

# A Study on Consumers' Preferences for Glass Products Incorporating Chinese Cultural Heritage Elements Based on Emotional Design

Qingfeng Liu<sup>1,2\*</sup>, Nurul 'Ayn Ahmad Sayuti<sup>1</sup>, Hong Chen<sup>1</sup>

<sup>1</sup> College of Creative Arts, Universiti Teknologi MARA, Kedah, 08400, Malaysia

<sup>2</sup> College of Creativity, Changzhou Vocational Institute of Textile and Garment, Jiangsu, 213100, China

\* Corresponding Author: [liuqingfeng315@gmail.com](mailto:liuqingfeng315@gmail.com)

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**Abstract:** *Incorporating Chinese cultural elements into glass products can align them more with consumers' emotional needs. This research adopted a quantitative method to investigate the preferences for glass products incorporating cultural heritage elements. 146 glass products with cultural heritage elements in today's market were investigated, and ten glass product samples were identified by interviews previously. For the study, 503 online questionnaires were distributed, using emotional ratings to assess consumer preferences for these 10 product samples. The study found that all participants gave positive ratings of glass products with cultural heritage with above 4 points. However, for some products, there were significant differences in the evaluation of the products among participants from different groups.*

**Keywords:** Glass Product, Preferences, Cultural heritage, Emotional design

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## 1. Introduction

Many scholars and designers are working on integrating cultural heritage elements and product design at the visual component level. This is the most direct and obvious way to combine the two objects. Product standards are based on the various requirements of the target market, such as shape, color, material, quality, duration, use, price, etc. (Ghazali et al., 2012). For most observers and users, graphic components of products are probably the element closest to the meaning of design, especially for glass product design. This is because vision is the perceptual system in which humans acquire the most information, and visual components in product design are driven by shape, color, and decoration. The desire to communicate value to consumers can be achieved without interacting with the product (Noble & Kumar, 2008). Thus, the design strategy on visual components mainly concerns producing psychosensory benefits, such as symbolic and hedonic benefits. This further explains that the design of glass products with cultural heritage elements should pay more attention to the design of visual elements of products, and this is based on emotional benefits, not on functional benefits like other product designs. Therefore, it can also be said that the data collection of the glass products with cultural heritage elements was suitable for online research without the actual use experience between the participants and the product samples. In this study, the images of product samples were displayed in the online survey questionnaire, and quantitative data were collected using the evaluation tool of emotional design. SPSS statistical analysis tool was used to present the final research results and give suggestions.

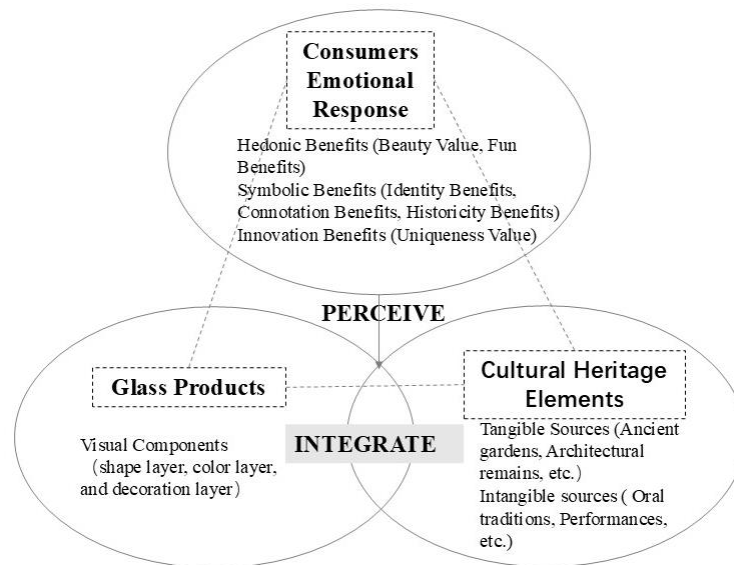
## **2. Problem Statement**

As mentioned above, the success of glass products incorporating cultural heritage elements lies in the emotional value attached to the products. Emotion and thought were initially thought to be independent situations. The field of cognitive science studies emotion as a separate and distinct aspect of human cognition (Khalid & Helander, 2006). This is because they look so different that people classify them as separate phenomena (Ratner, 2000). Emotions seem to be natural phenomena governed by biological mechanisms that are autonomous and beyond our control. Thinking, by contrast, is voluntary, learned, controlled, and dependent on cultural learning and concepts. In other words, emotions are associated with art, beauty, poetry, and music, while thinking is related to logic, science, and computation (Khalid & Helander, 2006). More and more studies have found that personal emotional feedback is closely related to cultural and work backgrounds. However, there is a lack of research on the emotional response of different groups of consumers to glass products with cultural heritage elements. Therefore, the research question to be solved in this study is the preference of potential consumers for glass products combining cultural heritage elements.

## **3. Literature Review**

### **3.1 Understanding Glass Products Innovation with Cultural Heritage Elements**

The essence of cultural and creative product design is to integrate cultural elements into products through innovative design techniques, and users can obtain cultural elements through observation and experience of products to achieve cultural transmission. In this process, the product's bearing of cultural elements and the user's emotional responses are the keys to achieving cultural transmission and also the core of the success of cultural and creative product design. In the literature, many scholars and product designers of cultural and creative industries have proposed a model or method of combining cultural heritage elements and products (Zhang & Hu, 2019; Sun et al., 2022). Based on the research of these scholars, and combined with the author's preliminary analysis of the combination of glass products and cultural heritage, the author proposed a model to help better understand the combination process at the visual component level, which also helped the author's understanding of glass products innovation with cultural heritage elements, as shown in Figure 1 below. This picture shows the model of combining and delivering cultural heritage elements into glass products. which describes the process of integrating cultural heritage elements into glass products. In the integration process, the product's shape, color, and decorative layer play an essential role in successfully transferring cultural elements, which will also affect the consumer's emotional response to the product through the perceived hedonic and symbolic benefits.



**Figure 1: The model of combination and delivery of cultural heritage elements in glass products (by author)**

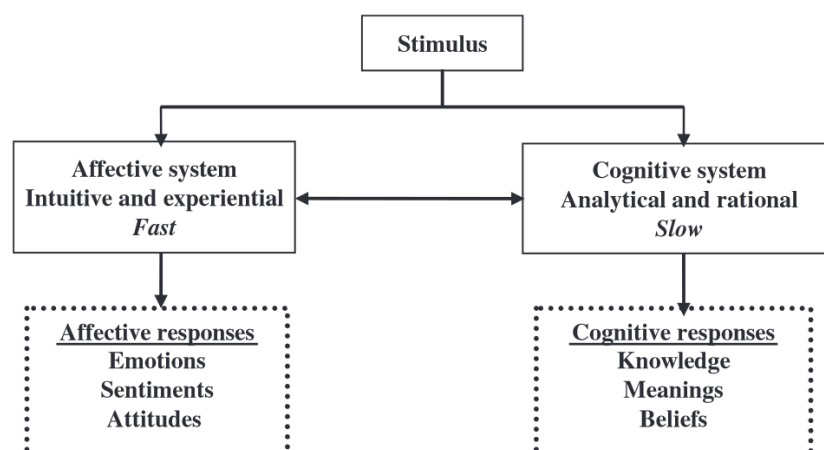
As shown in the picture, three main factors affect the successful integration of cultural heritage elements into glass products: the source of cultural heritage elements, the integration process at the level of visual components, and the emotional response of consumers. The last factor is the main content of this study, which is consistent with the research objectives and questions stated previously. The picture shows that cultural heritage elements mainly fall into two categories, tangible cultural heritage elements and intangible cultural heritage, and ten sub-categories: a) Ancient gardens, b) Architectural remains, c) Cultural landscapes, d) Cultural organisms, e) Museum relics, f) Oral traditions, g) Traditional performances, h) Ceremonial festivals, i) Literature and arts, j) Traditional skills. This classification of cultural heritage elements proposed by the author (Liu, 2024) is based on a literature review and preliminary observation of glass products with cultural heritage. Previously, the author detailedly analyzed the classification of glass products with cultural heritage elements according to shape, color, and decorative layer in a case study (Liu et al., 2024). Based on these studies, the author further analyzed the consumers' emotional responses toward glass products, which is the focus of this study and plays the most critical role in successfully incorporating cultural heritage elements into glass product design.

### 3.2 Emotional Design

Emotion can be defined as subjective biological conscious or non-conscious expressions involving facial and vocal expressions and physiological symptoms. They occur depending on specific events that can be experienced daily (Niedenthal & Ric, 2017). Moreover, according to Plutchik (2001) and Khalid (2006), emotions involve internal stimulations and happen naturally while influencing how humans react, behave, and think. In terms of classifications of emotion and pleasure, Scherer (2005) divided emotion into five components, which are (1) cognitive component (appraisal), which functions as the evaluator of objects and events; (2) neurophysiological component (bodily symptoms) which are responsible for the system regulation; (3) motivational component (action tendencies) involving in emotional preparation and direction of action; (4) motor expression component (facial and vocal expression) responsible for communication and behavior intention; and finally (5) subjective feeling component (emotional experience), which involve monitoring the internal feelings and interaction with other organisms. Khalid (2006) then goes further to define and explain

emotions in terms of five categories. He gave clear definitions and examples in each of the five categories, which are (1) physical pleasure, which includes physical feeling good, pleasure from relief, and sensory pleasure, (2) social fun, which includes how others perceive us, our character and status, (3) mental happiness which related to the happiness of the soul, the joy of reflection and the joy of feeling, (4) joy of reflection which has to do with reflecting on our knowledge and experience, and finally (5) normative happiness which is associated with social values such as moral judgment, care for the environment and religious belief. Norman (2005) proposed in his book that instinct, behavior and reflection are three different dimensions of design and explained emotion's important position and role in design. These scholars' definitions and classifications of human psychology and emotion provide the theoretical basis for researchers to carry out this research work.

Although this view may seem reasonable, it is based on several misconceptions. The fundamental mistake is to divide emotions and thoughts and attribute them to different processes (Ratner, 2000). A little thinking reveals that all thinking involves feeling and vice versa. Each emotional state is a different way of thinking. Scholars Khalid (2007) have shown a cross-coupling between emotion and cognition, and the relationship between them can be seen in Figure 2 below. This shows that consumers' emotional feedback on glass products with cultural heritage is not purely intuitive but is entangled with rational thinking.



**Figure 2: Cross-coupling of affect and cognition (Khalid & Helander, 2006).**

This theory can help researchers understand users' perceptions of the benefits and the emotional feedback of glass products with cultural heritage. According to Stokes (2015), the human body retrieves and processes information about its immediate surroundings at physical and perceptual levels. Perceptual refers to people's subjective feelings about things, which are affected by complicated psychological elements (W. Liu & Cui, 2020). To sum up, a product has specific features (content, presentational style, functionality, interactional style) chosen and combined by a designer to convey a particular, intended product character (Blythe & Monk, 2018). When individuals come in contact with a product, a process is triggered. First, people understand the features of the product. On this basis, each person builds a version of the individual product character, which is the appearance of the product character. This role is composed of pragmatic attributes and hedonic attributes. Second, the apparent product personality leads to outcomes: judgments about the product's attractiveness (e.g., it is good/bad), emotional consequences (e.g., pleasure, satisfaction), and behavioral outcomes (e.g., product purchase intention).

### 3.3 Assessment of Emotions

In detail, many assessment methods have been developed or used widely in the design fields to identify emotion. Here are some examples:

Likert scale is a standard scale in which items belonging to the same construct are scored and summed, and individual items have no meaning. It was developed by American social psychologist Likert in 1932 based on the original total scale (Jebb et al., 2021). It allows respondents to choose a level of agreement or disagreement with a neutral option regarding the questionnaires, which generally use 5 or 7 points. Likert scales are a quantitative method and can be used to measure response towards products, services, and more (Joshi et al., 2015; Willits et al., 2016). Taking a 5-point scale as an example, it consists of a set of statements; Each statement has five answers: strongly agree, agree, not necessarily, disagree, and strongly disagree, denoted as 5, 4, 3, 2, and 1, respectively. The total score of each respondent's attitude is the sum of their answers to each question. This total score can indicate the intensity of his attitude or his different states on this scale.

Another way to assess emotions is using the Semantic Differential Scale, developed in the 1950s. It measures the meaning of a word or concept the subject understands simultaneously. A series of bidirectional adjective scales are designed for such words or concepts, and subjects are asked to select corresponding positions on the scale according to their feelings and understanding of the words or concepts (Al-Hindawe, 1996). For example, to see the subject's evaluation of the work from his choice. Start with a list of antonyms such as "interesting" and "boring," "complex" and "simple," "traditional" and "modern," and so on. People were then asked to fill out a form with semantic differences. Semantic differences can be scored numerically, that is, the various scales are aggregated into a score that indicates the overall attitude strength of the respondents. The main advantage of the semantic difference scale is that it can depict images clearly and effectively. If the image of several objects is measured simultaneously. Researchers can also compare the entire image outline. The semantic differential scale is helpful in the design disciplines to measure the response toward product usage, functionality, preferences, and more.

Product Emotion Measurement Instrument inspires the author to assess emotional response towards glass products with cultural heritage elements. This tool was developed by Desmet in 2003 to assess emotional responses to consumer products through non-verbal self-report measurement instruments that use animated cartoon characters. Desmet originally developed a Product Emotion Measurement Instrument as part of his PhD in Product Emotion to assess emotional responses to different products. His research is funded by the Research and Development Center of Mitsubishi Motors in Germany. The early version consisted of 18 graphic emotion sets, nine representing negative emotions (disgust, indignation, contempt, disgust, disappointment, dissatisfaction, boredom, disillusionment, and vulnerability) and nine representing positive emotions (enthusiasm, inspiration, desire, appreciation, surprise, attraction, satisfaction, fascination, and vulnerability) (Desmet et al., 2000). Desmet then collaborated with the Delft University of Technology and SusaGroup to develop a new version of the Product Emotion Measurement Instrument containing a simplified set of 12 mood cartoons. In summary, the Product Emotion Measurement Instrument is a tool that assesses the emotion triggered by the appearance of a product, and subjects can express themselves by choosing an animation that corresponds to the emotion they feel.

This research project used assessment methods of the 7-point Likert scale for the online questionnaire format. The 7-point Likert scale helped the researcher evaluate the respondents'



emotional responses in glass products with cultural heritage elements. The literature review shows that there are many researchers (Tu et al., 2019; Z. Li et al., 2021, 2023) using this Likert scale to score the emotional attributes of respondents to cultural and creative products, and these studies provide references for the authors. This study also used assessment methods such as a semantic scale for the online questionnaires. The semantic scale was designed to be a colored version with positive and negative adjective words, which were also adapted from the Semantic Differential Scale and Product Emotion Measurement Instrument, and then used to measure the emotional reaction towards glass products with cultural heritage elements. It should be noted that Dr Sayuti (2017) also used this scale to measure the emotional reaction towards the furniture design with living organisms. Her research on furniture design with living organisms inspired the author.

### **3.4 Consumer Preference**

As rational beings, consumers are influenced by many external inputs that regulate their cognition, emotions, will, and even automatic behavior. Motivations, perceptions, attitudes, and expectations drive our daily lives and make our behavior predictable from a social, economic, cultural, or psychological perspective (Font-i-Furnols & Guerrero, 2014). Preference is a collective term for many related factors widely used in psychology, sociology, and anthropology, including how people express their value in life, society, experience, judgment, and behavior (Tu et al., 2019). The discovery of emotional codes (or cultural codes) can help enterprises improve the efficiency of product marketing (Coyle, 2018), which is based on the study of consumer preference. According to Li L. & Tang (2007), Consumer preferences can be divided into four basic types: (1) Consumers know that they do not have stable, clear preferences, and their supply assessment is likely based on their attractiveness. (2) Consumers' preferences are unstable and vague, and they do not know their preferences, so they are easily influenced. (3) Consumers have stable consumption preferences, which guide their choices, but they are unaware of the driving force of preferences on their choices. (4) Consumers have clear preferences and enough understanding of them to judge whether a customized supply correctly meets their preferences.

From these statements, it can be seen that consumer preferences are dynamic and will change with the change of living environment and knowledge background. Before deciding to buy a product, people evaluate the advantages and disadvantages of the product. In the evaluation process, the product's functional attributes are easily judged rationally, and the emotional impact is determined according to one's preferences. Everyone's preference for product attribute demand, such as aesthetics, identity, uniqueness, symbolism, etc., will change with their economy, the increase of experience, the growth of age, the background of work, and other factors. In the design of glass products with cultural heritage elements, preference refers to the additional emotional attributes of the product that consumers consider important and are willing to pay extra for.

## **4. Methodology**

### **4.1 Sampling Rationale**

Through the interview results done before by the author (Liu et al., 2024), it is found that consumers who buy glass cultural products may have different preferences. Therefore, this study selected people over 18 as the research objects and stratified the research subjects by working background (Art and Design/ Creative, Educational/academic/research staff, and Students) and design background (With and without a design background). The study used social network snowball sampling to collect 533 questionnaires from potential consumer

groups between August 10 and September 20, 2024. Thirty invalid questionnaires were excluded, and 503 valid questionnaires were collected and analyzed statistically.

Online surveys can be easily forwarded or linked to online social media such as WeChat, Tencent, email, and other network alliances to get more feedback from respondents and hopefully reach them easily. Many scholars have done in-depth research based on online research (Evans & Mathur, 2018; Andrade, 2020). According to these scholars, Due to the rapid and widespread use of the Internet and its powerful means of communication, web-based surveys are likely to become a powerful tool for survey research. Disadvantages of using the Internet as a research survey medium are perceived spam, low response rates, lack of online experience among respondents, privacy concerns, unclear response instructions, technological variations, and other reasons. However, it still offers significant advantages in supporting research involving online surveys. These advantages include flexibility, convenience, and presentation of setup issues, as well as advantages in research costs and timeliness of data acquisition. Moreover, due to technological innovation, the data obtained are easy to input and analyze and can easily be combined with SPSS used in this study. Beyond the first time, questionnaire stars support a diverse presentation of questions, easy access to large samples, easy follow-up, and other associated positive advantages.

As mentioned above, this survey uses a snowball point questionnaire, and the main target groups are those with creative design-related backgrounds, teachers, and students. The main reason for this sample is that those with creative design backgrounds have a better understanding of relevant design knowledge background. In contrast, teachers and students have a more comprehensive knowledge background and are more interested in Chinese cultural heritage.

#### **4.2 Experiment Planning**

All participants interviewed were provided with an informed consent form that provides complete information about the nature and purpose of the survey following the Code of Ethics for Privacy and Confidentiality approved by the University Ethics Committee.

Before the actual investigation, a pilot study was conducted with 54 invitees, mainly familiar to the researchers. The online questionnaire is mainly sent in the form of WeChat and completed online to ensure that the questionnaire is easy to understand and practical for the respondents, as well as to get some feedback. The pilot test helped ensure that the survey was well-functioning and easy for respondents to answer and helped researchers plan and refine the overall structure of the survey for analysis of the results. The questionnaire is conducted in the form of mandatory answers, requiring respondents to answer each question before proceeding to the next step, and not skip any questions in the middle. Doing so helps with data processing and minimizes incomplete answers that come up because respondents don't want to answer any questions, which can avoid a lot of problems. As discussed in the previous literature review, choosing an online survey tool like Question Star can help control answers and ask subjects to complete them. The first section; Part A collects background questions and demographic data of respondents by using radio buttons. In this section, there are 5 questions that address basic information (gender, age, work background, education background, and design background). In the second part, Emotional Design (Part B), respondents had to analyze and select emotional responses to product images with cultural heritage elements using an emotional scale designed for this project. It should be pointed out that the glass product samples used in this research were generated through the author's earlier interview data analysis (Liu et al., 2024). The general information of the glass product samples is shown in Table 1 below.

**Table 1: The general information of the glass product samples**

Type	Number	Name	Elements	Practicability	Prize/Economy	Craft
Tangible cultural heritage elements	P01	Suzhou Garden Lamps	Suzhou Garden	Lighting	The third prize of Cultural and Creative Design Competition	Mosaic
	P02	“Ji Shou Long” Pen Holder	The Forbidden City	Pen Holder	Best seller of the online flagship store	Dewaxing casting
	P03	“Dan Qing Qian Li” Study Supplies	Mountains and rivers	Study supplies	The second prize of cultural product Design Competition	Hot melt
	P04	Plum Blossom Goblet	Plum blossom	Wine set	Silver award of Jiangsu Star Art Design Competition	Dewaxing casting
	P05	Oracle Weather Bottle	Oracle bone	Predicting weather	Best seller of the online flagship store	Dewaxing casting
Intangible cultural heritage	P06	Yin Yang Gourd Glass Decoration	The eight immortals cross the sea	Holding wine	Best seller of the online flagship store	Dewaxing casting
	P07	Glass Shadow Puppets	Shadow Puppets	Decoration	The second prize of Cultural and Creative Design Competition	Mosaic
	P08	Cartoon Zongzi Glass Paperweight	Dragon Boat Festival	Paperweight	The second prize in Digital Culture Design Competition	Dewaxing casting
	P09	Glass Mosaic of Tang Dynasty ladies	Painting of Tang Dynasty Ladies	Decoration	Best seller of the offline store	Mosaic
	P10	Calligraphy Decorated Glass Clock	Calligraphy	Clock	Best seller of the offline store	Hot melt

## 5. Results and Discussion

### 5.1 Respondent Background

Part A looked at basic demographics, with five questions for respondents to answer. The basic personal data (gender, age, work background, education background, and design background) of the respondents were analysed in detail, as shown in Table 2. The table shows that 59.4% of the respondents were female, and 36.6% were between the ages of 31 and 40. The respondents, who were art and design/ creative and educational/academic/research staff, account for 32.3% and 33.4% of the sample respectively. The third largest group (23.9%) are from students, and the least group (10%) are from other working background. This table also shows that 50.3% were with a design background. As mentioned above, in this study, questionnaires were mainly distributed to these groups. It can be seen from the data that the sample numbers of the groups with different working backgrounds and design backgrounds are relatively average, so the subsequent analysis is also mainly conducted according to these groups.

**Table 2: Demographic characteristics (n = 503)**

Categories	Items	Frequencies	Percentage
Gender	Male	204	40.6%
	Female	299	59.4%
Age	18~25	120	23.9%
	26~30	153	30.4%
	31~40	184	36.6%
	41~50	29	5.8%
	more than 50	17	3.4%
Working background	Art and Design/ Creative	162	32.2%



	Educational/academic/research staff	168	33.4%
	Students	120	23.9%
	Other	53	10.5%
Design background	With a design background	253	50.3%
	Without a design background	250	49.7%

## 5.2 Summary of Results According to Different Design Backgrounds

Tabel 3 below shows the summary of overall results of Part B, Emotional Design according to design background. It can be seen that both groups of respondents have different responses towards the glass products with cultural heritage elements, where the Calligraphy Decorated Glass Clock received the highest negative response from participants with a design background (22.6%) while the participants without a design background chose the Plum Blossom Goblet (27.6%) for negative responses. Two different designs have the highest positive responses (77.9%) for Oracle Weather Bottle by the participants without a design background, and 71.2% for Suzhou Garden Lamps by participants without a design background.

**Table 3: Summary of all results of Part B in the percentage of frequency of positive and negative emotional responses for participants with and without a design background (being Yellow the highest negative and Green the highest positive)**

Participants with a design background				Participants without a design background			
Product Samples	Negative Emotion	Neutral	Positive Emotion	Product Samples	Negative Emotion	Neutral	Positive Emotion
P01: Suzhou Garden Lamps	9.9%	13.4%	76.7%	P01: Suzhou Garden Lamps	12.8%	16.0%	71.2%
P02: “Ji Shou Long” Pen Holder	13.4%	16.2%	70.3%	P02: “Ji Shou Long” Pen Holder	20.8%	16.0%	63.2%
P03: “Dan Qing Qian Li” Study Supplies	9.6%	15.4%	75.1%	P03: “Dan Qing Qian Li” Study Supplies	14.4%	14.8%	70.8%
P04: Plum Blossom Goblet	21.8%	22.5%	55.8%	P04: Plum Blossom Goblet	27.6%	25.2%	47.2%
P05: Oracle Weather Bottle	11.9%	10.3%	77.9%	P05: Oracle Weather Bottle	15.6%	15.6%	68.8%
P06: Yin Yang Gourd Glass Decoration	14.6%	14.6%	70.7%	P06: Yin Yang Gourd Glass Decoration	19.2%	16.4%	64.4%
P07: Glass Shadow Puppets	16.2%	18.2%	65.6%	P07: Glass Shadow Puppets	18.4%	15.6%	66.0%
P08: Cartoon Zongzi Glass Paperweight	18.9%	20.6%	60.4%	P08: Cartoon Zongzi Glass Paperweight	23.2%	18.8%	58.0%
P09: Glass Mosaic of Tang Dynasty Ladies	17.4%	15.0%	67.6%	P09: Glass Mosaic of Tang Dynasty Ladies	17.2%	15.6%	67.2%
P10: Calligraphy Decorated Glass Clock	22.6%	17.4%	60.1%	P10: Calligraphy Decorated Glass Clock	22.8%	18.8%	58.4%

Since a Likert scale is an ordinal scale (and in this case, a 7-point emotional scale), the numerical value of the SD (Standard Deviation), positive or negative, needs to be considered on how it may increase or decrease the mean values. However, the non-parametric or discrete data associated with Likert scale tests are not usually considered as being normally distributed (Pallant, 2020; Field, 2024). Based on the information from Table 4 below, it can be seen that all results have a Mean of more than 4, which shows that, the glass product samples received positive emotional responses from both participants with and without a design background. These outcomes were sufficient indications and suggested a positive emotional reaction towards the glass products with cultural heritage elements in this survey, as all the ten designs scored a Mean value of 4 or more.

**Table 4: Summary of valid means of Part B (emotional design) in percentage of frequency according to design background**

ID		P01	P02	P03	P04	P05	P06	P07	P08	P09	P10
With a design background	Valid	253	253	253	253	253	253	253	253	253	253
	Missing	0	0	0	0	0	0	0	0	0	0
	Mean	5.34	5.17	5.45	4.55	5.33	5.17	5.02	4.82	4.93	4.75
	Std. Error of Mean	0.087	0.094	0.095	0.095	0.1	0.096	0.094	0.101	0.1	0.104
	Median	6	5	6	5	6	5	5	5	5	5
	Std. Deviation	1.384	1.496	1.505	1.508	1.583	1.534	1.497	1.612	1.597	1.653
Without a design background	Valid	250	250	250	250	250	250	250	250	250	250
	Missing	0	0	0	0	0	0	0	0	0	0
	Mean	5.13	4.89	5.24	4.38	5.06	4.88	4.91	4.78	4.92	4.64
	Std. Error of Mean	0.088	0.101	0.104	0.098	0.094	0.101	0.095	0.106	0.098	0.101
	Median	5	5	6	4	5	5	5	5	5	5
	Std. Deviation	1.389	1.591	1.647	1.551	1.49	1.59	1.501	1.682	1.544	1.595

The Mann-Whitney test may be applied to test the significant differences in opinion, for this case, in the emotional responses between two groups of respondents for Part B. This test has detected a significant difference for design P04, titled Plum Blossom Goblet, where it indicated different emotional responses with 0.011, and design P05, titled Yin Yang Gourd Glass Decoration, with 0.041 (as noted, the probability level or p-value, is listed in the row labeled “Asymp. Sig. (2 tailed)). It shows the significant difference and disagreement between the designer groups (Please refer to Table 4 below, as both groups of respondents have different reactions towards this design).

**Table 4: Summary of Mann-Whitney Test in percentage of frequency applied to Part B for participants with and without a design background (SPSS output)**

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10
Mann-Whitney U	28577.5	28507	29516.5	29420.5	27578	28371.5	30382	31228	31587.5	30082.5
Wilcoxon W	59952.5	59882	60891.5	60795.5	58953	59746.5	61757	62603	62962.5	61457.5
Z	-1.924	-	-1.328	-1.379	-	-2.039	-0.78	-	-0.024	-0.963
Asymp. Sig. (2-tailed)	0.054	0.051	0.184	0.168	0.011	0.041	0.436	0.804	0.981	0.335

### 5.2.1 Results According to working background

The summarized results of responses to Part B were discussed according to the working background (Art and Design/ Creative, Educational/academic/research staff, and Students) in this section to further understand the subjects’ different responses.

**Table 5: Summary responses for Part B, Emotional Design from the Art and Design/Creative group Art and Design/Creative**

Glass Product Samples	Negative Emotions	Positive Emotions
P01: Suzhou Garden Lamps	8.0%	79.0%
P02: “Ji Shou Long” Pen Holder	13.5%	70.4%
P03: “Dan Qing Qian Li” Study Supplies	11.2%	74.7%
P04: Plum Blossom Goblet	18.6%	61.1%
P05: Oracle Weather Bottle	12.9%	75.9%

P06: Yin Yang Gourd Glass Decoration	15.5%	69.7%
P07: Glass Shadow Puppets	16.1%	64.2%
P08: Cartoon Zongzi Glass Paperweight	16.6%	64.2%
P09: Glass Mosaic of Tang Dynasty Ladies	15.5%	68.6%
P10: Calligraphy Decorated Glass Clock	19.8%	65.4%

As shown in Table 5 above, Calligraphy Decorated Glass Clock received the highest percentage of negative emotional responses (19.8%), and the Suzhou Garden Lamps received the highest percentage of positive emotional responses (79.0%) among the Art and Design/Creative group.

**Table 6: Summary responses for Part B, Emotional Design from the Educational/academic/research staff group**

Educational/academic/research staff		
Glass Product Samples	Negative Emotions	Positive Emotions
P01: Suzhou Garden Lamps	9.5%	78.0%
P02: “Ji Shou Long” Pen Holder	19.0%	64.9%
P03: “Dan Qing Qian Li” Study Supplies	6.0%	80.9%
P04: Plum Blossom Goblet	27.4%	45.9%
P05: Oracle Weather Bottle	7.2%	78.1%
P06: Yin Yang Gourd Glass Decoration	12.5%	75.6%
P07: Glass Shadow Puppets	13.7%	69.1%
P08: Cartoon Zongzi Glass Paperweight	19.1%	61.9%
P09: Glass Mosaic of Tang Dynasty Ladies	16.7%	70.9%
P10: Calligraphy Decorated Glass Clock	23.2%	54.7%

Table 6 above shows the highest and lowest percentages of negative and positive emotional responses towards glass product samples from the Educational/academic/research staff respondents. Different to the Art and Design/Creative respondents, the Plum Blossom Goblet obtained the highest negative emotional responses (27.4%), while the “Dan Qing Qian Li” Study Supplies received the highest percentage of positive emotional responses (80.9%).

**Table 7: Summary responses for Part B, Emotional Design from the Students group**

Students		
Glass Product Samples	Negative Emotions	Positive Emotions
P01: Suzhou Garden Lamps	12.5%	70.0%
P02: “Ji Shou Long” Pen Holder	13.3%	70.0%
P03: “Dan Qing Qian Li” Study Supplies	15.0%	70.9%
P04: Plum Blossom Goblet	25.8%	50.0%
P05: Oracle Weather Bottle	16.7%	71.7%
P06: Yin Yang Gourd Glass Decoration	21.7%	63.4%
P07: Glass Shadow Puppets	19.2%	65.9%
P08: Cartoon Zongzi Glass Paperweight	25.8%	52.5%
P09: Glass Mosaic of Tang Dynasty Ladies	15.8%	66.6%
P10: Calligraphy Decorated Glass Clock	21.7%	61.7%

As illustrated in Table 7 above, the results are also different to the Art and Design/Creative and Educational/academic/research staff respondents. The Plum Blossom Goblet and Cartoon Zongzi Glass Paperweight received the highest negative emotional responses by the Students

group (25.8%), while Oracle Weather Bottle obtained the highest percentage of positive emotional responses (71.7%). These results show different responses towards the glass products design with cultural heritage elements.

**Table 9: Summary of valid means of Part B (emotional design) in percentage of frequency according to working background**

ID		P01	P02	P03	P04	P05	P06	P07	P08	P09	P10
Art and Design/ Creative	Valid	162	162	162	162	162	162	162	162	162	162
	Missing	0	0	0	0	0	0	0	0	0	0
	Mean	5.38	5.14	5.4	4.72	5.25	5.07	5	4.98	4.96	4.92
	Std. Error of Mean	0.103	0.111	0.117	0.113	0.127	0.123	0.117	0.124	0.122	0.125
	Median	6	5	6	5	6	5	5	5	5	5
	Std. Deviation	1.305	1.418	1.493	1.442	1.62	1.563	1.483	1.576	1.558	1.592
Educational/ academic/ research staff	Valid	168	168	168	168	168	168	168	168	168	168
	Missing	0	0	0	0	0	0	0	0	0	0
	Mean	5.36	4.96	5.63	4.28	5.35	5.27	5.08	4.83	4.99	4.54
	Std. Error of Mean	0.098	0.118	0.101	0.113	0.094	0.108	0.111	0.121	0.115	0.124
	Median	6	5	6	4	5	6	5	5	5	5
	Std. Deviation	1.264	1.528	1.311	1.464	1.214	1.395	1.435	1.571	1.494	1.608
Students	Valid	120	120	120	120	120	120	120	120	120	120
	Missing	0	0	0	0	0	0	0	0	0	0
	Mean	5.07	5.21	5.23	4.48	5.15	4.85	4.87	4.61	4.93	4.75
	Std. Error of Mean	0.13	0.146	0.155	0.143	0.147	0.15	0.133	0.156	0.139	0.143
	Median	5	5	6	4.5	5.5	5	5	5	5	5
	Std. Deviation	1.424	1.603	1.694	1.566	1.612	1.648	1.455	1.712	1.518	1.562

Based on the information from Table 9 above, it can be seen that responses for all questions have a Mean of more than 4, which shows that, generally all the glass product samples received positive emotional responses from this stratified group. The outcomes are sufficient to suggest a positive emotional reaction towards product samples surveyed. This might be due to the preferences towards cultural heritage elements that were embedded into the glass product designs.

**Table 10: Kruskal-Wallis test results of responses to questions 1-10 on Emotional Design, comparison towards emotional responses according to working background**

	Test Statistics <sup>a,b</sup>									
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10
Kruskal-Wallis H	4.934	2.457	2.953	8.145	0.409	4.171	1.408	3.653	0.412	5.557
df	2	2	2	2	2	2	2	2	2	2
Asymp. Sig.	0.085	0.293	0.228	0.017	0.815	0.124	0.494	0.161	0.814	0.062

a. Kruskal Wallis Test

b. Grouping Variable: Working Background

The Kruskal-Wallis test has also been employed to compare three main groups of the stratified data. As presented in Table 10 above, the results of the Kruskal-Wallis test detected a

significant difference for the design P04 titled Plum Blossom Goblet, where it indicated different emotional responses with 0.017.

## 6. Conclusions

Based on the analysis of online survey data, this study studied the preferences of consumers with different working and design backgrounds for glass products with cultural heritage elements. The study found that all respondents gave the product positive emotional feedback. In the product samples studied, only P05 and P06 have differences in consumer emotional feedback in work background, while P04 has differences in design background. This study shows that consumers consistently prefer glass products with cultural heritage elements, and give positive reviews. It is found that the design of glass products on the market today mainly reflects cultural elements in physical visual elements such as shape, color or decoration, and the performance of this appearance can obtain more general interest and good emotional feedback from consumers. This is crucial in the consumer's first impression of the product. The change of this effect in the course of consumers' interaction with the product over a more extended period of time is worth studying in the future.

When innovating Chinese glass products, integrating cultural elements into product design is a feasible solution, which is also in line with the development trend of Chinese cultural and creative products. The analysis of consumer preferences of cultural heritage elements in glass products can fill the gap in the theoretical field of this area, and can also provide knowledge for product designers and researchers studying this issue in China.

At present, the impact of globalization and social transformation on cultural heritage and industrial products is enormous (Godwin et al., 2022). China's current protection of traditional Chinese culture and the promotion of cultural and creative products are also carried out in this context. Glass products combining cultural heritage elements is one of the essential ways to strengthen the development and utilization of cultural heritage, help to enhance the cultural identity of consumers, help designers to consider various visual components of cultural heritage elements in product design, and use this way to enhance the emotional feedback of consumers.

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## Conflict of Interest

Authors declare that there is no conflict of interests regarding the publication of the paper.

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