MEDIATING EFFECTS OF AVATAR REALISM LEVEL IN MOTIVATION IN GAME-BASED LEARNING – A RESEARCH PROPOSAL

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ABSTRACT

Referring to digital entertainment games, digital game-based learning (DGBL) expanded in several ways such as in using avatar to assist the students to learn on their own. Nevertheless, question arises as what type of avatar would be preferred by the learners in DGBL. Therefore, this study aims to identify how different level of realism of a game avatar would influence different elements of emotions (valence and arousal) and aspects of motivation among Malaysian tertiary level students in DGBL setting. For this research purpose, a DGBL with avatar entitled Colour Travel with five different realism levels has been developed and will be tested towards 300 students enrolled into Diploma in Computer Graphic Design at Cosmopoint College among 10 different campuses. It is a quasi-experimental study which investigates the effects of five different realism level of avatar in DGBL on the emotion and motivation of students. The research design approach will be five groups emotion test and motivation test, where all the five groups are experimental group. Emotion test and motivation test will be conducted by using suitable instrument which are a pictorial mood reporting based questionnaire adapted from SAM (Self-Assessment Manikin) and a questionnaire adapted from MSLQ (Motivated Strategies for Learning Questionnaire) respectively. Emotion and motivation will be tested at the first before playing the DGBL prototype and second test after playing the DGBL prototype. Descriptive analysis (mean and standard deviation) and inferential analysis (ANOVA, linear regression and multiple linear regressions) will be used to answer the research questions.

Keywords: *Avatar, Realism, DGBL, Emotion, Motivation*

1. INTRODUCTION

Usage of avatars as an educator in the virtual learning environment such as game is increasing as it is interactive, engaging, communicative and motivating whereby, these are important design requirements in a virtual learning environment (Ratan & Hasler, 2011). Another study stated that characters which are designed in the right aesthetic way, any level of realism or notion can be appealing (Hanson, 2005). Nevertheless, there were dearth studies conducted on how the realism level of an avatar in DGBL would influence the emotions and motivation of a learner since researchers stated that feeling experienced by learner during a learning progression offers evidence in the learning process which also motivates the learner (Novak & Johnson, 2012; Sincero, 2012). As such, this research is aimed to investigates how different level of realism of a game avatar would influence different elements of emotions (valence and arousal) and aspect of motivation among tertiary level students.

2. BACKGROUND STUDY

Educational digital games have become a huge research opportunity nowadays which has opened up plenty of research area for researchers to expand their ideas. It has also enabled players to immerse themselves into virtual world and acquire knowledge while having fun. Over the past

decade, implementation of DGBL has provoked important aspects in exploring in what manner games might be powerful tools in the classroom (Groff, Howells & Cranmer, 2010). There are also growing bodies of DGBL research in Malaysia to enhance both tertiary and also the secondary level students' knowledge acquisition. Nevertheless, in a virtual learning environment such as game-based learning, learners tend to complain online learning feels emotionless and detached since presence of coach or pal is missing in supporting learner via the instruction process. One way to overcome this problem is by using virtual characters or avatars to personalize the experience (Ratan & Hasler, 2011). However, implementation of DGBL particularly assisted by an avatar seems lacking in teaching and learning in Malaysia.

"Avatars is an online manifestation of self in a virtual world, and are designed to enhance interaction in a virtual space", (Peterson, 2005). Meanwhile, in a study conducted by Inal and Cagiltay (2006) stated that, when virtual space is implemented to represent classroom in game-based learning, educators prefer an avatar to represent them to increase student's motivation. By the same token, human-like avatars that have many characteristics are ideal to serve as tutors, coaches, or guides in game-based learning environments to provide knowledge-based facilities to the learners (Johnson, Rickel & Lester 2000). Avatar or virtual character has gone through several developments to suit the players need in a digital game environment. High technology advancement pave path to animators and game designers to design extremely realistic virtual characters (Tinwell, 2015). Doerr (2007), Hoggins (2010) and Ravaja et.al (2008) stated that, "increased in realism would allow the viewer to engage and enjoy the game that they play". Notably, according to MacDorman, Green, Ho and Koch (2009), users incline to be scared when a simulated character looks too human like. Masahari Mori (1970) has explained this phenomenon through a graph named the Uncanny Valley. The "valley" refers to that allegedly unavoidably creepy region in the middle. Mori (1970) claimed that the valley occurred for static and dynamic humanlike figures and inventor should not invent robots that might fall in the valley as such creation would be rejected by people. Meanwhile Hanson, et.al (2005) stated in their studies that there is almost utterly unexplored territory of intermediate designs between realistic and cartoonish character. Hence, Hanson et al, (2005) conducted a research to identify the acceptance level versus the realism level of virtual character among participants.

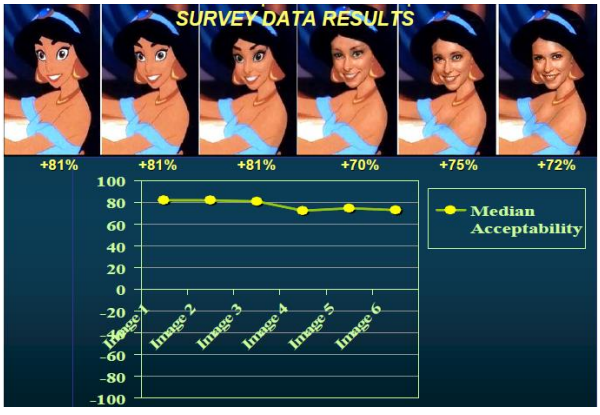

Figure 1.1: Percentage of respondent acceptance level base on the realistic level of 2D animated character and real human character (Hanson, 2005)

On the other hand, Schindler et al. (2017) has reviewed human brain responses to six professionally stylized faces that expresses happy, neutral and angry emotions varying from abstract to realistic by using an electroencephalogram or EEG measuring device. The data from the EEG reading found that 3D characters with happy emotions showed higher readings on the level of acceptance and comfort experienced by the respondents. However, the most realistic 3D characters in reading are almost identical to smiling and neutral face expression. It is also found that human emotion was less disturbed by a character that resembled a real human who portrayed a happy emotion like smiling.

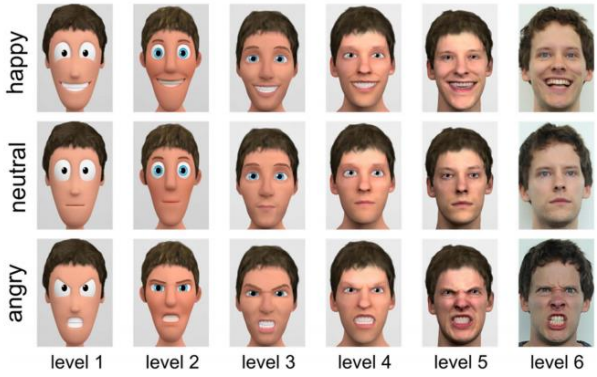

Figure 1.2: Expressions of emotion and neutral state in six different levels of realism (Schindler et al., 2017).

However, these studies did not explore different scopes of emotion involved among participants during the experiment. There are two scopes in emotion which fluctuates from calm and arousing (arousal) to positive to negative (valence) and concurrently (Russell, 2003). Studies have been conducted to identify whether emotions influence a player in a game. Hence, in a study conducted by Bailey, Wise and Bolls (2014) stated that, a game that is psychologically arousing will trigger the players to return back to play and stay extended. By the same token, students' emotions influence their motivation and performance (Muñoz, Lunney, Kevitt, Noguez, & Neri, 2013). Meanwhile studies also found that learning strategies, learning outcome and motivation enhanced by positive emotions (Pekrun, 2006; Pekrun, Goetz, Tiltz, & Perry, 2002). Alternatively, arousal too can improve learning and memory (Falk & Gillespie, 2009). As a matter of fact, psychology studies identified that valence and arousal in numerous levels contrarily impact the intellectual resources volume assigned in processing information (Lang, 2006). Nevertheless, there were fewer studies conducted in considering interaction effects between valence and arousal on different theories of motivation. "Motivation is a driving force behind both participation and progression in gaming environments", (Konetes, 2010). Motivation can be divided into two separate theories which are intrinsic (internal) motivation and extrinsic (external) motivation. As to date, numerous studies have been conducted either separately or combined to identify intrinsic and extrinsic motivational factor in DGBL. As pointed out earlier, usage of avatar in DGBL proven to motivate students (Inal & Cagiltay, 2006; Falloon, 2010). In line with this, studies have been conducted in features and metamorphosis of an anthropomorphic avatar that would motivate and

engage learners in a virtual environment (Nowak & Rauh, 2006). The term motivation and engagement has been a norm in DGBL world. In consequence, engaged students experience aroused pleasure that is synonymous with intrinsic motivation (Kang & Tan, 2014). Whereas, Lacovides, et.al (2011) stated that, in order to consider the recent game-related developments, the current motivation and engagement theories need to be revisited. Besides that, understanding the links between why people play games, what keeps them engaged in this process, and what they learn as a result could have a significant impact on how people value and use games for learning (Lacovides et al., 2011). Considering all these views together, this research aims to investigate how different level of realism of a game avatar would influence different elements of emotions (valence and arousal) and aspects of motivation among tertiary level students in DGBL settings.

3. THEORETICAL FRAMEWORK

This study is being grounded on Russell's Circumplex Model of Affect (1980) and Uncanny Valley phenomenon. "Circumplex Model of Affect is a theory proposing that emotions are distributed in a two-dimensional circular space, containing arousal and valence dimensions", (Russell, 1980). The vertical axis is represented by arousal where else horizontal axis represented by valence (Figure 1.3), and neutral valence and medium level arousal is represented at the centre of the circle (Rubin & Talerico, 2009). According to the model, the states of emotion can be indicated at any level of arousal and valence or even at a neutral level of one or both factors together. Every feeling can be depicted as a direct blend of these two measurements, or as variable degrees of both arousal and valence (Posner, Russell and Peterson, 2005). Delight, for instance, is a passionate condition that is the outcome related with positive valence or joy together with modest initiation with arousal (Posner, Russell and Peterson, 2005). Emotional states other than delight correspondingly emerge from a similar two neurophysiological frameworks however contrast in the degree or degree of enactment. Precise emotions in this way emerge out of examples of enactment inside these two neurophysiological frameworks, together with psychological elucidations and marking of these centre physiological encounters (Posner, Russell and Peterson, 2005). Circumplex models have been utilized most ordinarily to test stimuli of emotion words, emotional facial expressions, and emotional states (Rubin & Talerico, 2009).

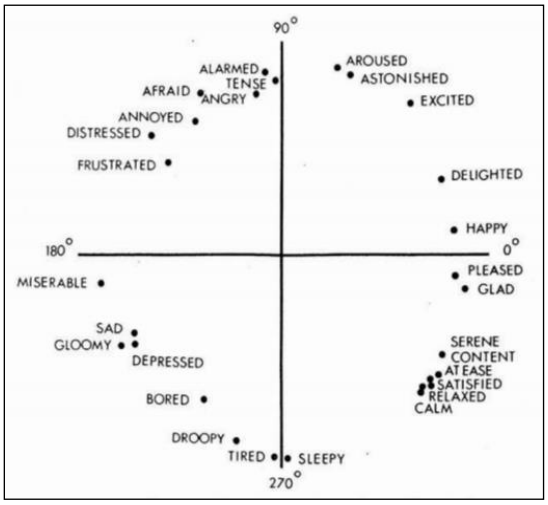

Figure 1.3: Russell's Circumplex Model of Affect (Russell, 1980)

Meanwhile, effects that arise from incorporating different realism level of avatar is explained via the Uncanny Valley phenomenon which will be the second theory this research has been grounded. Uncanny valley is a phenomenon that describes the relationship between different levels of realism of a character and towards the comfort and human emotions (Mori, 1970; MacDorman, 2006). Masahiro Mori's Uncanny Valley graph illustrates the phenomenon.

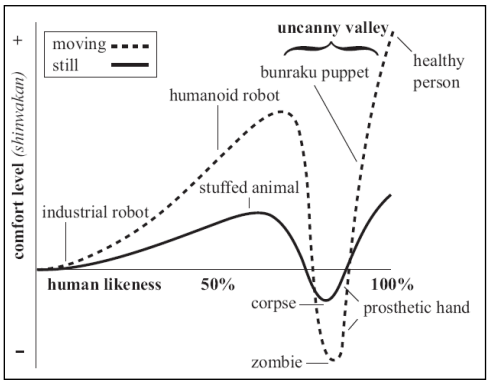

Figure 1.4: The Uncanny Valley Graph by Masahari Mori (MacDorman, Green, Ho, & Koch, 2009).

Figure 1.4 depicts the connection between comfort level and human likeness whereby it clearly states a character that look too realistic will scare the audience even with a smallest defect (MacDorman, Green, Ho, & Koch, 2009). This situation excavated when the character moves (MacDorman, Green, Ho, & Koch, 2009). Nevertheless, the human emotion graph increased to positive level when the character is a real human (Mori, 1970; MacDorman, 2006). In sum, by adapting to these theories, principles and the literature overview, a conceptual framework has been proposed as depicted in Figure 1.5.

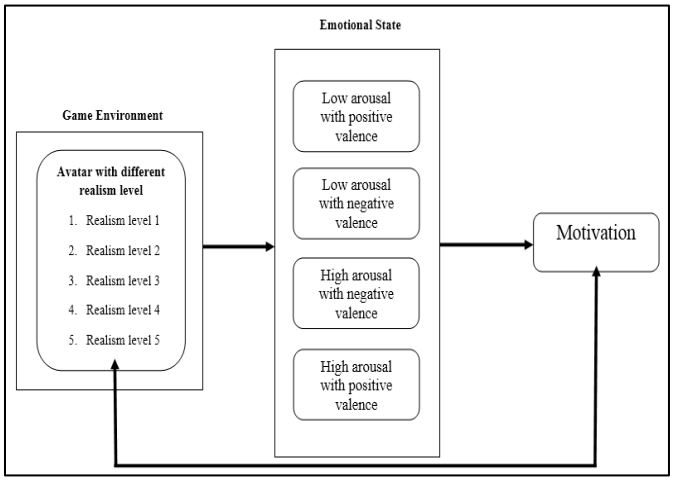

Figure 1.5: A conceptual framework for colour travel digital game.

4. PROBLEM STATEMENT

One of the challenges in designing a DGBL is getting the students engaged with the content and stay in the game. In order to get the students engaged, a motivational factor needs to be implemented in the DGBL environment. In this case, implementation of an avatar in DGBL environment would motivate and engage the students as avatar would represent a coach or a buddy in the virtual world. However, question arises as what level of realism would be appropriate in order to make the students motivated and engaged. This situation evolves as many theories and studies have stated that different realism level would create different emotions among students. As stated earlier, there are two scopes in emotion which are valence and arousal. A DGBL which is physiologically arousing will encourage the learner to sustain in the game and play longer. As such, emotions influence the students' performance and motivation to sustain in the game (Muñoz et al., 2013). Learner's intrinsic and extrinsic motives in participating and becoming engaged with an educational game content usually portrayed in their motivation (Konetes, 2010). The intrinsic motivational factors created in an educational game is used to measure the advance stages of achievement in the game. On the other hand, extrinsic motivational factors vary in terms of attract and demand since the learner becomes motivated by the desire to achieve a reward for their participation or to avoid the consequence for non-participation (Konetes, 2010). Therefore, sustaining the elements perhaps require having relation between realism, emotion and motivation. Nevertheless, there is dearth of research conducted in investigating how different level of realism of a game avatar would influence different elements of emotions (valence and arousal) and aspects of motivation among Malaysian tertiary level students in DGBL. Game-based learning as such is less conducted among tertiary level students compared to schools and pre-schools students especially with virtual environments which are highly interactive (Terzidou, et.al, 2012). Thus, this research is conducted to fill this gap.

4.1 Research Objectives

The objectives of this research are:

Development:

1. DGBL prototype development entitled Study on Colours five with different avatar realism level.
2. Usability (UX) and User Satisfaction study of the DGBL prototype developed.

Research:

1. To analyse if there will be any significant difference in emotion level of students who undergo different realism level of avatar in DGBL.
2. To analyse if there will be any significant difference in motivation level of students who undergo different realism level of avatar in DGBL.
3. To analyse if emotion appeared to be a significant mediator in determining the motivation of students who undergo different realism level of avatar in DGBL.

4.2 Research Questions

1. Will there be any significant difference in arousal and positive valence students who undergo different realism level of avatar in DGBL?
2. Will there be any significant difference in arousal and negative valence of students who undergo different realism level of avatar in DGBL?
3. Will there be any significant difference in motivation level of students who undergo different realism level of avatar in DGBL?
4. Is arousal and positive valence a significant mediator in determining the motivation of students who undergo different realism level of avatar in DGBL?
5. Is arousal and negative valence a significant mediator in determining the motivation of students who undergo different realism level of avatar in DGBL?

4.3 Hypotheses

Hypotheses derived based on pass studies related literature and theoretical framework grounded are as follows:

Ha1. There will be a significant difference in arousal and positive valence of students who undergo different realism level of avatar in DGBL.

Ha2. There will be a significant difference in arousal and negative valence of students who undergo different realism level of avatar in DGBL.

Ha3. The will be a significant difference in motivation level of students who undergo different realism level of avatar in DGBL.

Ha4. Arousal and positive valence are a significant mediator in determining the motivation of students who undergo different realism level of avatar in DGBL.

Ha5. Arousal and negative valence are a significant mediator in determining the motivation of students who undergo different realism level of avatar in DGBL.

5. METHODOLOGY

For this research purpose, a DGBL with avatar entitled Colour Travel with five different realism levels has been developed. This DGBL is being tested towards students enrolled into Diploma in Computer Graphic Design at Cosmopoint College at 10 different campuses. All of 10 campuses of Cosmopoint College are offering Diploma in Computer Graphic Design program. It is a quasi-experimental study which examines the effects of five different realism level of avatar in DGBL on the emotion and motivation of students. 300 samples will be used for this research purpose. These 300 students will be identified randomly and will be divided into five groups with 60 students each. The groups will be contained with balanced proportions of gender. The research design approach is five groups emotion test and motivation test, where all the five groups are experimental group. The research conducted involves three types of variables which are independent variable (IV) the realism level, mediating variable (MV) the students' emotion and dependent variable (DV) the students' motivation. Emotion test and motivation test will be conducted by using suitable instrument which are a pictorial mood reporting based questionnaire

adapted from SAM (Self-Assessment Manikin) and a questionnaire adapted from MSLQ (Motivated Strategies for Learning Questionnaire) respectively. Emotion and motivation will be tested at the first before playing the DGBL prototype and second test after playing the DGBL prototype. Descriptive analysis (mean and standard deviation) and inferential analysis (ANOVA, linear regression and multiple linear regressions) will be used to answer the research questions.

6. CONCLUSION

Over the years there has been numerous amount of study of DGBL technologies and concepts conducted to improve teaching and learning, for both training and education purposes. DGBL is being a trend in the world of academia as it is known for motivating and engaging students to acquire knowledge. Hence, in order to fulfil learners' expectation to have a virtual teacher, avatar been introduced to represent an educator. However, there have been many studies conducted in order to represent an avatar that would accommodate the need of all kind of learners. As such, studies also have been conducted in order to identify the level of realism prefered by user of an anthropomophic character in a virtual interaction. By the same token, there were dearth research conducted in order to identify the emotional aspect of user when they are interacting with avatar that was developed with different level of realism and the motivation theory involved while learning using avatar with different realism level. Underlining to that, this research is vital in identifying how different level of realism of a game avatar would influence different elements of emotions (valence and arousal) and aspects of motivation among Malaysian tertiary level students in DGBL settings.

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