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Values and Design Strategies of Emotional Design in Educational Games

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Abstract: With the educational value of games being more and more recognized, educational games are stepping into a new stage of rapid development. However, although the amount of educational games is rising fast, only a few can integrate well with both learning and gaming. Therefore, how to design educational games is becoming an important subject. This paper attempts to introduce an emotional approach to educational games design. First, the paper has a brief review of emotional design. Then the paper points out its values for educational games. Lastly, the paper puts forward a strategy framework which is composed of four parts: aesthetic design, flow design, social design and content design.

Keywords: Educational Games, Emotional Design, Design Strategy

1. Introduction

Educational game is computer game software which is instructive in cultivating users' knowledge, skill, intelligence, emotion, attitude and values (Lv, 2004). Researches have shown that educational games are of great value in creating learning environment, stimulating learning motivation and improving learning effect (Prensky, 2003).

In recent years, a great number of educational games have been developed, however, only a few has really incorporated in the classroom teaching, and many of them are not that fun either (Kirriemuir, & McFarlane, 2004). So how to design educational games well-integrated with learning and gaming is becoming an important issue.

In this study, we introduce an emotional approach to the design of educational games. The paper first addresses what is emotional design and why it is valuable for educational games. Then based on researches in psychology, neuroscience and design, the paper presents a framework of emotional design in educational games.

2. An Overview of Emotional Design

2.1 What is Emotional Design

Emotional design is a concept of product design originally proposed by Donald Norman (2005). It means incorporating emotions into products and creating positive experiences for users. To do so, a good design should address three levels: (a) The visceral level concerns with the aesthetic or attractiveness of an object; (b) The behavioral level considers the function and usability of a product; (c) The reflective level is about ones' thoughts afterwards, such as feelings, memories, reflections.

Based on that, Jordan (2002) identifies four kinds of pleasures that emotional design may evoke: (a) Physio-pleasure deals with the pleasure derived from the sensory organs, including taste, touch, and smell; (b) Socio-pleasure is the enjoyment derived from the company of others; (c) Psycho-pleasure is defined as pleasure obtained from a feeling of accomplishment. It is related to the extent to which a product can help in task fulfillment and make the process satisfying and effective; (d) Ideo-pleasure refers to pleasure derived from theoretical entities such as books, music, and art. It may relate to the aesthetics of a product and the values it embodies.

In education, emotional design has also been studied and applied. Some researchers have showed that emotional design of multimedia learning, such as using emotional design principles in redesigning graphics, can induce positive emotions in learners and in turn facilitate comprehension and transfer (Um, Plass, Hayward, & Homer,2012; Mayer, & Estrella, 2014). Besides, based on Norman's theory, Yang, Wang, & Liu (2016) and Zheng (2014) put forward their models and strategies of micro-lecture emotional design. The results of their experiment and teaching practice also show that emotional design can obviously stimulate learners' positive emotions and improve learning outcomes.

2.2 Definition and Value of Emotional Design in Educational Games

As to educational games, emotional design is still at an early stage. Li (2010) described emotional design in educational games as considering people's emotional experience when playing games during developing games. Some researchers conducted experiments on emotional design and found that using interface agents with emotional expressions and feedbacks can significantly increase students' motivation, enjoyment and learning performance (Guo, & Goh, 2016; Chen, Chou, Tseng, & Su, 2018). Besides, Dormann and Biddle (2008) analyzed several educational games and discovered that well-emotionally-designed games could effectively support students' affective learning.

Based on that, this paper defines the emotional design in educational games as a process of incorporating human emotions into educational games. And its value mainly has three aspects:

(a) Emotion is a critical measure of a game's attractiveness. Since game is an art of emotion transmission between designers and players, which means if players cannot acquire emotion experience (e.g. happiness, excitement, belongingness), they will soon abandon the game.

(b) Emotion is an important influencing factor and cognitive basis of learning. Researches have shown that positive emotion can facilitate learner's engagement and promote learning performance. Studies of cognitive processing also found that positive emotions can support information and communication processing, memory processing, negotiation, decision-making, creative problem solving, and sorting performance (Erez & Isen, 2002; Konradt, Filip, & Hoffman, 2003). Besides, negative emotions such as confusion, resulting from contradictions experienced during learning, can also result in deep learning (D'Mello, Lehman, Pekrun, & Graesser, 2013).

(c) Emotion itself is one of the most important instructional dimensions in education. However, today's educational games focus more on developing learners' knowledge, skill and ability, lack of attention and experience on cultivation of their emotions, attitudes and values.

3. Strategies of Emotional Design in Educational Games

This paper defines emotional design in educational games as three levels: visceral level, behavioral level and reflective levels. (a) the visceral level mainly concerns with the sensory and physical stimulation; (b)behavioral design focuses on the psychological and social pleasure brought by the interaction with others during the gaming process; (c) The reflective level considers about the depth of the content in order to stimulate the higher order thinking and ideological pleasure. Furthermore, this paper also presented some specific strategies and build a framework as follows:

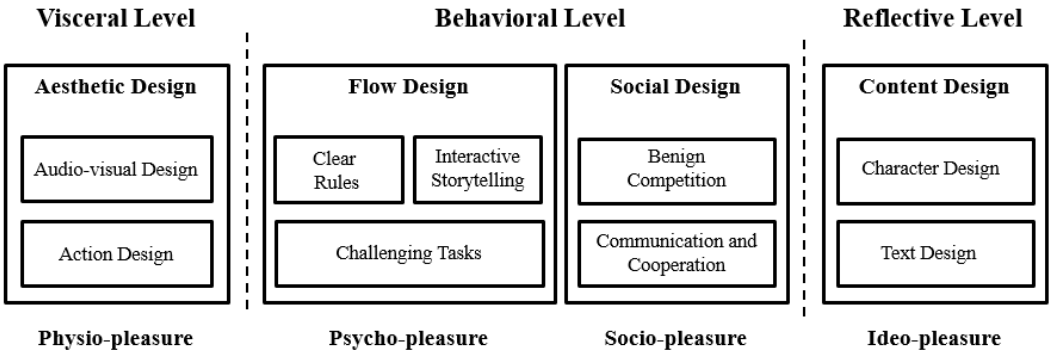

Figure 1. The Framework of Emotional Design in Educational Games

3.1 Aesthetic Design

With improvement of computer technology and hardware, educational games start to concentrate more on the expression of aesthetic elements. Some educational games have already equipped with beautiful pictures, moving music, even VR and somatosensory technology. As many aesthetics theories emphasized, art plays an important role in evoking, shaping, and modifying human feelings (Silvia,2005). Aesthetic design is one of the most crucial part of visceral level design. Here we discuss two aspects, Audi-visual design and action design.

3.1.1 Audio-visual Design

Audio-visual design involves all the elements of vision and hearing in games, including scenes, soundtracks, interfaces, images, animations and so on. Designers should keep all the elements with aesthetic standards, such as beautiful pictures, comprehensible interfaces, moving music. Besides, designers also need to create specific artistic designs to express expected emotional experiences.

For example, a famous game named *Journey* sought to develop an unusual game that can evoke feelings of smallness and awe. So they made the player control a robed avatar in a vast desert, traveling towards a mountain in the distance. On the path, the player would encounter deep snow, high winds, hostile giant creatures and many wonderful sights. The music is also unique and moving. Musicians composed and recorded different songs with different themes for each character and environment. These efforts ultimately enable players experience impressive and abundant emotions.

3.1.2 Action Design

Many researches of embodied cognition have pointed out that people's emotive, motivational and cognitive processes are deeply influenced by body's actions (Riskind, & Gotay,1982; Havas et al., 2010). In addition, psychologists also found that emotions are not only influenced by body actions, but also influenced by seeing others' body actions. When we simply observe other people's movements, the same brain neurons will be activated, just as we really performance actions with our own body (Price, Peterson, & Harmon-Jones, 2012).

These findings inspire educational games could affect players' emotional responses through action design. For example, *Dance Central 2* is a music rhythm somatosensory game. In the early version, developers used Kinect to capture players' dance movements and project them as real as possible to the screen. However, they soon realized that players did not like to see themselves on the screen, because their appearances and awkward dances might greatly affect their confidence. So developers decided to design an ideal avatar replacing players themselves which finally led to a great success. The avatar with graceful dances and lovely appearance not only deeply attracted players, but also made them more confident and dance better (Dean, & Matt, 2011).

3.2 Flow Design

Flow is the mental state of operation in which a person is totally absorbed in an activity with deep enjoyment, unawareness of irrelevant thoughts, and an altered sense of time (Csikszentmihalyi,1992). Generally, to achieve flow, three conditions need to be met: (a) clear goals and progress; (b) immediate feedback; (c) a balance between challenges and skills. In view of this, the paper proposes three design strategies.

3.2.1 Clear Rules

Many learners don't achieve good performances at school, not because they are not smart enough, but because the reality is full of distraction and uncertainty. Learners are hard to find a clear criterion and line to follow, which makes the process of learning difficult and unpleasant.

So clear rules mean educational games must set up a series of clear goals, clues, standards, feedbacks, so that players can know what to do, how to do, where to go, and how well they are doing.

All of these settings can help remove unnecessary noise information and make players concentrate on the core messages, which is crucial to improve learning motivations and performances.

3.2.2 Challenging Tasks

Researchers and game designers have emphasized that games must reflect the right balance of challenge and ability in order to maintain flow experience (Csikszentmihalyi, 1992; Chen, 2007). If the challenge is beyond players' ability, the activity will become so overwhelming that generating anxiety. If the challenge fails to engage players, players will quickly lose interest and tend to quit.

Vygotsky's theory of the zone of proximal development also points out that teachers should provide an environment that enables students to do tasks slightly beyond their ability (Wass, & Golding, 2014). When students cannot do on their own, teachers can offer just enough assistance to gradually develop their ability to do certain tasks.

Therefore, emotional design should note that assigning players with challenging tasks to arouse their curiosity and potentials. When players have made their efforts but still cannot overcome tasks, appropriate hints or guidance should be offered at the appropriate time.

3.2.3 Interactive Storytelling

Interactive storytelling means players are able to participate in the story, make choices independently and affect where the story goes (Crawford, Mine, & Lambert, 2012).

Psychologists have found that emotions arise from people's interpretations of their circumstances even in the absence of physiological arousal. In games, players have to encounter difference situations and make a lot of choices. At every situation, people will undergo a rapid and automated assessment about how each thing will impact on their goals and plans. During this process, emotions will be deeply aroused (Ellsworth, & Scherer, 2003).

Accordingly, designers should provide players with as many choices and corresponding feedbacks as possible. That will create more emotional stimulations for players. Through exploration, players' understanding of the right options and knowledge behind will also be greatly improved.

3.3 Social Design

Social interaction plays a very important role in the game. Many people play games not because how interesting games are, but because they enjoy the feelings of being with others. Mandryk and Inkpen (2004) also found evidence through experiment that people prefer playing against friends to playing against computers. When they play against friends, their physiological responses reflect more excitement and enjoyment. So it is important for educational games to create abundant and attractive social environment for players' interactions.

3.3.1 Communication and Cooperation

Many interpersonal social psychological researches have mentioned that cooperating with each other helps to build a sense of connection and affection (Marsh, Richardson, & Schmidt, 2009). Cooperative learning theory also holds that cooperation can promote students' academic achievements, self-confidence and learning satisfaction. Therefore, it is important for educational games to provide opportunities of interaction and communication, such as team system and chat functions. Encouraging cooperative actions among players by providing compliments for those active in team performance will enhance game's attractiveness and players' team spirits.

3.3.2 Benign Competition

Compared to excessive competition which may lead to anxiety, benign competition can bring people moderate pressure, thus motivate their potentials and raise learning efficiency. Meanwhile, students can learn from the comparison with others and achieve a sense of accomplishment by improving their shortages.

For example, Moreno (2012) implemented a score comparing mechanism in his computer programming game in order to encourage students to analyze their solutions and look for better ones. And research demonstrates that this comparing mechanism not only strengthens students' interest but also improves their educational effectiveness.

Therefore, some competitive elements like rankings and achievement badges should be taken in to consideration in educational games.

3.4 Content Design

Game content includes characters, dialogues, plots, world views etc. The design of content is a process of empowering all of the game elements with meaning and connections. Just as aesthetic design is games' skin and behavior design is games' skeleton, the content design is games' flesh and blood.

When people are reading a book, they may form a strong emotional attachment to the book characters, seeing what they see and feeling what they feel. Through proper content design, educational games can also immerse players on the characters and plots.

3.4.1 Character Design

Character design is composed of Player-Controlled Character (PCC) and Non-Player Character (NPC). PCC is the avatar that players directly control. It provides players with the opportunity to embrace the world as another individual, thus achieving completely different social practices, feelings and thoughts. Whether the PCC is real, logical and vivid largely influences players' sense of identification. NPCs are other characters not controlled by players. If PCC is the narrative's protagonist, NPCs can be thought of as the supporting cast. Similar to interactions among players, the interactions between players and NPCs is equally important.

It is essential for educational games to express the spirits and knowledge through game characters. Thus players could develop a sense of empathy and reflection out of the features, personalities and stories of characters.

3.4.2 Text Design

Game text includes any content related to words like dialogues, plots and world views, even pictures and animations which embedded with messages. For instance, *Hush* is a moral game based on a real historical event Rwandan Genocide. Players play a Rwandan Tutsi mother trying to calm her crying infant with a lullaby. If players didn't play well, the infant crying would alert the passing Hutu patrol which will lead mother and her child to a bloody end. Such unique plots design could greatly invoke people's reflection on wars and cultivating their sense of empathy.

Therefore, text design in educational games should integrate knowledge vividly with game rules and story backgrounds, in order to making them both interesting and meaningful, instead of simply moving schoolbooks into the game.

4. Conclusion

Emotional design is a design concept of integrating emotions into educational games. Based on researches in psychology, neuroscience and design, this paper proposes a strategy framework of emotional design in educational games which may be helpful for researchers developing their games.

As a relatively new area, emotional design is becoming increasingly important with the development of educational games. More and more researches should be initiated and discussed.

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