Bridging the Emotional Divide in Instructional Design: A Kansei Perspective

Chwen Jen Chen, Kee Man Chuah and Chee Siong Teh
Faculty of Cognitive Sciences and Human Development
Universiti Malaysia Sarawak
Kota Samarahan, 94300 Sarawak, Malaysia
cjchen@fcs.unimas.my, chuahkeeman@gmail.com and csteh@fcs.unimas.my

***Abstract*- Emotion has long been regarded as an obstacle to cognitive processes in learning. Despite various studies that showed strong influences of emotional state in learning, instructional designers tend to overlook its role when designing and developing instructional materials. This is mainly due to the lack of proper method or framework in linking emotions and instructions. Thus, with recent renewed interest on affective issues in instructions, this paper offers a fresh perspective by integrating Kansei Engineering methodology in the instructional design process. Kansei Engineering is a proven methodology for translating human feelings into a design. This paper describes how Kansei Engineering methods can be used to elicit important design elements of instructional materials that would in turn induce positive emotions on the learners and optimize effective learning.**

I. Introduction

For decades, emotion has been regarded as a threat to rational thinking. There has been a constant deep-rooted conviction that emotions are unreliable and untrustworthy and that for sanity to prevail, rationality and intellect must function unfettered by the vagaries of emotion [1]. This belief has formed a major influence in the domain of teaching and learning. Learning theories have largely treated emotion and cognition as occupying separate realms and cognitive processes have been given a primary place in the educational scheme of things at the expense of emotions [2]. Though there were attempts to challenge this view over twenty years ago, efforts by researchers such as Martin and Briggs [3] to combine both cognitive and affective domain in creating a more holistic framework for instructional design were seen as problematic and unpopular. Such division between emotion and cognition occurs due to several reasons. The primary reason is the multitude of definitions on the term "emotion" that more often than not conflict with each other [1]. Moreover, the difficulty of research methodologies such as direct observations of private emotional experience and the experiment setup, which often conceal the true nature of emotional experience, is another a major barrier to overcome [4].

Nevertheless, recent development in instructional design and learning sciences has seen a mounting awareness and revitalized efforts among educators and instructional designers on the need to reconsider the role of emotions in instructions. Though limited, several emerging approaches such as FEASP-[4] and ECOLE-approach [5] have been introduced in order to facilitate instructional designers in designing emotionally sound instructional materials (especially computer-based materials) and instructions. A more prominent attempt is done by Astleitner in [3] who have introduced the framework for Emotional Design of Instruction (EDI), which combines the fields of emotional and instructional design. Despite these attempts, emotions have not featured significantly in instructional research and are often overlooked by instructional designers when developing instructional materials mainly due to the lack of proper method in linking emotions and instructions.

Thus, this paper aims to address this gap of emotional divide in instructional design by highlighting the role of emotions in learning and instruction, as well as the need to consider affective and emotional factors when designing instructional materials. In relation to that, this paper proposes the use of Kansei Engineering methodology as an additional tool to facilitate instructional designers in making judgment pertaining to the emotional effects of various design elements.

II. The Role of Emotion In Learning

Generally, emotions include one's action tendencies, desires, feelings, and physiological responses. Kleinginna and Kleinginna [6], in a more comprehensive manner, defined emotion as a complex set of interactions among subjective and objective factors, which can give rise to affective experiences, generate cognitive processes, activate widespread physiological adjustments, and lead to behavior that is usually goal-directed, and adaptive. In learning, emotion may either disrupt or promote information processing. According to Pekrun in [7], emotions have an effect on learning and achievement as mediated by attention, self-regulation and motivation. They direct a person toward or away from learning matters in learning situations, which eventually leads to self-regulated learning.

In addition, several studies have provided empirical evidences that positive emotions have a crucial effect on diverse cognitive processes such as information processing and problem solving. For example, Isen and Reeve in [8] based on their empirical study mentioned that learners who are feeling happy or in positive state of emotions are more cognitively flexible and more able to see potential relations among stimuli than other learners in a neutral state. In another study, Fredickson [9] identified four positive emotions (joy, interest, contentment, and love) that broaden one's scope of attention, cognition and action. She further suggested that the broadening effect triggered by positive emotions builds a range of personal resources that would enhance one's cognitive process. There-

Acknowledgement: The author acknowledges the financial support rendered by UNIMAS through Fundamental Research Grant Scheme FRGS/05(02)/616/2006(49), Ministry of Higher Education, Malaysia.

M. Iskander et al. (eds.), *Technological Developments in Education and Automation*,
DOI 10.1007/978-90-481-3656-8_33, © Springer Science+Business Media B.V. 2010

fore, it is safe to conclude that positive emotions can indeed promote effective learning. Despite that, the effect of instructional materials and instructions in inducing positive emotions is yet to be explored thoroughly.

III. Emotion And Instructional Design

Traditionally, in the field of instructional design, a strong emphasis is given to learners' cognitive and some motivational processes. As pointed out by Reigeluth [10], emotions have not been sufficiently attended in instruction. One possible factor is that emotions have been conceived as interfering with the cognitive learning objectives and achievement especially when Gagné's nine condition of learning [11] were the main source for instructional designer. In his model, there were no indictors of emotions and the listed instructional events were mainly cognitive in nature.

However, with the propagation of instructional models which are derived from the constructivist approach, instructional designers begin to realise the fact that cognitive, social and emotional development cannot be viewed in isolations as each is closely linked with the other. Wilson [12] further mentioned that instructional designers should not be viewed only as designers of materials. Instead, they should be considered predominantly as designers of experience, specifically learning experience. According to him, on both levels, they move beyond purely technical issues of theory application and enter into the realm of aesthetics that inevitably involves human feelings and emotions.

Although addressing affective and emotional issues is nothing new in the field of instructional design, it is only recently that theoretically guided approaches focusing on instructional strategies to influence learners' emotions are introduced. The most notable one is the FEASP approach as proposed by Astleitner [3]. In the approach, Astleitner suggested that there are five emotions that educators need to consider in the learning context, which are fear, envy, anger, sympathy and pleasure (FEASP). He also added that instructional designers have to consider these emotions in order to optimize the learner's emotion states during the learning process. Astleitner and Leutner in [13] further conceptualized the FEASP approach in guiding the design of computer-assisted instructional materials. They outlined several strategies in identifying emotional problems faced by learners during the use of instructional technology and suggested ways to improve those problems. Another more recent approach is the ECOLE approach (*Emotional and Cognitive Aspects of Learning*) that is rather similar to FEASP approach in which it aims at improving the quality of instruction by increasing positive emotions and achievement and by avoiding negative emotions. However, these approaches are mainly for designing instructions in the classroom.

In bridging the emotional divide in instructional materials, two recent studies [14], [15] have investigated how aesthetic elements such as colours, layout and graphic illustrations of multimedia learning materials could increase the positive emotions of the learners whose emotional state in the beginning of the learning was neutral. The studies showed how students managed to improved their problem solving and decision making ability (as shown in their transfer test results) when given a stimulus that could stimulate cheerful and relaxing feelings. This suggests that positive emotions can be induced from the instructional materials through the quality of the aesthetic design. Both studies have also highlighted the need for instructional designers to incorporate principles of emotional design in instructional design as it is able to affect learners' learning experiences and performance. On close examination of the aforementioned studies, it is questionable how emotions could be categorised to facilitate instructional designer in using the information during the actual design of instructional materials due to the limitation of the employed methodology. As such, due to the systematic procedures in which it is possible to evaluate quantitative relationships between emotions and design elements, Kansei Engineering is seen as a potential method in offering plausible solutions to this problem.

IV. Kansei Engineering

Kansei Engineering or affective engineering is a methodology that assimilates human Kansei (psychological feelings and emotions) into design elements, with an aim to create products or designs that users or consumers will satisfy [16]. This method is derived from the understanding of human Kansei. Kansei is a Japanese term that refers to human's sensitivity, sensibility and feelings, in which when presented with a stimulus, it will be evoked and hence influences the judgement of a person on that stimulus, either positive or negative [17]. The concept of Kansei is then combined with the field of engineering in assisting the development of new products that would closely resemble consumer's insights and desire. Kansei Engineering is based on subjective estimations of products and concept properties and helps users to express their demands on the product including those which they might not be aware of [18].

The process of performing Kansei Engineering methodology can be illustrated in the following diagram (Fig.1):

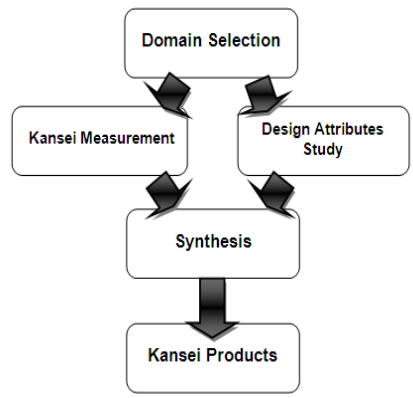

Fig. 1. Principle of Kansei Engineering (Adapted from Nagamachi [18])

A. Choosing a Domain

In Kansei Engineering, choosing the domain includes the selection of a target group, market-niche, and specification of the new product. Based on this information, product samples are collected, representing the domain. The Kansei Domain can be understood as the ideal concept behind a certain product. Thus, the major task in this step is to define the domain and find representatives (such as design drawings, products or samples) covering wide part of the domain.

B. Kansei Measurement

Kansei measurement is the process of capturing consumer's emotions or internal sensation. Kansei measurement covers physiological measures and psychological measures. Physiological measures target to capture users' behaviors and body responses. On the other hand, psychological measure (which is the popular one between the two) deals with human emotional and mental states. In this psychological measure, users' changes in emotions are captured using self-reporting system such as Semantic Differential (SD) scale or free labeling system. In a typical Kansei measurement procedure, users will be required to rate a product on the Semantic Differential scale (see Fig. 2), which contains list of words in a pre-determined scale range. These words (known as Kansei words) are compiled from various sources such as target users, experts, pertinent literature and the like.

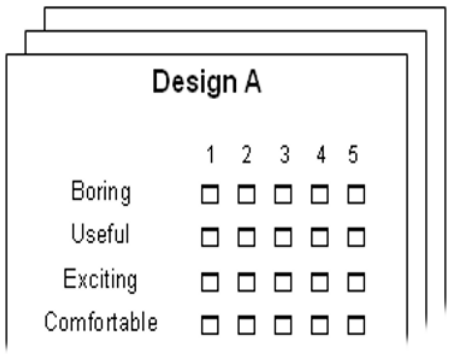

Fig. 2. Example of Semantic Differential scale questionnaire

C. Design Attributes Study

In this step, identification of specific design features such as size, shape and colors are conducted. This is to determine the sets of design parameters to be studied and evaluated by the target users. Generally, product or design attributes are selected from the existing products available in the market. In some cases, however, the product attributes can be created or designed from scratch by the product designers especially when there are limited designs available within the selected domain.

D. Synthesis

Upon obtaining the evaluation data from Kansei measurement, the correlation between the Kansei words and design attributes (e.g. colour, layout, and size) is then measured using statistical and data visualization method. The most frequently used method is Hayashi's Quantification Theory Type I [17]. This method is a variant of the linear multiple regression analysis that can shows the connection between the properties and each Kansei factor.

V. Kansei Engineering Approach In Instructional Design

Many studies conducted have reported positive results from the use of Kansei Engineering methods in enhancing user's satisfaction on a particular product [17]. Advantages of using KE are that abstract feelings are visualized and made comprehensible. Thus, it may provide a structured support for integrating affective values into product design, especially in early and later stages of the product development process. Despite that, KE methods are not restricted only to the field of industrial and product design. There have been various attempts to incorporate KE in other fields such as e-commerce website design [19] and community design. Its application in instructional design is still yet to be thoroughly examined.

In applying Kansei Engineering methodology in instructional design, the steps taken are illustrated in Fig. 3 and its major steps are explained in the following sections.

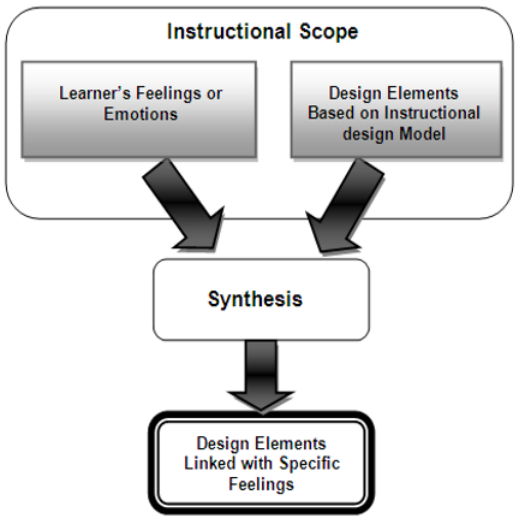

Fig. 3. Proposed approach for Kansei Engineering implementation in instructional design (Adapted from Chuah, Chen and Teh [20])

In designing instructional materials, a designer would commonly select a guiding model based on the scope of the instructional materials. This scope covers the descriptions of target learners, subject matter as well as learning objectives. After an instructional design model is chosen, the designer would proceed by generating design elements based on the prescribe methods or components of the model. To investigate whether the design elements are emotionally sound, it is then presented to the learners for Kansei evaluation. The synthesis process using statistical methods such as Quantification Theory Type I [18] can create links between learner's emotions and design elements and thus form groups of design element linked with specific feelings. In other words, instructional designers will be able to identify the design elements related to the component of the chosen instructional design model that can generate positive emotions. Hence, the final version of the instructional material that suit learners' desire and emotional needs can be created. However, unlike in conventional Kansei Engineering methodology, two important aspects needed close attention when applying the methods to the design of instructional materials: 1) selection of Kansei words and 2) determination of design attributes.

A. Selection of Kansei Words

In Kansei Engineering, user evaluation of a particular design element can be done using various techniques but the most common one is via Kansei survey, which includes a set of Kansei words listed in the form of good-bad manner. Instructional designers can obtain these words from various sources such as pertinent literature, target users, as well as experts. However, unlike in product design, the scope of Kansei words to be used in evaluating instructional learning materials is somewhat different. The selection of Kansei words for such purpose should cover emotions or adjectives closely related to the learning process.

The affective model by Kort, Reilly, and Picard [21] is one example that can guide the Kansei words selection process. The model divides emotions into positive affect and negative affect according to the cognitive dynamics of the learning process. It assumes that there is a process of specific emotions and equivalent cognition in learning context and those emotions are derived from 30 different emotion states. The emotions listed in the model are the common emotions involved in the learning process and it can serve as a guide in generating more Kansei words within the same scope. In addition to that, instructional designers should also be aware that the words selected for Kansei evaluation should be comprehensible to the users in order to obtain feedback that is more accurate and reliable.

B. Determination of Design Attributes

As mentioned in the Kansei Engineering methodology, the design elements are normally selected from the available products in the market. In the case of instructional design, such selection method may not be possible. Instead, in determining the design elements, careful reference to the components within the chosen instructional design model is crucial. In the initial stage, a complete instructional material fulfilling all the components in a chosen instructional model is developed. Then, depending on the intent of the instructional designer, design elements related to each component will be "manipulated" or "removed" accordingly. This will thus create a set of designs with different highlighted component for user evaluation. Target learners are required to rate all these design sets using the Semantic Differential questionnaire given to them. Changes to the learners' emotional state can then be identified by analysing the data collected using multivariate analysis. The output from the analysis is sets of design elements linked to specific feelings or emotions. This will provide valuable information for the instructional designers to determine which design elements that can be used to induce positive emotions.

VI. Conclusions

It can be noted from the review of literature (such as in [8] and [9]) that emotions played a major role in promoting effective and engaging learning. Nonetheless, studies that investigated emotions in instructional design were still insufficient and did not address the emotional divide in instructional materials. As such, this paper proposed the use of Kansei Engineering methodology in instructional design particularly in the design of instructional materials. It attempts to provide an alternative perspective towards inducing emotions in instructions. It is reckoned that Kansei Engineering methodology has the potentials to reduce the gap that exists between cognition and emotion in the process of designing and developing instructional materials regardless of its medium or technology. In addition, the possible connection between KE methodology and instructional design is useful in helping instructional designers to create emotionally sound materials that facilitate learning.

References

[1] L. O'Regan, "Emotion and e-learning," *Journal of Asynchronous Learning Networks*, vol. 7, no. 3, pp.78-92, 2003.

[2] M. Martinez, "Key design considerations for personalized learning on the Web", *Educational Technology and Society*, vol. 4, no.1, pp.26–40, 2001.

[3] B. Martin and L. Briggs, *The Affective and Cognitive Domains: Integration for Instruction and Research,* Englewood Cliffs: Educational Technology Publications, 1986.

[4] H. Astleitner, "Designing emotionally sound instruction: The FEASP-approach," *Instructional Science*, Vol. 28, pp.169-198, 2000.

[5] M. Glaser-Zikuda, Fub, S., Laukenmann, M, K. Metz, and C. Randler. "Promoting students' emotions and achievement—Instructional design and evaluation of the ECOLE-approach", *Learning and Instruction*, vol. 15, pp.481-495, 2005.

[6] P. Kleinginna and A. Kleinginna, "Categorized list of emotion definitions, with suggestions for a consensual definition," *Motivation and Emotion*, vol. 5, pp.345-379, 1981.

[7] R. Pekrun, "The impact of emotions on learning and achievement: towards a theory of cognitive/emotional mediators," *Applied Psychology: An International Review*, vol. 41, pp.359-376, 1992.

[8] A.M. Isen and J. Reeve, "The influence of positive affect on intrinsic and extrinsic motivation: Facilitating enjoyment of play, responsible work behaviour, and self-control," *Motivation and Emotion*, vol. 29, no. 4, pp.297-325, 2005.

[9] B.L. Fredickson, "What good are positive emotions?," *Review of General Psychology*, vol. 2, no. 3, pp.300-319, 1998.

[10] C.M. Reigeluth, "Instructional theory, practitioner needs, and new directions: some reflections," *Educational Technology*, vol. 37, pp.42–47, 1997.

[11] R.M. Gagné, *The Conditions of Learning (2nd ed.),* New York: Holt, Rinehart and Winston, 1970.

[12] B.G. Wilson, "Broadening our foundation for instructional design: Four pillars of practice," *Educational Technology*, vol. 45, no. 2, pp. 10-15, 2005.

[13] H. Astleitner and D. Leutner, "Designing instructional technology from an emotional perspective," *Journal of Research on Computing in Education*, vol. 32, pp. 497-510, 2000.

[14] S. Park and J. Lim, "Promoting positive emotion in multimedia learning using visual illustrations," *Journal of Educational Multimedia and Hypermedia*, vol. 16, no. 2, pp. 141-162, 2007.

[15] E. Um, H. Song and J. Plass, "The effect of positive emotions on multimedia learning," in *Proceedings of World Conference on Educational Multimedia, Hypermedia and Telecommunications 2007*, C. Montgomerie and J. Seale, Eds. VA: AACE, 2007, pp. 4176-4185

[16] M. Nagamachi, "Kansei Engineering: The implication and applications to product development," *IEEE International Conference*, 1999.

[17] S. Schütte, *Engineering emotional values in product design - Kansei Engineering in development*, Linköping Universitet: Sweden, 2005.

[18] M. Nagamachi, "Kansei Engineering: A new ergonomic consumer-oriented technology for product development," *International Journal of Industrial Ergonomics*, vol. 15, pp.3-11, 1995.

[19] M.L. Anitawati and M.N. Nor Laila, "Kansei Engineering Concept in E-commerce Website", *International Conference on Kansei Engineering and Intelligent Systems 2006*, Aizu-Wakamatsu, Japan, 2006, pp. 117-124

[20] K. M. Chuah, C. J. Chen and C. S. Teh. "Incorporating Kansei Engineering in instructional design: Designing virtual reality based learning environments from a novel perspective," *Themes in Science and Technology Education*, vol. 1, no. 1, pp. 37-48, 2008

[21] B. Kort, R. Reilly, and R.W. Picard, "An affective model of interplay between emotions and learning: Reengineering educational pedagogy-building a learning companion," *Proceedings of ICALT*, 2001.