Infusing Engagement into Digital Game-based Learning Design for Orang Asli Learners

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Keywords: Design Guidelines, DGBL, Engagement, Game Design, Orang Asli learners.

Abstract: The advancement of technological applications has paved the way to the rapid development of digital modules across learning subjects. Employment of digital game-based (DGBL) methodology in a classroom setting is increasing in number as it has the potential to offer overwhelmingly engaging experiences to learners. However, teachers often whine over the one-size-fits-all game designs of the presently available DGBL materials which often do not cater to the needs of marginalized indigenous learners, Orang Asli in this context of the review, thus discouraging them to be fully engaged in lessons. Therefore, integrating digital game-play into learning becomes a daunting task without a comprehensive understanding of what game design engages learners the best. The aims of this paper are to 1) review the place of engagement in the digital platform by synthesizing game designs that effectively affect engagement and 2) propose relevant, engaging design guidelines meant for the learning of marginalized learners. This is the first review article proposing game design guidelines that are engagement friendly, and context-sensitive to these indigenous learners who will be termed as Orang Asli learners in the rest of this article. The implications of the review are two-fold: addressing the significance of engaging DGBL activities and providing a set of DGBL design guidelines for educational technologists to consider in their future DGBL projects.

1   INTRODUCTION

The right learning stimulus can extrinsically motivate learners in the classroom, resulting the learners to get engaged and later intrinsically push them to fulfill the assigned learning tasks. Studies on learning engagement have gained growing attention from academicians around the globe, but the focus has been short in which engagement is always viewed as the subcategory of motivation. A plethora of research has embarked on exploring learners' motivation in the classroom (Ahmad, 2016; Ali Mohsen, 2016; Calvo-Ferrer, 2015). Ironically, despite motivation is the core focus, the discussions of the findings dominantly used the terms 'engagement', 'cognitive engagement', 'task engagement', 'disengagement', 'engaged', and 'engaging' in discussing how the learners responded.   Thus, studies specifically concentrating on engagement in DGBL platform are empirically scarce in number and worth to be explored further.

This review aims to establish the place of engagement in DGBL studies while at the same time exploring the potential game designs that are

engagement friendly and consequently cater to the needs of hard-to-engage Orang Asli learners. This short exploratory review of the literature (Hallinger, 2013) examines past relevant DGBL studies that testified, directly or indirectly, engagement as one of the learning outcomes. Due to the very limited number of studies related to the engagement of Orang Asli in DGBL environment, studies targeting marginalized learners as samples were also chosen. We employed Google Scholar TM as the primary research tool due to its powerful capability to locate potential articles across databases around the world. Keywords like "DGBL", "engagement", "special education", "special needs", "CALL", "digital platform", "indigenous", "native" and "Orang Asli" were keyed in into the search engine to sieve the potential articles. As many as 46 articles were retrieved and filtered further for their relevancy. Finally, ten relevant articles from 2010 to 2017 were finally chosen by after they were reviewed for contents about the objectives of this review.

Orang Asli learners experienced an extreme deficiency in learning across subjects (Renganathan, 2016; Ma'alip, 2016). Orang Asli learners' attitudinal

behaviors in class are distinctly different as compared to other groups of learners; they do not show any signs of dejected behaviors towards what is being taught in classroom-like not doing the homework given and skipping lessons as opposed to what many students of other races always do. Despite having good behaviors, many of them were reported to experience basic literacy and numeracy (3R) problems (Md Nor et.al, 2011; Mihat, 2013). High anxiety in learning has been identified as the main factor contributing to these problems (Pawanchik et.al, 2010). High anxiety level inhibits them from engaging themselves to be an active learner and this sad state of affair has posed a real challenge for teachers to teach this group of learners.

In response to this issue, coupled with the growing trend of DGBL utilization in the classroom, transactional study, utilizing design and development research method (Richey et.al, 2010) to design and develop DGBL materials, has been seen as an alternative to improve learning engagement in the classroom.

The engaging design is proposed to be infused into the design and development of DGBL module with the aim to break the spell of reclusiveness among Orang Asli learners. Nevertheless, teachers in Malaysia often claim over the generic designs of the presently available DGBL materials that do not cater to the needs of Orang Asli learners and this has violated the rule of thumb in design-based research in which design elements embedded in any DGBL modules should be contextually sensitive (Wang & Hannafin, 2005). The problem is substantiated with the recent move by the Ministry of Education of Malaysia (MOE), officially announced in the Malaysia education development plan 2013-2015, to introduce the Asli Penan Curriculum (KAP) to cater to the needs of indigenous communities (Mihat, 2013).

Therefore, contextually sensitive elements of marginalized learners with relevant engaging designs about the social and cultural contacts of those learners were synthesized in this review. For instructional technologists, integrating digital game-play into learning is no mean feat without comprehensive input and understanding on what game design engages learners the best (Qian & Clark, 2016). In the context of Orang Asli learners in Malaysia, our review of articles addressed the following two guiding questions:

1. What is the place of engagement in the digital platform by synthesizing game designs that effectively affect engagement?

2. What are the engaging design guidelines relevant to be utilized in the design of DGBL module for Orang Asli learners?

2 LITERARY REVIEW

The definition of engagement used in this review is based on Vygotsky's (1978) social constructivist theory of how human constructs world knowledge based on the different environments they are in. He argues that knowledge construction and active engagement in learning are pre-defined by social and cultural contexts. Social interaction influences learners' knowledge 'absorption'. Learners scaffold the knowledge which is embedded within social and cultural contexts via meaning negotiation and sense-making process.

The implications of Vygotsky's view have given significant impact to the present teaching and learning processes. One of them is that, to scaffold learners of diverse backgrounds, it is pivotal for teachers to consider infusing authentic and meaningful learning (Kaufman, 2004) into social and cultural interactions to make learners engaged with given learning tasks and thus drive their understandings way forward.

In the context of instructional technology, Kasper (Kasper, 2000) contends that the employment of technology in learning increases learner motivation in which learners are stimulated to be engaged with language and content. Technological platforms are viewed as powerful teaching tools, having the capability to provide virtual yet authentic tasks, that cannot be offered by traditional classroom teaching. Apart from that, DGBL, one of many manifestations of computer-assisted language learning (CALL), contributes to the following advantages in getting learners engaged; less instructor time per student and instantaneous feedback features that respectively promote a sense of autonomous learning and immediate feedback (Pittman & Edmond, 2016).

Aragon, Johnson, and Shaik (Aragon et.al, 2002) review on Curry's (1991) Theoretical Model of Learning Style Components and Effects. The model theorizes the consideration of factors such as motivation maintenance and task engagement when designing any educational program. Such specific information-processing orientations dictate learner learning styles and learning success. Motivation maintenance and task engagement complement one another in the sense that the former is realized first by learner via positive motivation. The later then comes in the form of the desired magnitude of task engagement that is illustrated into "active effort,

behavior, and cognitive processing to integrate the new information into long-term memory" (Curry, 1991). Thus, the following figure is put forth as a conceptual framework to guide our review:
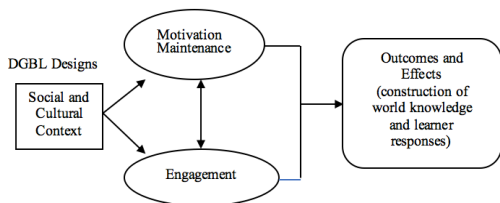

Figure 1: Conceptual framework.

Conceptual framework for reviewing articles related to engagement in DGBL platform for Orang Asli learners

Reflecting on the dominant influence of motivation towards student learning, infusing explicit engaging elements into learning design is of importance to be implemented although engagement in the first place is initiated as a result of motivation. As highlighted by Dormann, Whitson, & Biddle (2011) design structures should not come from pre-conceived notions for them to be working well in various contexts. Hence, careful synthesis on various game designs in tandem with engagement factor and the needs-based design of learners of specific needs should be carried out and concurrently relevant game design guidelines that celebrate learning engagement and have the potential to cater the socially and culturally sensitive needs of Orang Asli learners were put forth.

3 CREATING LEARNING ENGAGEMENT VIA DGBL

Research outcomes from several studies of different designs related to learning engagement in the digital platform have served as the foci of this review, leading to an understanding on the importance of designing digital learning platform. These foci, together with the 'best' practices from past research via borrowing and adapting techniques in developmental research (Alias, 2007) could lead to the proposal of initial design guidelines which aim to guide future development efforts.

Firstly, engagement affects motivation, curiosity, interests, control and learning effectiveness (Ali Mohsen, 2016; Calvo-Ferrer, 2015; Thanabalan, 2015; Katuk, 2013). Thanabalan et al. (2015) conducted qualitative interview sessions with ten English Language teachers from Orang Asli schools and observations to observe English as a Second Language (ESL) learning in the classroom. The teachers were required to use a digital story pedagogical module developed by the researchers. In the observations, the learners were seen to be engaged with the lessons in the module. One of the main qualitative findings from the interviews was the teacher informants claimed they were pleased with the features of the digital module. They managed to engage learners' interest and excitement during the teaching and learning processes since the module was sensitive and familiar to the learners' values, prior experiences and cultural knowledge.

Another study by Ali Mohsen (2016) examined the extent of students' interaction with an online video simulation and its effects on second language video comprehension and incidental vocabulary learning (done via computer-based simulation). The main finding was the players from the experimental group significantly outclassed the viewers from the control group in comprehension and vocabulary recognition test. World knowledge gained from video simulation was transferred into virtual problem-solving tasks in computer-based simulation and such continuation engaged the players to accomplish the tasks and gave better comprehension and memory retention of the knowledge learned.

Calvo-Ferrer (2015) conducted an experimental study on 59 undergraduate students. The study aimed to measure the effect of the developed educational game on second language (L2) vocabulary acquisition and perceived learning gains, as compared with a non-gaming tool which only replicated its contents. This study was in place due to the number of past studies that questioned the real educational values that computer games could offer especially when used without instructional support or for informal learning purposes. Two main findings were drawn from the study. First, the results of pre-, post- and delayed tests showed that the experimental group who had access to the contents via the video game achieved statistically better results, viewed the learning materials as appealing and perceived their vocabulary skills were developed further than those in the control group. The second finding contradicts with the finding made by Ali Mohsen (2016) in which the regression model showed the actual enjoyment of the game did not affect their learning outcomes, be it their perceived effectiveness or vocabulary test results. Such contradiction calls for thoughtful consideration on the value of fun elements in DGBL design over other value such as engagement which can serve as an important predictor in learning success.

However, despite not being able to contribute positively to student learning outcomes, Calvo-Ferrer (2015) attributed the finding to the importance of cognitive engagement that should play a more central role rather than the feeling of fun in educational gaming activities in second language vocabulary acquisition. This is an angle that instructional designers should be cautious of when developing DGBL activities as many educational game developers tend to subside the supposed educational values by focusing more on fun factors.

The second research outcome is affective learning domains about emotions, and social values have often gone unnoticed in DGBL research as these learning domains will influence the level of scaffolding in the gameplay and game patterns for optimal learning condition (Abdul Jabbar & Felicia, 2015; Dorman, 2011). Abdul Jabbar & Felicia (2015) were initially in support of the standard norm practiced by researchers who referred to Bloom's (1956) taxonomy when determining learning outcomes in curriculum design, but they later realize that the taxonomy is not being comprehensive enough, pointing solely on cognitive factors and thus excluding affective factors that shape human experiences.

The work of both Silver & Perini (2010) was referred to address the ambiguity. As a result, they resorted to utilizing Kolb's (1984) experiential learning theory focusing on affective learning elements such knowledge anticipation and reflection with the aim to investigate the effects of learning styles and instructional designs in increasing student commitment to learning. Undeniably, cognitive learning elements are viewed as the learning core and these elements reflect on the skills or knowledge awareness gained by learners. Nevertheless, for affective learning elements, though functioning at the peripheral learning circle, prove to be the firing cylinder for learning to occur as the different emotions experienced by learners has been paramount in any engagement process.

In 2011, the likes of Dormann et al. (2011) conducted multiple case studies deploying affective walkthrough approach to observe game-play designs in two genres of serious games and identify recurring design elements that could be identified as patterns with the focus on affective learning. They used popularly rated serious games to identify those game patterns. The patterns identified in those games were social maintenance, sacrificial action, shared learning, call to action and sympathy for victims. Another major finding was about the unique role of scaffolding embedded in the gameplay, instead of

instructional support in conventional classroom interaction. They were enlightened by the fact that giving and removing the amount of support in traditional learning requires explicit or tangible instructions by teachers. However, in gamification, scaffolding can be part of the game-play in which the nature of player engagement becomes central.

The third research outcome is that, as far as engagement in the digital platform is concerned, learning via technological platforms helps lengthen the attention span for marginalized learners. Carr & Blanchfield (2011) conducted a qualitative study utilizing the motivational power of computer games to aid children with behavioural, emotional and social difficulties (BESD) respond to their extreme problem in focusing on traditional educational activities. Several findings which were considered significant were discovered. First, DGBL provided a platform for BESD children to be responsible of their learning. Second, BESD children were exposed and indirectly educated to social literacy in a gamified environment that is occupied by characters and exploratory activities. Third, BESD children were found to be emphatically towards others and this encouraged social literacy as they became engaged with the 'right' games by taking another role in such gamified environment, different from what they had perceived themselves in real world about their 'special' state of minds. Last but not least, the 'right' computer game had the power to attract attention and imagination of BESD children and engage them with learning tasks.

However, despite the advantages that the computer games could offer, Carr & Blanchfield (2011) contended on the insufficiency of emphasis on the must-include design elements for computer games such as, to name a few, competition, reward and punishment, difficulty level, score summary and discovery gamified environment. There was a marked tendency for the games to focus more on content-getting aspect rather than infuse gameplay experience, resulting in the software to resemble traditional educational materials wrapped in a game-like interface. This is something common happening to the development of educational games and should be noted seriously in which such effort is merely a translation of pencil-and-paper activities or games, often found in the traditional classroom, into a digital platform. Thus, game-play elements should be a central focus in the design and development of DGBL modules.

Most recent notable outcomes of utilizing gamification for learning engagement purpose were made by Sobocinski (2017) in his reflective research in which he qualitatively revealed his "hands-on

experience, mistakes and solutions" on gamification based on his vast experience of designing gamified courses and workshops. He acknowledges the benefits that gamification could offer to students: increase motivation, sustain engagement and ensure learning flow.

Nevertheless, he accentuated that gamification project does not happen overnight as preparing, organizing, and designing it are tedious and time-consuming and there are pertinent conditions to be met before the development decision. With that, Sobocinski made a statement that gamification is introduced only when a learning problem is evident on learners' side such lack of motivation, dwindling engagement and old-fashioned instructional approach where learning flow is affected greatly.

Another concern raised by Sobocinski worth to be addressed here is that researchers and academicians are inclined to find only the beautiful 'facades' of gamification as such is the 'right' and 'novel' thing to do in research. It always occurs in many research and journal reports in which the strengths always outweigh the weaknesses. Instances are locating articles that reported on the flaws of their prototype designs and how the flawed designs were formatively evaluated and refined further, are indeed lacking.

Knowing how to measure engagement level in classroom instruction helps teachers improve teaching and learning. Engagement is closely referred to one's motivational affair in accomplishing one particular task (Aneetta et.al, 2011). In the context of student learning, engagement is viewed as the contact point when one's motivation is triggered, as a result of interesting learning activity. Curry (1991), in his exhaustive qualitative study, claimed that stimulating learning activities would affect attention during instruction, persistence in fulfilling the set learning tasks, class participation and enthusiasm and sustainability of learning outcomes whether in-class or out-of-class classroom contexts.

Therefore, the significant relationship between learner motivation, task engagement and cognitive control has brought to light about the importance of designing pedagogical approaches and materials that should also lend weight on engagement aspect and simultaneously maintain the development of cognitively-abled task and instruction.

All in all, the discussions on different perspectives of engagement studies in the digital platform have generated some important points pertinent to engaging learners via DGBL activities.

While some studies negatively reported on the infusion of digital learning platform of not being positively correlated with learning performance in spite of experiencing higher engagement, most authors seem to come to a consensus about the engaging power of such learning platform to spur learner interest in learning while concurrently allow windows of opportunity for learners to attain autonomous learning that is really lacking in traditional learning system.

This realization has impacted the consideration of DGBL design guidelines to have the following features for Orang Asli learners: infusing elements of Orang Asli cultures, also considering the possibility of infusing the present trendy pop culture that might socially affect the learners, focusing more on cognitively engaging task rather than fun factors, infusing game-play elements like game characters, role-playing mode, competition, reward and punishment, difficulty level and score summary, and finally utilizing latest digital learning tools that can lead to self-learning discovery like multiplayer gaming mode and mission-based games.

In response to the success stories of digital technology utilization in creating engaging learning atmosphere for learners of different levels (Ali Mohsen, 2016; Thanabalan, 2015; Katuk, 2013) it is imperative for instructional designers to identify first what actually interests learners and concurrently draw out a range of engaging elements that are context-specific and sensitive to this group of learners. This is important as to create engagement for first-time game users are easy but to sustain such continuing engagement for longer period of time proves to be a challenge. Hence, DGBL elements must allow for sustained engagement over time to perpetuate learning.

Finally, researchers or course designers should be aware that any proposal to infuse DGBL program should stem from authentic learning problems experienced learners, not merely following trends in research. Other than that, designing and developing DGBL activities or modules must go through rigorous formative evaluation. In doing so, design flaws of the developed prototypes need to be addressed, refined and reported accordingly for the research outcomes to be of worthy reference to guide future development efforts (All et.al, 2016).

While the majority of the studies assent to the importance of learner excitement factors in the design of digital learning platform, it is ironical when engagement has been viewed as the missing component in the instructional design and thus should be given more emphasis than that feeling-fun factor (Calvo-Ferrer, 2015). The premise proves to be a statement worth to be noted with regards to the abundant number of research in recent years directed

to evaluate the employed digital prototypes solely regarding technological user acceptance that disregards the aspect of learning engagement (Berns, 2016; Abdul Aziz, 2015; Milošević, 2014) Consequently, developmental research effort, specifically focusing on engagement factors in the instructional design and evaluating the extent of learner engagement in any technological intervention endeavour, is seen as an advancement to what we have in the present body of literature.

4 CONCLUSION

Although this exploratory nature of review is rather short as compared to typical rigorous review as employed by Çiftçi (2016), Clark et.al (2016), and Svingby & Nilsson (2011) the review has put forward the worthiness of considering engaging game designs during the design and development processes of any DGBL project. In response to the effort in combating extreme deficiency of majority of Orang Asli learners, responsively pedagogical approach, focusing on engagement factors with the incorporation of the cultural and social traits of Orang Asli learners, needs to be applied by instructional designers as the main design features for future technology-enhanced projects.

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