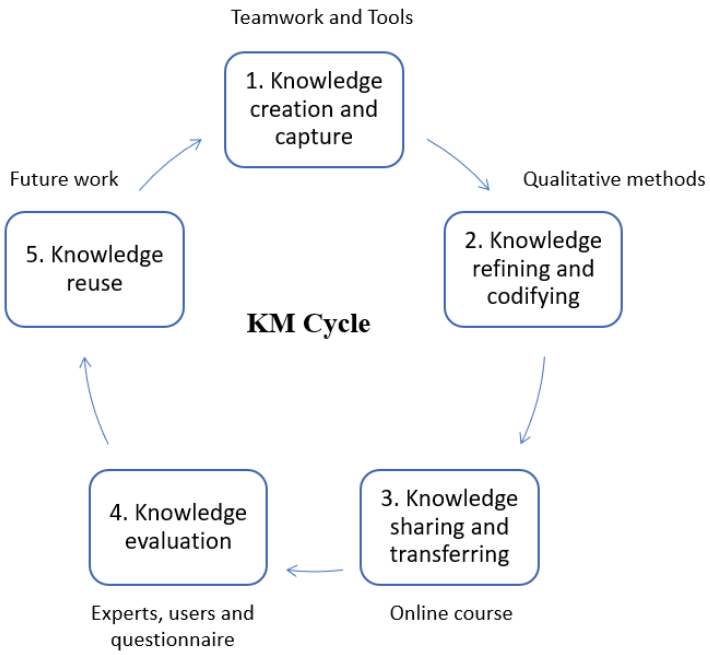

Figure 7-1. KM Cycle

This KM Cycle has contained five steps as shown below:

1. The first step of the KM cycle is to create and capture knowledge, the teamwork and tools were applied to create knowledge and capture tacit knowledge in case study I and II.
2. The second step of the KM Cycle is knowledge refining and codifying; the obtained interview transcripts were codified and refined to the codes, categories, and themes by content analysis and grounded theory methods in case study I and II.
3. The third step of the KM Cycle is knowledge sharing and transferring; an online course was conducted in case study III, to share the design knowledge (results) obtained from the previous two case studies. The students got new insights during their interview periods who summarized them in their survey reports and designed products based on the obtained insights from the survey; these steps are to transfer the design knowledge.

4. The fourth step of the KM Cycle is knowledge evaluation; the designs of students were evaluated by the emotional words acquired by content analysis and grounded theory to identify the positive emotional experiences of the designs.
5. The last step of the KM Cycle is knowledge reuse, an emotional appraisal model was built, it can be reused in emotional design in future work.

The KM cycle is shown as a procedure of knowledge management, from knowledge creation and capture to reuse knowledge. The purpose is to build the link between emotional product design and knowledge science (KS). Product design is a plan to create new things, comparing with the KS, the created new products as well as new knowledge. Some new products were designed based on users' emotional requirements in this research.

This research makes three contributions to the KS. First, this study is to stimulate the students to get novel design ideals easily according to users' positive emotional requirements. A systematic process has been applied from design research to design education to build an emotional design appraisal model; the purpose is to facilitate the students to learn the users' emotional requirements in their future design tasks. Second, the case study's implication is shown the results from interdisciplinary knowledge, which contains science, humanities, and design education. The figure of the 'emotional design research process' is further to show a systematic progress in conducting emotional design research, which could facilitate the researchers and designers to learn the users' emotional needs. Lastly, the designers' tacit and explicit knowledge has been summarized, which could help in design education in learning users' emotional requirements.

7.2.2. Theoretical Implication

This research applied three case studies to research emotional design, the results are obtained from design research, humanity and design education aspects, as it shown in Figure 7-2.

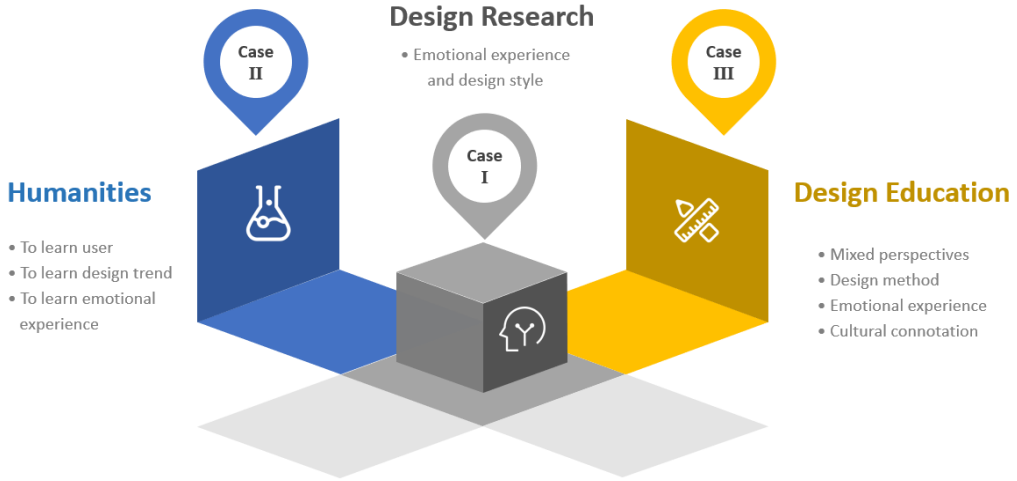

Figure 7-2. Implication of three case studies

- In the design research aspect, the most vital factor is ‘emotion experience and design style’. This result obtained by content analysis in the case study I.
- In the humanities aspect, this research evaluated positive and negative emotion influences on the designers and obtained design theory from user, design trend, and emotional experience perspectives in case study II.
- In the design education aspect, on the one hand, the findings obtained by mixed perspectives identified the influences from each perspective. Hence, mixed perspectives are a useful method in emotional design. On the other hand, this research got nine themes by thematic analysis approach. The theme named ‘design method’, ‘emotional experience’, and ‘culture connotation’ are core themes for providing positive influences on the designs of the students, which have been tested with emotional words in the case study III.

Figure 7-3 is shown the process of this research from methodology, epistemology, ontology, to worldview perspectives. First, all the case studies of this research are based on design research, humanities and design education foundation; those belong to epistemology. Second, from the ontology aspect, the case study is related to objects (hill censers), users (censers’ users/users’ emotional requirements) and designers (designers tacit and explicit knowledge). Last, as to the worldview perspectives, the case study is mainly qualitative data-based research, which is a constructivist worldview and focus on theory generation.

This emotional design research process can help the researchers and educators to do their research based on a systematic process. The objects, users and designers are the foundation of design research; we should clear up the research target at the beginning and choose the suitable research methods from the worldview perspective; the purpose is to learn the users’ needs from interdisciplinary aspects, such as science, humanity, design anthropology, etc.

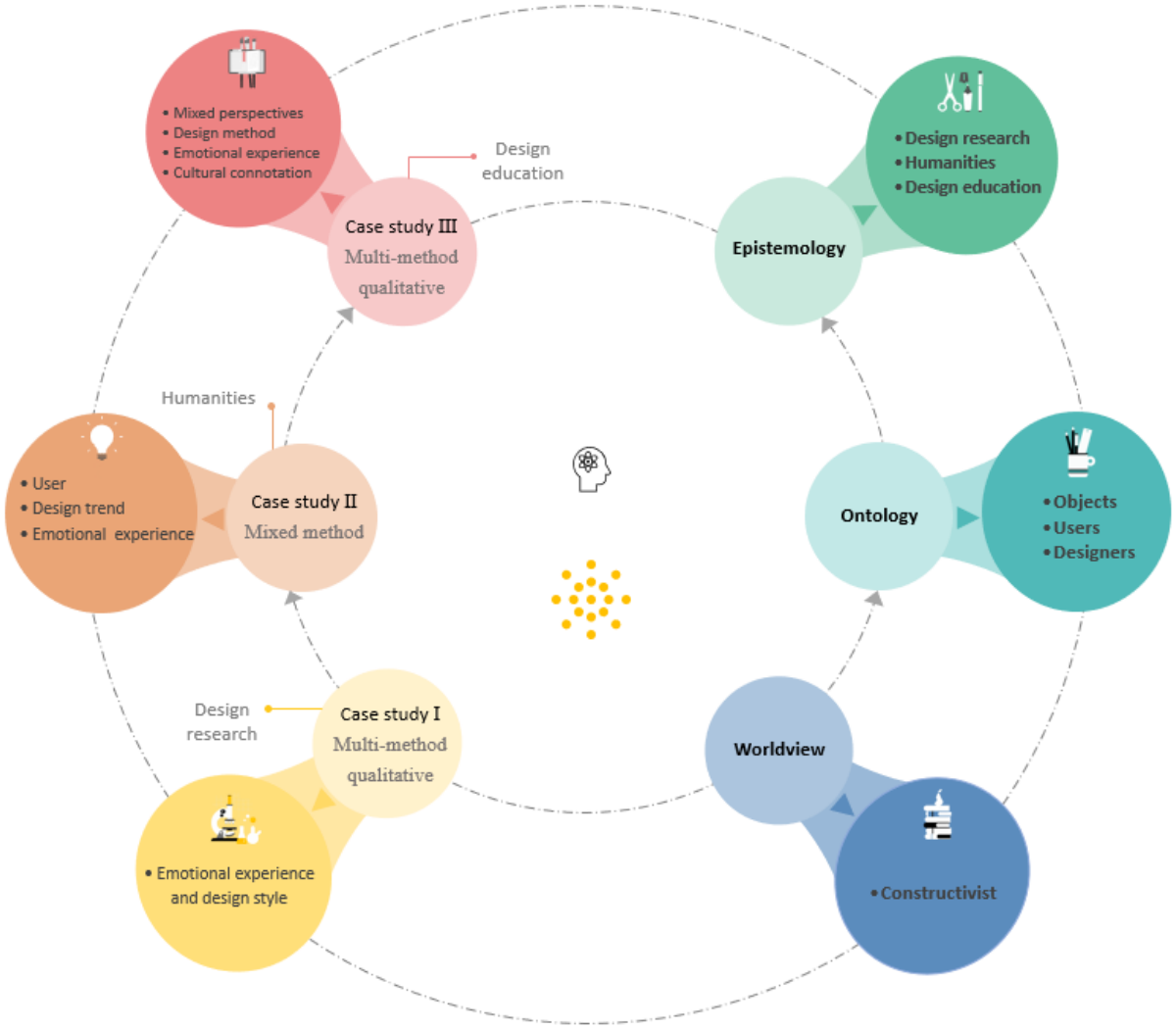

Figure 7-3. Theoretical foundation

7.2.3. **Practical Implication**

An emotional design procedure was built based on the results of case study III, to assist students in coming up with design ideas based on users' emotional requirements, as shown in Figure 7-4. This procedure could be used for the design of other kinds of products aside from hill censers. It could also be used to stimulate students to quickly generate novel design ideals and to develop products based on users' emotional requirements.

Three stages (pre-design stage, design stage and post-design stage) are in this step (design procedure). In the pre-design stage, starting from the 'design task' as the first step, the students/designers need first to understand the design task, and then move on to the next step to survey based on the third-person perspective, with the purpose being to clarify the research questions. After defining the research questions, co-creation with the stakeholders through the second-person perspective is necessary, and this is counted as the third step. From the angle of the stakeholders, finding answers to the existing questions is the fourth step; these four steps belong to the pre-design stage.

In the Design stage, two steps of design works should be done by the students/designers who should utilize the first-person perspective to design products. The design methods obtained by thematic analysis could help students/designers easily come up with novel design ideas. However, the process should not be limited to these methods since any method that can help generalize the design ideals would be feasible for the design stage. After finishing the design works of step 5, which needs to get the feedback from the stakeholders, if the results are positive, then go to the next step; if the results are negative, they should be back to step 5 to re-design.

In the Post-design stage, the designs would be evaluated by the emotional words, obtained in Case Study I and II. If the results are positive (Yes), then they can move to the next step, but if the results are negative (No), they should go back to step 5 to redesign the products.

After building the emotional design procedure, the last step was to build an emotional design appraisal model to summarize what new knowledge is generated to fill the knowledge gap. Figure 7-5 is shown the design stages from pre-design to post-design, which is a process of dealing with the challenges and exploring the solutions in product design. Through this process, the new knowledge will be generated, and the obtained skills would be helping in future design; the value is to get the emotional design skills to fill the knowledge gap in design education. This model could help to test the emotional design in knowledge, skills and value three aspects; those designs have such characteristics could have positive emotional experiences to the users.

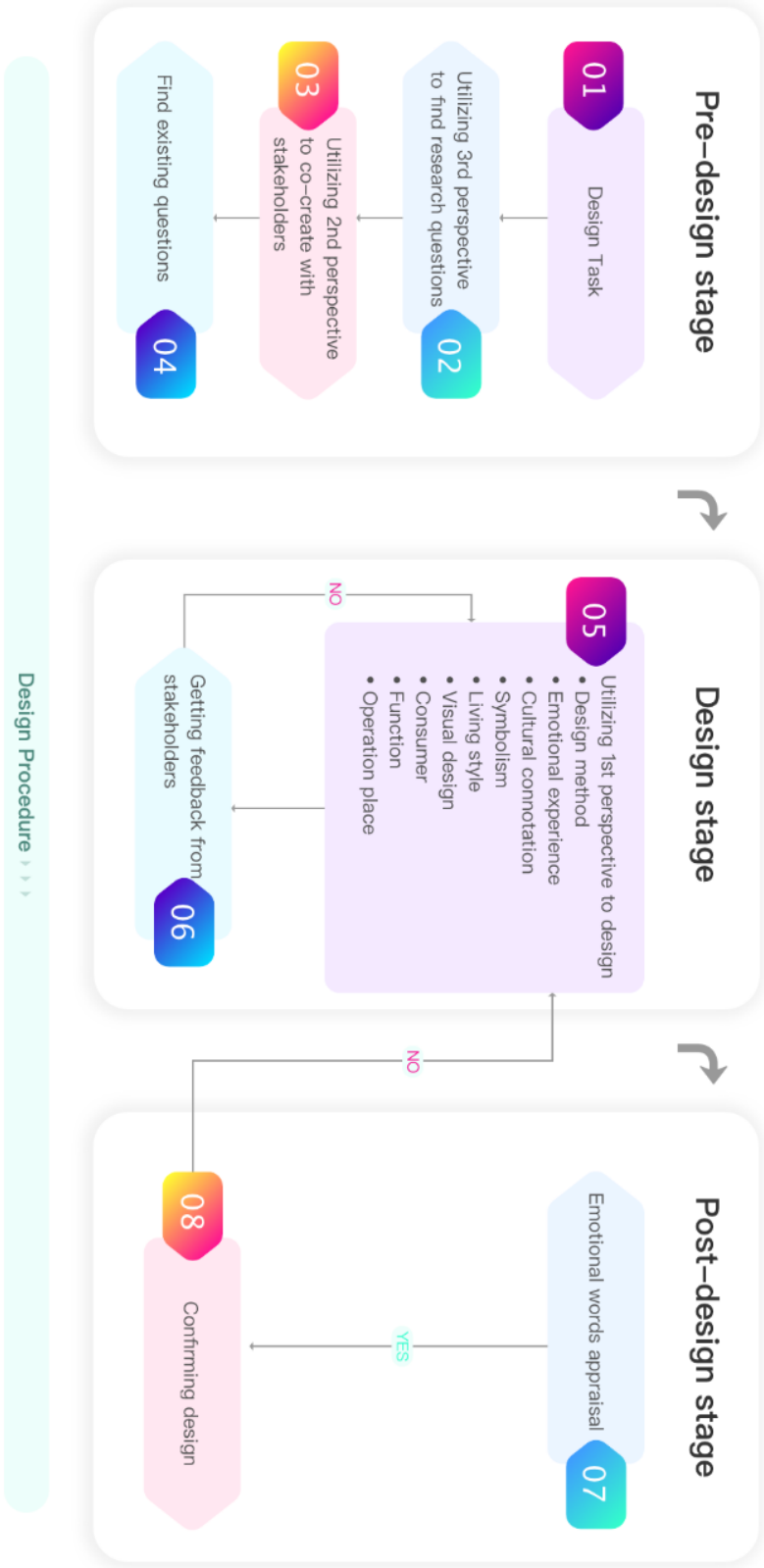

Figure 7-4. Emotional design procedure

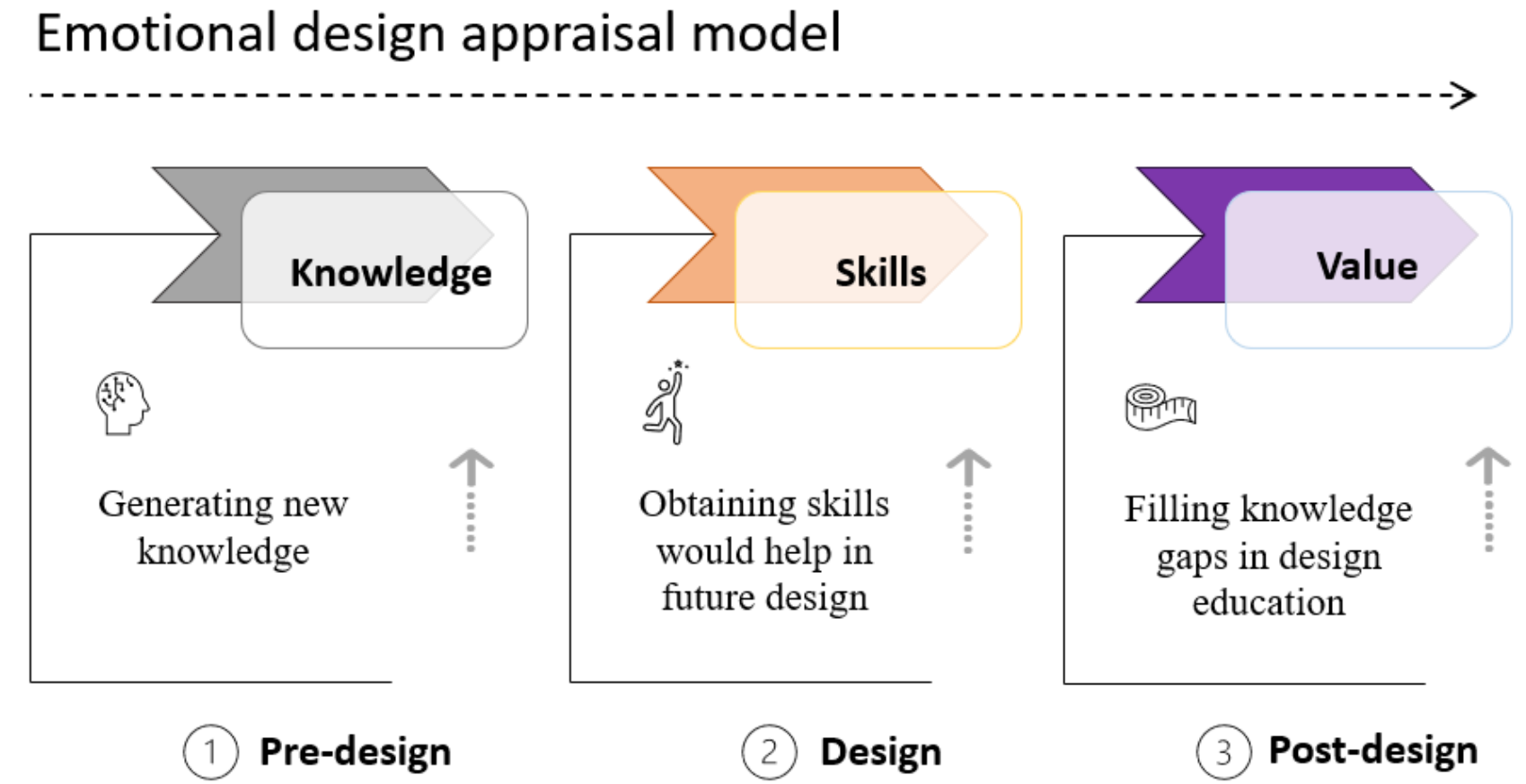

Figure 7-5. Emotional design appraisal model

7.3. Research Limitations

This study has been accomplished by utilizing systematic analysis; however, it still has some limitations and should be improved to enhance the current results.

On the one hand, an online course was conducted in this research because of the COVID-19; this was the first time for the teacher to teach a design course online; although many kinds of online courses have already existed, it is not easy to study design online. The student needs a guide from the teacher during the design process and needs to collaborate with their classmates. The limitation of online manner made the design process difficult; the design quality would be lower than the offline course.

On the other hand, the students' designs are still in the design-model stage (the model built by software), not making the mock-ups. Hence, the emotional evaluation was tested by the pictures of these designs; it should influence the reliability of the results.

Lastly, in terms of the initial objectives, this research explored how to design products based on users' emotional requirements. It is more inclined to research users' positive emotions in this study; however, negative emotions are also crucial. The emotional design procedure and emotional design appraisal model were built in this research is only guiding to acquire positive emotional experiences.

7.4. Recommendations for Future Research

This study mainly focused on emotional design; there are several gaps in our knowledge that follow from the results and would benefit from further research:

1. This research successfully developed a systematic method to study emotional design from design research to education and built an emotional design appraisal model. However, the emotional design procedure is still needed to evaluate by other kinds of products to test the feasibility in future work.

2. The generalized design guidelines and design procedure need to be tested by the market to determine if these design methods can help the students/designers catch the positive emotional experience in product design.

3. The rich emotional experience is also crucial in product design. The next step is to continue this emotional design research; a model should be developed on the rich emotional experiences.

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Appendix 1

Questionnaire Survey of Hill Censers

Hello

We are doing the emotional evaluation of hill censers, thank you for your cooperation. All data are used for academic research, and the subjects fill in the questionnaire anonymously, and does not involve personal privacy issues.

Part 1: Personal Information

1. What is your gender?

Male □ Female □

2. Which of following age groups do you belong to?

□ Less than 25 years □ 26-30 years □ 31-40 years

□ 41-50 years □ 51-60 years □ Over 61 years

Part 2: Your attitude towards hill censers

Bellow you will find 18 samples you will test.

Please indicate your agreement or disagreement for each statement by selecting the appropriate number.

Please rate according to the following sensuous vocabulary picture. 1 is strongly disagree, 2 is disagree, 3 is neutral, 4 is agree, 5 is strongly agree.					
Emotion	Strongly disagree 1	Disagree 2	Neutral 3	Agree 4	Strongly agree 5
Desire	□	□	□	□	□
Satisfaction	□	□	□	□	□
Fascination	□	□	□	□	□
Boredom	□	□	□	□	□
Disgust	□	□	□	□	□
Fear	□	□	□	□	□

18 Samples of hill censers

Appendix 2

Questionnaire Survey of Hill Censers

Please select 15 words from 30 words in the Table below according to your impression of those 18 groups' designs of students.

Table 1. 30 emotional words from positive and negative sides

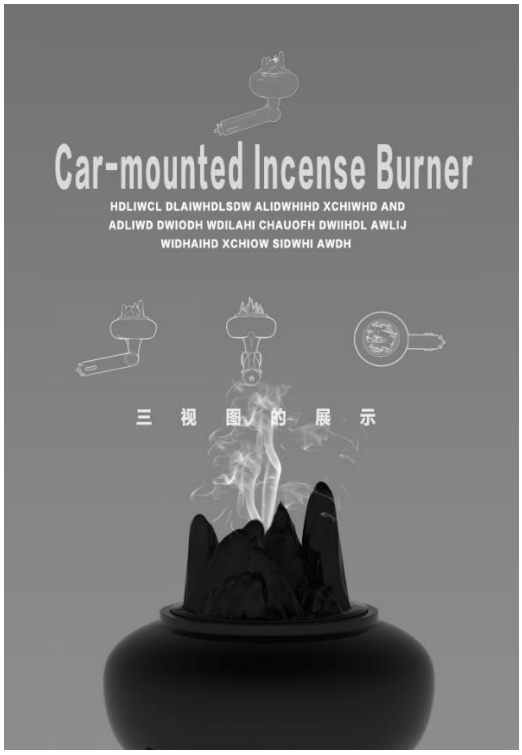
Positive						**Negative**					
Elegant	□	Pleasant	□	Exquisite	□	Shabby	□	Unpleasant	□	Strange	□
Fairyland	□	Smooth	□	Classical	□	Uncomfortable	□	Ominous	□	Depressive	□
Comfortable	□	Bright	□	Vivid	□	Old-fashioned	□	Dark	□	Rigid	□
Fashionable	□	Conventional	□	Solemn	□	Complicated	□	Messy	□	Pale	□
Unique	□	Mild	□	Lively	□	Rough	□	Arbitrary	□	Tedious	□

Group 1

Group 2

Group 3

Group 4



Group 5

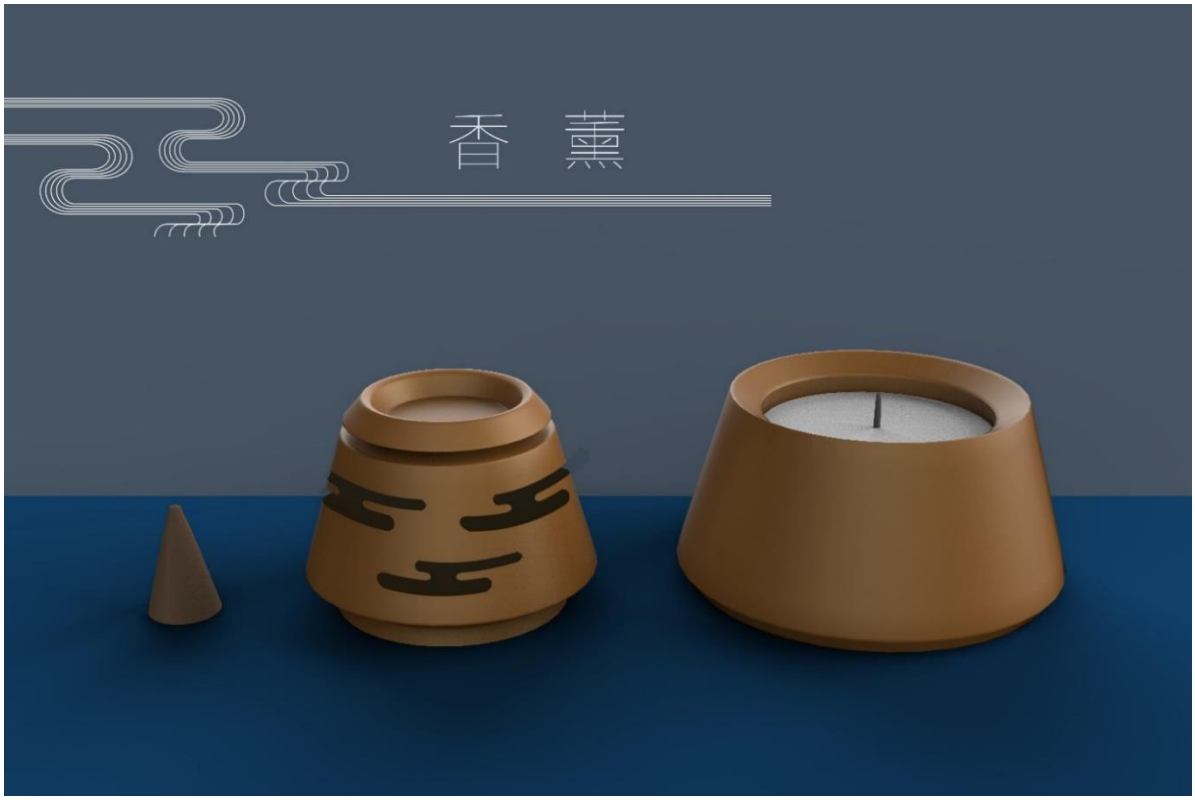
Group 6

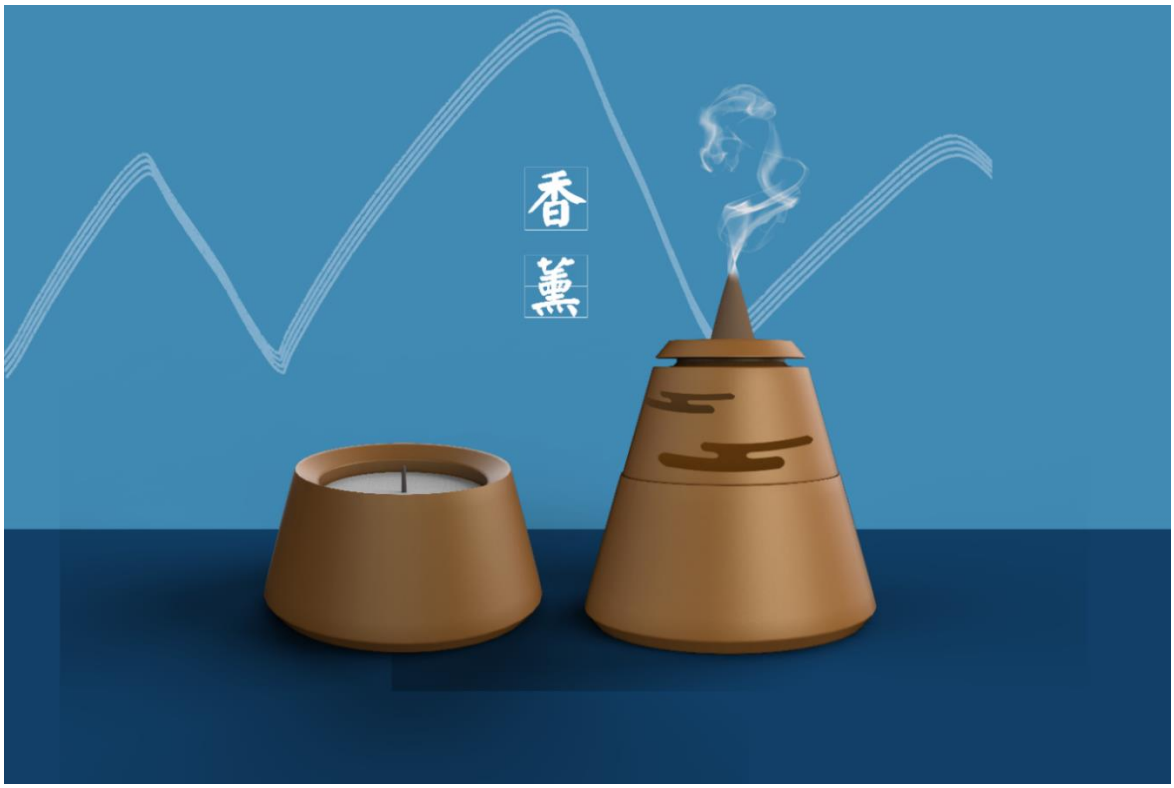
Group 7

Group 8

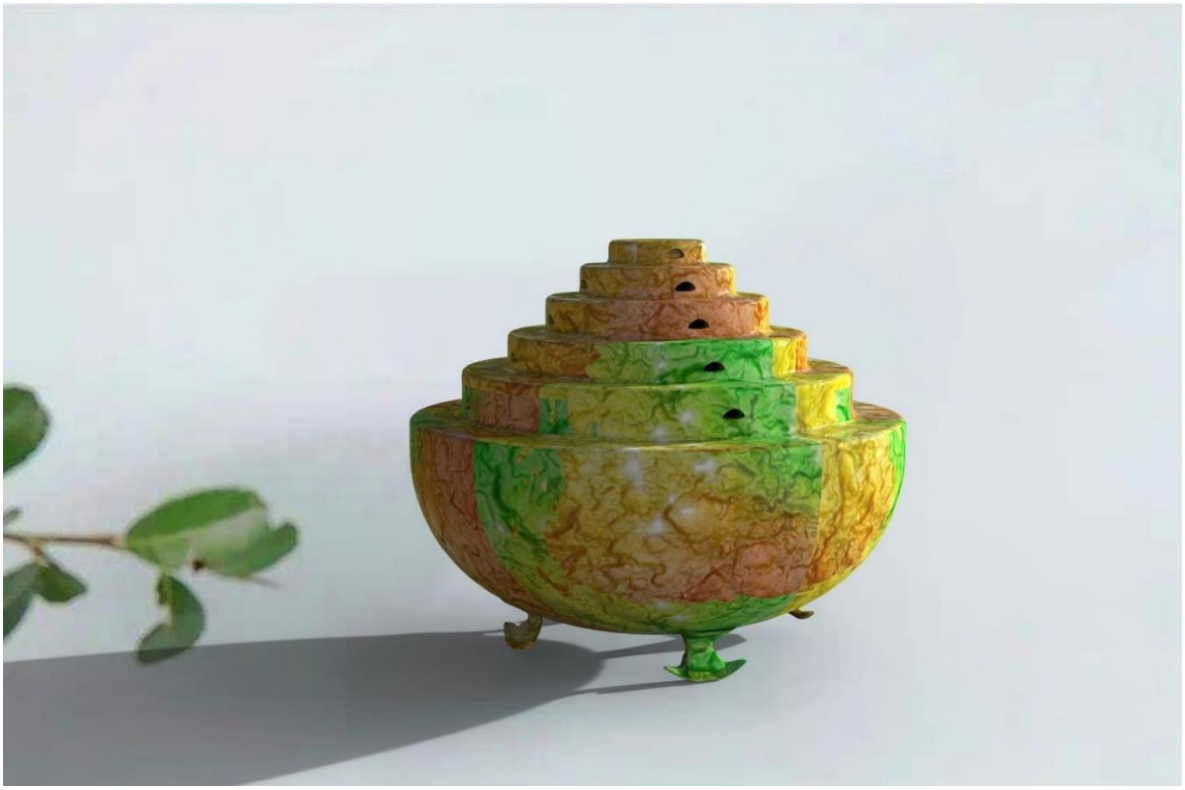
Group 9

Group 10

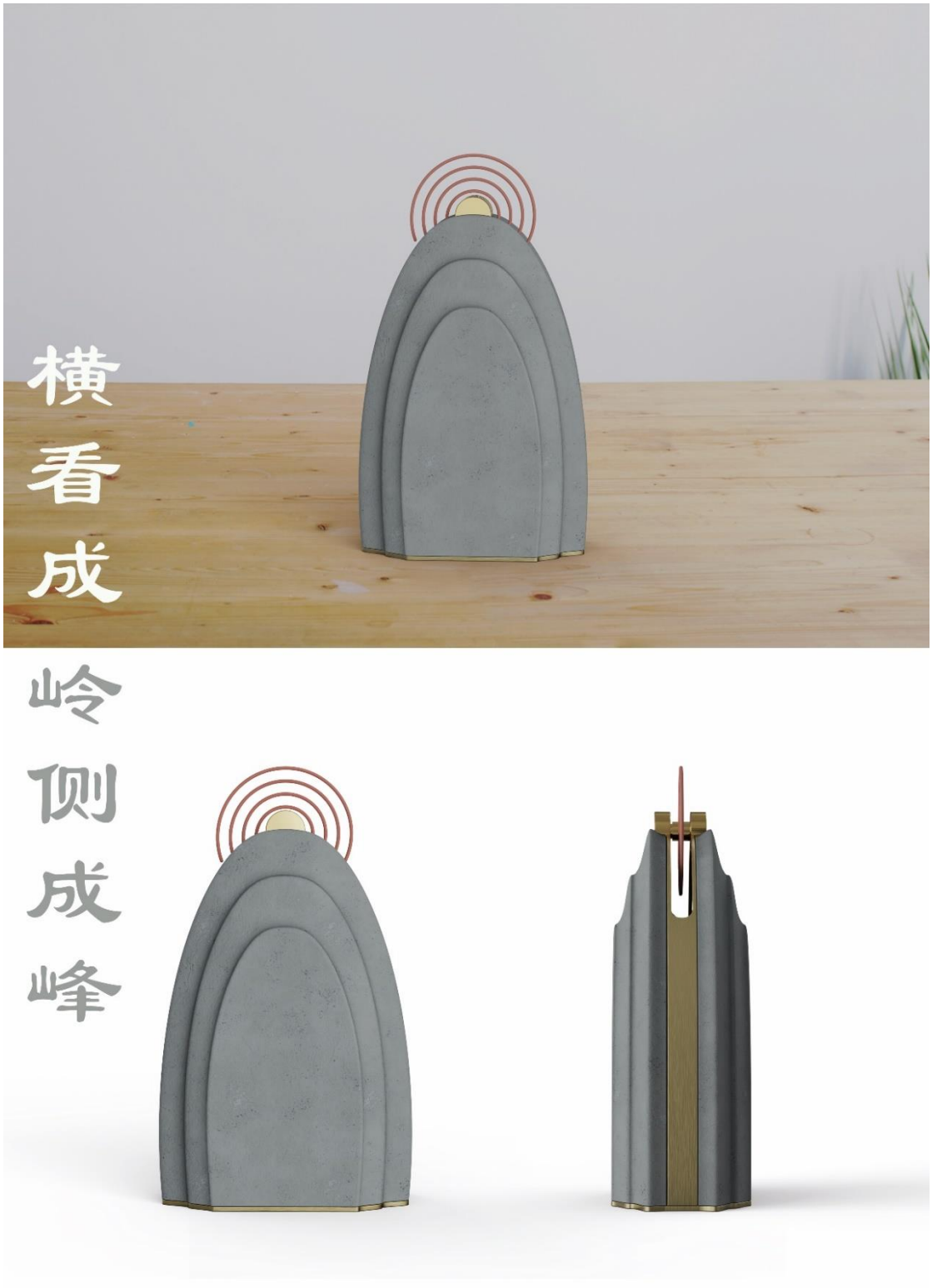




Group 11



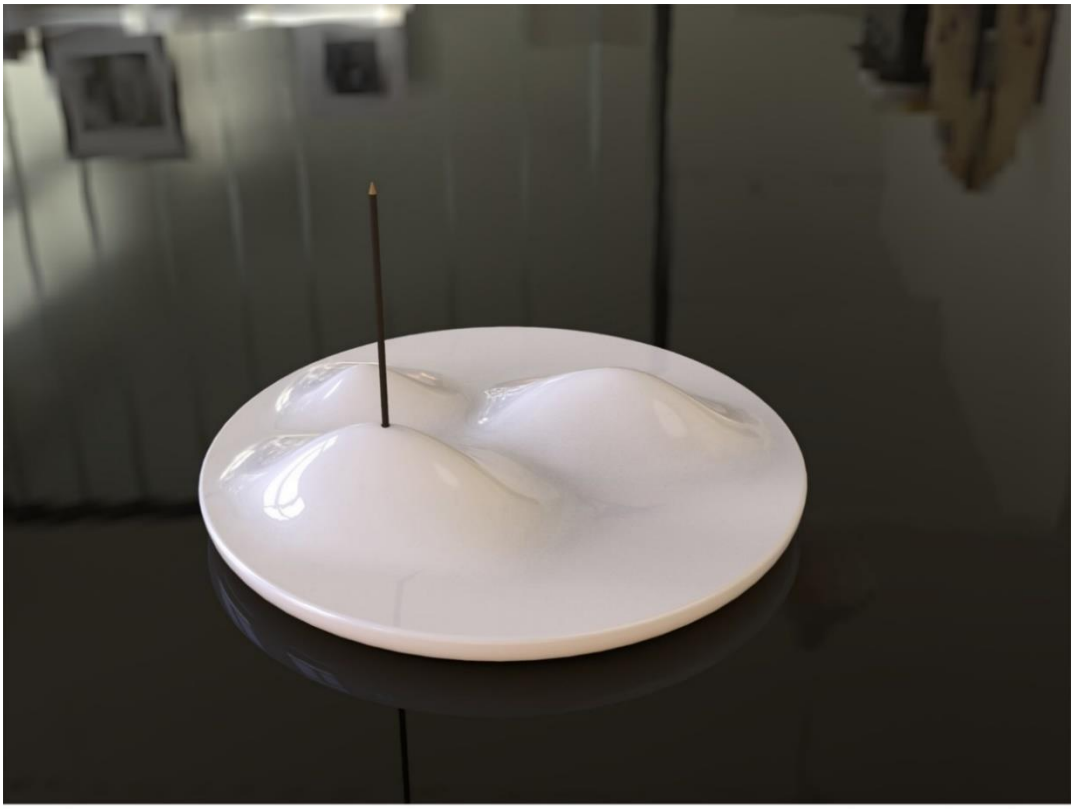
Group 12



Group 13

Group 14

Group 15



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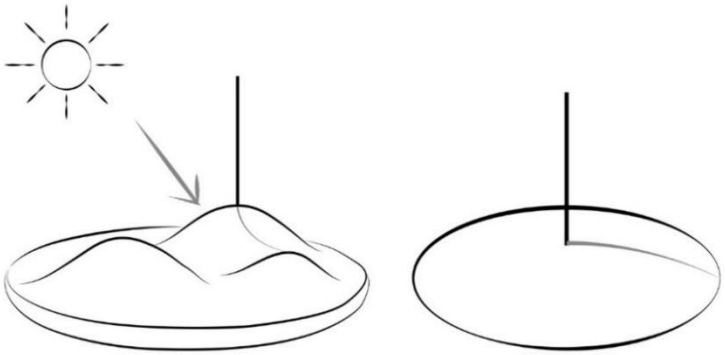
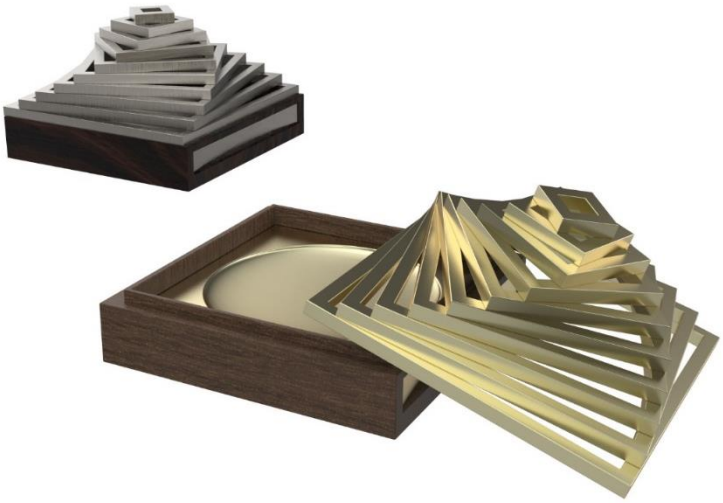
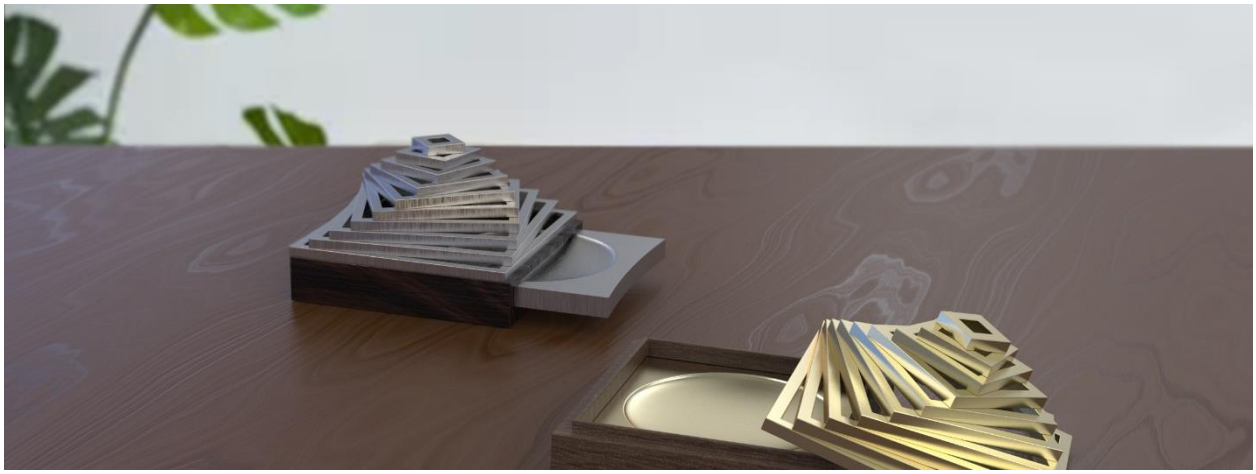


通过阳光的投影显示时间

Group 16

Group 17





Group 18