Constructing the Consensus Map for Imageries of Green Household Appliances of Design Students

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Abstract

In the category of design education, the effective transmission and understanding of knowledge are the key elements for the success of design practice. Although the design teaching method is two-way communication between teachers and students, cognitive gaps in teaching contents often occur, especially in a product design course. In order to achieve consistency in cognition and teaching, this research took green household appliances as the example, and applied the Zaltman Metaphor Elicitation Technique (ZMET) and the Means-End Chain(MEC) Theory, in order to explore the experience and opinions of students in a design department. According to the analysis results, 27 common constructs were obtained, including 9 attributes, 10 consequences, and 8 values, and 3 major expectation dimensions were summarized, namely "environmental sustainability", "use feeling", and "life & health". Moreover, according to the consensus, the ACV connection model was confirmed. The results of this research can be provided to teachers as course guidance to develop green products and expand student's opportunities to realize the specific goal of product design.

Key words: Keywords: Consensus Map, Green Household Appliances, Means-End Chain (MEC), Zaltman Metaphor Elicitation Technique(ZMET)

Introduction

Good communication and interaction between teachers and students are important factors in maintaining the quality of product design and improving learning performance. At present, research on product design communication has received good support in general design practice (between designers and consumers) (Chen, 2004), but the teaching communication between teachers and students is rarely discussed (Liu & Lin, 2010). Some dilemmas have been found in product design courses, especially in technical and vocational education systems. Studies have shown that poor teaching methods can lead to student learning problems. The students at current vocational colleges are not all composed of undergraduates, which form students' inconsistency in design perception, ability, and behavior (Liu & Lin, 2010; You, Yang and Liao, 2007). For example, learning information is not easy to get based on a course, but it easily causes students to learn with a low attitude (Liao, 2004). In addition, students' own feelings and needs for the course are not clear and universal. Undoubtedly, an excellent teaching method covers the mutual understanding between teachers and students. From the teacher's perspective, students' cognition and ideas need to be explored and compared to one-way teaching methods.

In order to improve the above problems, ZMET is a research method that effectively understands the hidden inner cognition, which is good at exploring the ideas, emotions, and behaviors chosen by people to summarize the internal consensus mode through image and language communication (Zaltman, 1997). ZMET has long been used in the field of design and education, as it can understand the learner's experience in the learning process and propose ways to improve learning efficiency and explain the behavior of learners (Liu & Lin, 2010). Furthermore, the three stages of confirming demand, concept development, and materialization often focus on product design courses (Chang and Chiang, 2014). Therefore, in order to make students' perceptions of product design more contextual, the appropriateness of students' behavior in the learning environment ultimately points to value according to the MEC theory (Haghighi and Jusan, 2012). MEC emphasizes product or service attributes that will evoke people's perceptions, and the results will enhance their inner value (Gutman, 1982). On the whole, the main purpose of design education is to encourage students to form a sense of design and to internalize it into their individual traits through extensive and connected thinking (Jiang and Jou, 2017). A complementary perspective is presented in this study, which aims to explore students' understanding of the concept and image of demand for product design.

Research Method

A. Research Process

Taking green home appliances as an example, this study explores students' intrinsic ideas and experiences in product design through ZMET and MGB so as to provide teachers with green product practice courses to increase students' understanding and efficiency. The relationship between students' constructs of green product design will be extracted through ZMET. The attributes, outcomes, and values between constructs will be classified, and a consensus map will be formed through MEC. The research process is shown in Figure 1.

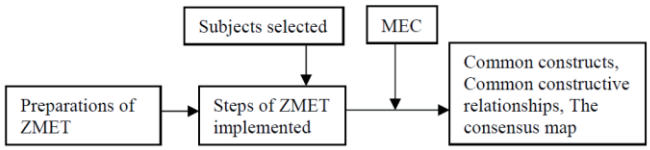

Fig. 1 Research Process

B. Research Subjects

ZMET is a qualitative study. Although only 4-5 respondents in ZMET research can include more than 90% of the ideas of a large sample of respondents (Coulter, Zaltman, and Coulter, 2001), 10-15 respondents are most often used in actual ZMET studies (Christensen and Olson, 2002). Therefore, this study selected the subjects with purposeful sampling. Ten students with high academic performance were selected in the product design curriculum as representative respondents based on design learning performance and thinking skills (Shin, Ya, and Lu, 2014).

C. Steps of ZMET implemented

Respondents were asked to look for 8 to 10 images one week ago that matched the design or feel of the green home appliances they were expecting. In the process, the respondents' ideas and purposes for green home appliances will be clearer. The interview was implemented according to the picture. The sequence of the ZMET interview steps is as follows (Zaltman, 1997).

(1) Narrative story. The thoughts and feelings of each picture are narrated from the students.
(2) Pictures not found. The idea of not having a suitable picture is narrated from the student.
(3) Branching pictures. Students explain how pictures are classified and named.
(4) The construct is extracted. Students' inner psychological perceptions of green home appliances were explored through a comparison of three images. In the continuation, the relationship between constructs is established through continuous guidance and questioning until no new constructs are produced.
(5) The most (not) representative picture. The student explains and chooses the picture that is the most (not) representative of his thoughts.
(6) Sensory images. The green product's image is described by what the students feel.
(7) Summarize the image. A meaningful summary image was collaged from 8 to 10 images based on the respondent's ideas.
(8) Small essay. The inner thoughts of the respondents were reconfirmed and written in a short essay.

D. Data Coding

The interview data of 10 students were summarized and coded by three coders (researcher and 2 experts of design field) through MEC, including constructs, constructive relationships, and a consensus map, as shown in the following Figure 2. The construct represents the transition of the respondent's words into vocabulary through a picture. The constructive relationship represents the causal link between the two constructs. According to the advice of the scholar, the map is composed of common constructs and common constructive relationships. Basically, the common construct means that the construct is mentioned as being based on one-third of the number of respondents, and the common constructive relationship means that the constructive relationship is mentioned based on one-quarter of the number of respondents (Zaltman and Coulter, 1995). Therefore, the common construct and constructive relationship must be mentioned by at least 3 respondents based on 10 respondents in this study. The validity of this study was supported, based on the consistency of the three coders, and the interview data were established from ZMET with high involvement.

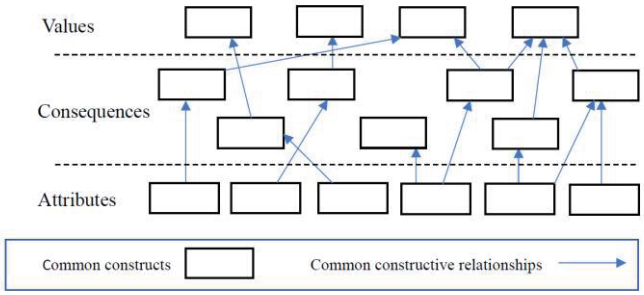

Fig. 2 The consensus map

Result and Analysis

A. Common Constructs Extracted

Tab. 1 Common Constructs Extracted form students

No	MEC	Common construction	Research subjects										Frequency
			St1	St2	St3	St4	St5	St6	St7	St8	St9	St10	
1	Attributes	Simple shape	1	1	1	1	1	1	1		1	1	9
2		Multi-functionality	1		1	1			1	1	1	1	7
3		Metal texture	1		1			1	1		1		5
4		Color	1	1	1	1			1	1		1	7
5		Detachable	1	1	1								3
6		Environmentally friendly materials		1						1	1		3
7		Combined design		1		1			1				3
8		Solar energy		1		1	1			1		1	5
9		Use rapidly			1	1		1	1		1		5
10		Technology		1	1	1	1	1	1	1	1		8
11		Basic design			1				1		1	1	4
12		Safety design			1			1	1		1		4
13	Consequences	Clean	1	1	1	1		1	1		1	1	8
14		Saving energy and carbon reduced	1	1	1			1		1	1		6
15		Energy consumption reduced	1	1	1	1	1	1					6
16		Decorations		1	1		1	1	1	1	1		7
17		Saving time and effort			1	1		1			1		4
18		Efficient			1	1						1	3
19		Quiet			1	1		1					3
20		Durable and practical			1	1			1			1	4
21		Safe to use	1		1		1	1	1		1		6
22		Convenient to use		1	1		1	1	1	1	1		7
23		Energy converted		1			1			1		1	4
24	Values	Environmental protection	1	1	1	1	1	1	1	1	1	1	10
25		Comfortable	1		1				1				3
26		Environmental benefits	1		1	1	1	1				1	6
27		Health promotion	1	1		1	1	1	1		1	1	8
28		Environmental friendliness	1	1			1						3
29		Quality of life	1		1	1		1					4
30		Fashion		1	1	1	1	1			1	1	7
31		Beauty enhanced		1	1		1		1				4
32		Convenience		1	1			1	1	1	1		6
33		Security			1			1	1		1		4
34		Beautification and greening				1			1	1			3

Personal constructs are built to be used as a basis for common constructs. 57 Personal constructs were extracted from the interview data. Furthermore, common constructs are confirmed by more than three respondents. Therefore, 34 common constructs are extracted as shown in Table 1, including 12 attributes (A), 11 consequences (C), and 11 values (V). This means that students' understandings of the properties of green home appliances include simple shape, multi-functionality, metal texture, color, detachable, environmentally friendly materials, solar energy, combined design, technology, use rapidly (high performance), basic design (easy to operate), and safety design (12). Students think that the purposes of using green household appliances include clean, saving energy and carbon reduced, energy consumption reduced, decorations, saving time and effort, efficient, quiet, durable and practical, safe to use, convenient to use, and energy converted (11). Values of green home appliances in Students' mind include comfortable, environmental benefit, environmental protection, health promotion, environmental friendliness, quality of life, fashion, beauty enhanced, convenience, security, and beautification and greening (11).

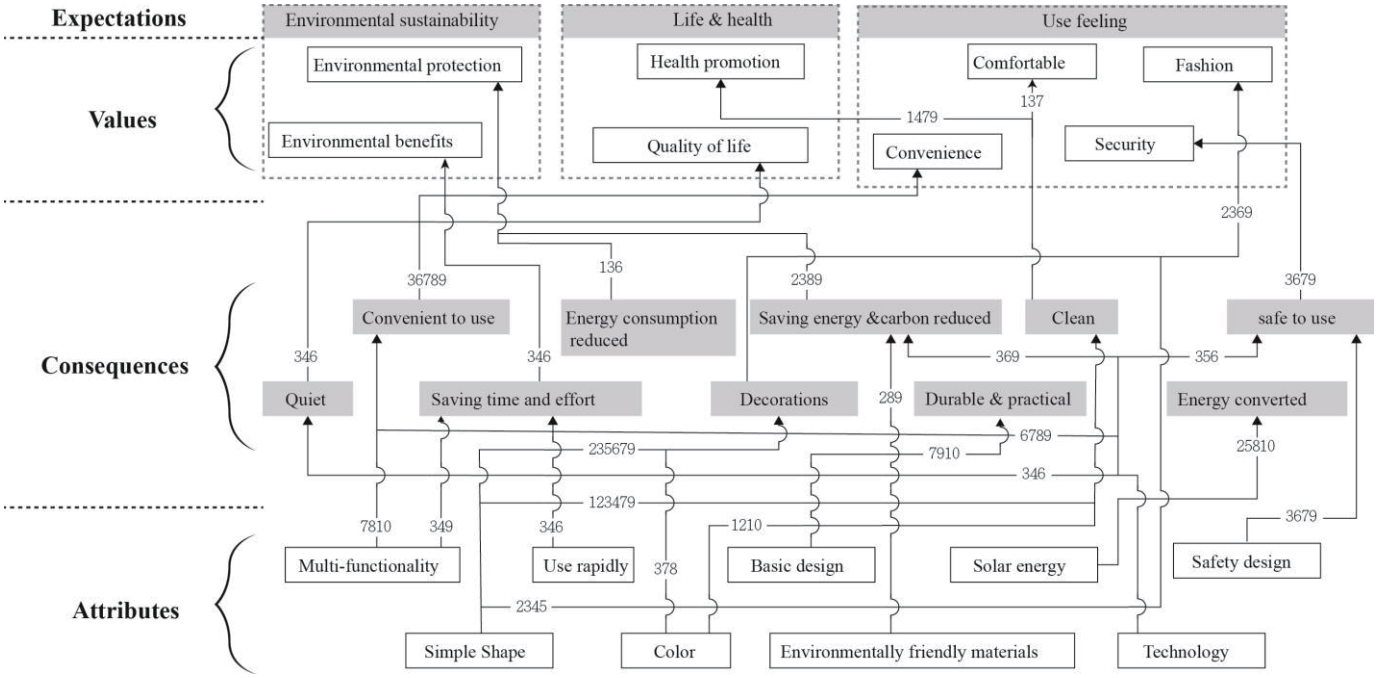

Fig. 3 The consensus map of for Imageries of Green Household Appliances of Design Students
Note : "→" indicates common constructive relationships, and the number on the line indicates the student number.

B. The Consensus Map

The consensus map is built from common constructs and common constructive relationships, which specifically presents students' internal perceptions of green home appliances. The three main expectations are summarized from the eight product values based on relevance, including "environmental sustainability", "use feelings", and "life health". The consensus map of 10 students is presented in Figure 3 below based on attributes, results, and values.

First, the first level of expectation is "environmental sustainability", which includes two values (environmental protection, environmental benefits), three results (saving time and effort, waste reduced, saving energy and carbon reduced), and four attributes (multi-functionality, use rapidly, technology, environmentally friendly materials). The second expected level of "life & health" includes two values (health promotion, quality of life), two results (clean and convenient to use), and three attributes (color, simple shape, technology). The third expected level "use feeling" includes 4 values (convenience, comfortable, security, fashion), 3 results (saving time and effort, waste reduced, energy saving and carbon reduced), and 4 attributes (multi-functionality, use rapidly, technology, environmentally friendly materials).

Based on the above, the study has explored students' concepts of green home appliances and revealed the basis for these perceptions as to the potential expectations that students seek. Results of this study can be used in the curriculum of green product development and to improve students' chances of practicing product design goals. The consensus map can be used to develop teaching strategies, increase students' understanding speed, and improve their learning efficiency, thus motivating teachers to continue to explore students' cognition for teaching.

Conclusion

In teaching, teachers' understanding and mastery of students' learning level are more important than the transmission of unilateral knowledge. However, students' needs for learning topics are always not easy to detect and express, and teachers often ignore the state of student learning in the current educational environment. Therefore, some research results are presented in this study. On the whole, teachers must often explore cognitive differences with students. Learning is a dynamic process of improving teaching quality and strategy, which have significant benefits for students' learning. Taking

green household appliances as an example, this study proposes future recommendations as follows.

(1) Creating an effective learning strategy is based on the continuous exploration of students' internal perceptions of the curriculum from a teacher's perspective.
(2) Understand the background and individual differences of students, and adjust the teaching content and difficulty in a timely manner.
(3) Environmental education should be promoted to promote ecological sustainability.

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