Abstract or Realistic Style: Inclusive Designing for Student Experience in Educational Games

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Emphasizing on visual design possibilities, which is something that is always questionable on how the visual directing as a phenomenon to ameliorate meaningful interactive experiences in educational games, especially in Malaysia, where the implementation of educational games needed be addressed the extent of visual design in educational game development that suit local student preferences. In dedicated to understanding the effectiveness visual design in educational games to eliciting students' experiences. This study investigates the impact of 'Abstract' and 'Realistic' styles on student motivation, engagement and enjoyment of an educational games. The both graphic style approaches have been obtained much attention and discussion in the game design ever since, especially the suitability and endurability aspect are disputed heatedly. In this study, the experimental design was applied in order to identifies the relationship between the graphic styles and student's experiences in educational games. Experience Based Design Graphic Style (EBDGS) prototypes were developed which consists of EBDGS A (Abstract) and EBDGS R (Realistic) to review the relationship between each graphic style and students' experience domains. A questionnaire was conducted on 240 local Form One students to obtain their perceptions and experiences derived from EBDGS prototypes design. The results showed vast majority of students gained positive experiences through the EBDGS A (Abstract) version, through the experimentation of 'abstract' styles in educational game design. This also indirect reflect the 'Abstract' style as a visual mark that can alter the experience of the senses and as catalyst for learning development towards educational games.

Keywords: abstract style; realistic style; visual design; educational games; student's experiences

I. INTRODUCTION

Despite the many advances in educational game development in the classroom, however, the relevant visual design is another challenge that needs to be addressed to improve the performance and potential of educational games to enhance the learning process among students. Additionally, preliminary investigations show the lack of development and evaluation of educational games, especially in the aspects of visual design for Form One students in Secondary Schools. The preliminary results pointing out the required to understand the discrepancy between visual design appearance and student experiences. Suitable graphic styles in educational games need to be identified by the designers and educators following the Malaysian students' perceptions in order to enhance the students' motivation and immerse them in the game environment (Lilian & Jasni, 2016). Critically review the literature (Lin *et al.*, 2015; Deen, 2015, Ying, 2014) also emphasised the importance of visual design in the gamification concept. A better visual appearance play an indispensable role in enhancing the suitability and usability of educational games to eliciting student's attentiveness responses (Wang and Lee, 2014; Whitton, 2011).

As an effort to enrich the educational game design, identify and understand the visual design is the main aspect that needs to be studied. This approach the term "graphic styles" as the analytical concept in discussing and analysing the visual design intentions in relation how graphic styles be implemented as a necessity for increasing the student's interest and feeling. The "Abstract" and "Realistic" style has an influential condition in continuing discussion of the visual design paradigm be applied and represented in game scenes

(Lindh, 2018; Bollini, 2017). Growth and evolution of visual game designs have sparked debate about a better approach between 'Abstract' styles and 'Realistic' styles (Gullick *et al.*, 2017). Consequently, the educational game design value is determined by taking a closer look on the 'Abstract' and 'Realistic' style, which act as 'indicating functions' generating whole interaction sequences.

This intended that educational game designs (design-in-use) should concern with suitability visual designs (design intentions) by prioritizing students' reactions (experiences). Understanding the relationship between visual design and students' experiences are essential to sustain subject-related knowledge educational gaming design contexts. By mapping the graphic style (abstract and realistic style) as assessment of the degree efficacy educational games towards the ways of the visual appearance appeal. This study attempts to indicate conducive visual appearances in educational games amplify consistencies experience outcomes, particularly in terms of motivation, engagement and enjoyment. Accordingly, determining suitability of graphic style providing support and aid to fittings the formation educational gaming that attains students' preferences and perceptions. Therefore, a well-blended design is needed in an educational game in order to sustaining our Malaysian students' experiences increasing continuously.

II. VISUAL DESIGN AND STUDENT'S EXPERIENCES

In a visual context, images or graphs can convey information accurately as well retained longer in memory storage (Landa, 2012). The visual design is information, which aims to provide students with better presentation and understanding (Wong, 2006). Accordingly, development of multimedia applications and games brings the visual effect paths as an important element to delivers an appropriate and attractive appearances. This also showed visual design is the consideration factor in showing natural interaction between human and game (Druin & Hourcade, 2005; Tversky, 2005). As mentioned above, visual design is an important component of educational games as a stimulus to attract and engage students towards the learning content presented (Deen, 2015).

Periphrastic visual is to evoke emotion and reaction for proposing individual experiences. As well as visual in games that intend to enrich the visualization to generate player experience (McLaughlin *et al.*, 2010; Deen, 2015). Thereby,

how visual is applied in the design principles are primarily bound to the results of the player's experience of the game. This also indicate that visuals and experiences interconnected relationships between each other (Shi & Shih, 2015). Therefore, assessing the visual design is to understand the students' priorities and preferences regard the educational game appearances - graphic style was reacting as variables intended identify the student experiences, in which three main experiences are motivation, engagement and enjoyment (Johnson & Wiles, 2003; Iacovides *et al.*, 2011; Scoresby and Shelton, 2011; Ibrahim *et al.*, 2012) acquired by individual during gameplay.

III. ABSTRACT VS. REALISTIC STYLE

The word 'graphic style' refers to design techniques created by the artist to describe a mood and feature that will be communicated to the audience (Muller, 1979). This also indicated that the terms of graphic style are more emphasis on the overall game environment, including characters, objects and atmospheres, based on the basic elements, concepts, and expressions. Abstract style is a design style that emphasizes minimalist visual nature, especially avoiding realistic disciplines such as drop shadows, bevels, emboss and gradients (Oswald, 2015). This style uses two-dimensional designs with simplified art elements - maintaining simple forms, solid colours and restricted textures (McLaughlin *et al.*, 2010). Briefly summarized, abstract style is more intensive to bring forth the visual appearances that pinch on the simple design.

In contrast, the realistic style more closely imitates the appearance of real objects (Robbins, 2014; Rose, 2013). The concept of this style is practiced in game design with the use of art elements that are closest to the real object view in order to induce a feeling of familiarity for the players. As this style accentuate on the visualization details in terms of artificial textures, drop shadow, embossed and gradient shading for the artistic purposes (Morson, 2014). Differences abstract and realistic representation can be seen in terms of the artistic quality complexities associated with elements of art in detail. Seen abstract style is a visual concept that tends to simplify the appearance of artwork and is less visible naturally. Instead, realistic style is a process and visualization techniques that increase the specifics of art elements. Both styles have different characteristics to produce a gaming

environment - as the overall art direction to the game background, characters, objects and assets.

IV. THE PERCPETIVE OF 'ABSTRACT' AND 'REALISTIC' STYLES

Evolution of video game art designs has sparked debate about a better approach between 'Abstract' and 'Realistic' styles (Gullick *et al.*, 2017) to emphasis the artistic and design the visual game representations. From an 'Abstract' point of view, simplicity more facilitates information delivery (McCloud, 1994) and observations by the students, where increased popularity of 'Abstract' style in the mobile gaming (Egenfeldt-Nielsen *et al.,* 2015) indicates the abstraction as a good design option should be practiced due to their familiarity and acceptance of the players. As well, largely missed the consideration to examine the 'Abstract' style (Gullick *et al.*, 2017) has revived the opportunity to examine the 'Abstract' style binds experiences well in the educational games.

However, contrastively, when the three-dimensional visualization became a major trend in the 1990s for the game graphics, the realistic outlook the desired style for the modern games (Low, 2001). The 'Realistic' styles still dominate the mainstream of video game art to generate strong imagination as important to disseminate information on game scenes. Regards, Perry (2009) insists on bringing an idea of realistic game into the classroom, supported by Smeureanu and Isăilă (2017) who posits that 3D environment in educational games that realistically visualizes facilitate the relationship of imagination throughout the game and improve learning motivation, where an overview of 'realistic' style can bring forth more positive students' emotions and experiences in educational games needed be reviewed (Selmbacherova *et al.*, 2014). Based on the viewpoint above, the effectiveness of "Abstract' and 'Realistic' styles to the tendency of art appreciation, especially the positive experiences brought into the educational games should be noted clearly based on student's perception and reaction in order to understanding the suitability of graphic representations in encompassing two different graphic styles.

V. STUDY'S HYPOTHESES

The grandness of this research was to better understand how and to what degree specific visual design affect the student need and satisfaction towards educational games. Therefore, three research hypotheses have been presented to refer to the consideration of the above-mentioned matters.

H1. There is a significant difference effects of two graphic style modes in Experience Based Design Graphic Style (EBDGS) on student's motivation.

H2. There is a significant difference effects of two graphic style modes in Experience Based Design Graphic Style (EBDGS) on student's engagement.

H3. There is a significant difference effects of two graphic style modes in Experience Based Design Graphic Style (EBDGS) on student's enjoyment.

VI. MATERIALS AND METHOD

A total of 240 Form One students was involved in this study. Each student is randomly selected based on simple random sampling technique. As to lessen potential threats, the student sample must adhere to the following characteristics: i) studying under the same implementation of Learning Curriculum Policy, ii) possess equivalent academic achievement and iii) possess basic skills in computer usage. All students were divided into two experiment groups: N = 120 in EBDGS A (Abstract) and N = 120 in EBDGS R (Realistic). The students will play the game prototypes (PC-based) individually with confidentiality concept is practiced preventing any interaction between the two groups of students. The playing session for both EBDGS will only take 40 minutes.

In ordination to enable this experimental study, two EBDGS game prototypes are designed in accordance 'Abstract' and 'Realistic' representation mode, which classified as EBDGS A (Abstract) and EBDGS R (Realistic). The both EBDGS prototypes display are illustrated as in Figure 1.
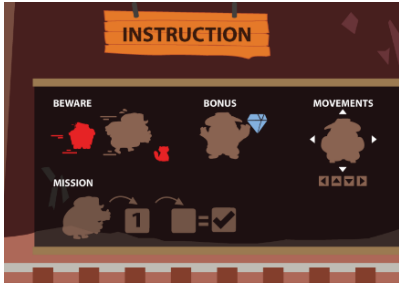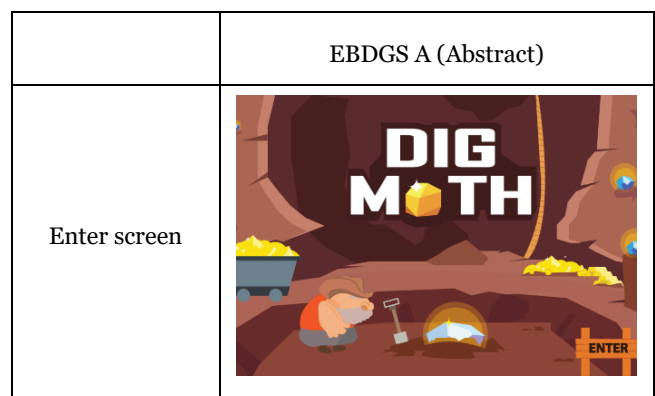
	EBDGS A (Abstract)
Enter screen	

Introduction screen displayed	
The gameplay learning activities scene (Factoring Topic)	
The gameplay learning activities scene (Highest Common Factor Topic)	

Figure 1. The design concept of EBDGS A (Abstract) based on Abstract representation mode.

EBDGS R (Realistic)	
Enter screen	
Introduction screen displayed	

The gameplay learning activities scene (Factoring Topic)	
The gameplay learning activities scene (Highest Common Factor Topic)	

Figure 2. The design concept of EBDGS R (Realistic) based on Realistic representation mode.

Both prototypes are only introduced as EBDGS in order to prevent students being biased towards one specific prototype during the treatment sessions. The Student Experience in Graphic Measurement Scale (SEIGMS) questionnaire is given after the students finish the gameplay sessions. The questionnaire items developed to assess the motivation, engagement and enjoyment of the students towards the visual appearance of the EBDGS prototypes, which is based on the concept of 'Abstract' and 'Realistic' representation mode. Each of the three variables consisted of 7 to 14 items. The items used five-point Likert scales.

VII. RESULTS AND DISCUSSION

Table 1 indicated the students respond and characterized the EBDGS versions in highlighted on the motivation, engagement and enjoyment outcomes. The results will be described in further detail for each proposed research hypothesis.

H1. Regarding the motivation, there was a significant difference on EBDGS versions, t (238) = 4.981, p < 0.001, in which students who experienced the EBDGS A were more significantly motivated (M = 3.975, SD = 0.765) than students who played the EBDGS R mode (M = 3.450, SD = 0.864). Students in the gaming environment with 'Abstract' style

conditions had significantly higher levels of motivation with simplistic and flat design. Accordingly, H1 is supported.

H2. Concerning the engagement, there was a significant effect of engaging between both versions of EBDGS, t (238) = 3.729, p < 0.001. In this experimental condition, students in the EBGDS A were more immersed (M = 3.817, SD = 0.884) compared to the students who participant in EBDGS R (M = 3.401, SD = 0.841). Students had significantly higher level of engagement with the abstract design appearances than the realistic displays in educational game purpose. Thus, H2 is supported.

H3. Regarding the enjoyment, students who are exposed to EBDGS A (M = 4.050, SD = 0.915) were significantly more enjoyed than the students in EBDGS R (M = 3.625, SD = 0.969; t (238) = 3.491, p = 0.001. Result showed students in the abstraction surrounding gaming outlook had significantly higher levels of enjoyment. Hence, H3 is supported.

Table 1. The student experience outcomes towards both EBDGS versions

	Experiment	N	Mean	SD	t	P
Motivation					4.98	.000*
	EBDGS A (Abstract)	120	3.97	0.76		
	EBDGS R (Realistic)	120	3.45	0.86		
					3.729	.000*
Engagement	EBDGS A (Abstract)	120	3.81	0.88		
	EBDGS R (Realistic)	120	3.40	0.84		
					3.49	.001*
Enjoyment	EBDGS A (Abstract)	120	4.05	0.91	3.491	.001*
	EBDGS R (Realistic)	120	3.62	0.96		

*p < 0.05

Findings from this study indicate a high interest among students towards 'Abstract' style implication for their learning activities in an educational game. The students have shown great positive experiences in using the EBDGS A especially enhancing their motivation, engagement and enjoyment. This reinforce the highlighted part that 'Abstract' is easier to be accepted and to deliver the information to students as supported by McCloud Theory, where sense of positive experiences is "interlink" by "Abstract' style to give attention and focus in the game. The current study adds to the previous studies (Whitton, 2011; Soylucicek, 2012; Dickey, 2015) that emphasize visual design as a variable in effectiveness of educational games, and the importance of 'Abstract' style is one of the current studies that could append to the educational games.

Additionally, the 'Abstract' style might be more suitable for certain learning subject, particularly mathematic topics in order to enhancing student involvement and sensation. Gaining high acceptance of abstraction game design may be one of the solutions to stimulate student interest in an educational game. Based on students' perceptions, interval testing in student achievement scores would be the next step. An additional sub-categories of abstract style technique should be examined in further studies. Consequently, it is vital to identify the art elements (form, texture and shading) at a detail level, which developing a visual design guideline to manipulate the 'Abstract' and 'Realistic' style precisely to enriching and dynamic visual design of the game. Additionally, evaluate the student backgrounds (gender, age and area) is needed in order to determine the strength between 'Abstract' style and students' experiences in educational gaming design conditions

VIII. CONCLUSION

The results of the study provide an overview and guidance for gamification research especially the issues relating to how different graphic styles influence the student experiences significantly. Observation and assessment the differences of graphic styles provide a wider perspective on visual design topics as to explore the relevant idea visualization in designing an educational game. The concept of 'Abstract' style was capable enhancing positive experience outcomes, as also was successfully consider applied to the educational game design concept. The 'Abstract' is more preferred and suitable design - as an external factor that more influences in the context of gaming learning activities. This study also provides recommendations and insight to the research's gap addressed the lack of visual design and effects of visual design in game on an individual experience (McLaughlin *et al.*, 2010, Whitton, 2011, Whitton, 2014; Deen, 2015; Dickey, 2015). Regards, how to design, and visual designs are employed to

help certain student groups to interact with educational games are essential to improving the learning and teaching process. It also states that the impact of educational games on student satisfaction and needs also depends on the artistic and quality of gaming appearance. In other words, visual design plays an important role, as emphasized by Whitton (2011). For this reason, research findings suggest 'Abstract' style can be a powerful design guide to improve student experiences (motivation, engagement and enjoyment), as long as this style of design is well designed and applied in a robust implementation prototype.

X.   REFERENCES

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