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Designing an Instrument for Gamified Community-based Application Using Critical Analysis: Preliminary Study

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ABSTRACT

The purpose of the paper is to study an instrument of gamification framework. This study focuses on gamification in e-learning, especially in early education; the 'what' and 'how' gamification can support e-learning within a community context. Gamification has taken someone popularity in the past few years in research in the context of education and business marketing. It has also gained interest from academics, educators, health management, employee engagement, civic engagement, and innovation. Gamification is an established practice and industry segment. Thus, because of the lack of children's engagement in the learning process and lack of motivation to learn, incorporating gamification has been acknowledged. It is hoped that these instruments will be useful for future research and the development of community learning applications using gamification.

Key Words: Gamification, framework, learning, children

1. INTRODUCTION

Austrian philosopher Ludwig Wittgenstien was one of the first who tried to formalize and made systematic gamification – Philosophical Investigation 1958; he was known for famously using games as an example to illustrate the inadequacy of language for defining abstract concepts. This has opened up more research study in gamification, which led to a much progressive learning process (Wittgenstein, 1958). Past studies have noted that in terms of gamification application contexts, one size does not fit all. Meaning to say individual differences must be considered, such as studies by Deterding (2011), classifying different player types in gamification. Proulx et al. (2015) stated that the beginning of understanding what gamification design elements and method best map onto what application domains.

Landers and Armstrong (2015) tested students on materials with PowerPoint versus gamified instructions in order to evaluate how satisfying enjoyable or relevant participants expected to be before using a gamified application. The results show that the effects relatively relate back to the participant's attitude and experience. Participants who have past experience in games and has a positive attitude benefit more from gamification, whereas participants with less experience and negative attitude expected more benefits from traditional instruction. Another classic example of how gamification is changing the way education was research by Fitz-Walter et al. (2016). He had created a gamified logbook application for driving school students to record their driving hours. This study has shown that applying gamification in a classic scenario makes boring driving hours more engaging and enjoyable than a manual logbook without changing any of the students' behaviour.

Many literature claims claim gamification is about learning at its core (Smiderle et al., 2020), which leads to more studies being conducted to see the effect of gamification on education. However, the assessment of how effective gamification in learning strategy is a hard problem. This is due to lacking long-term studies that systematically analyze and affect gamification interventions on student learning ability. According to McGonigal (2011), through the game, it is proven that children can cultivate creativity.

Furthermore, games have also proven to stimulate the mind while providing the education one seeks. Therefore, it is no surprise that children at a very young age are familiar with any medium of games (Lenhart et al., 2008).

Technology and economic development have hugely impacted the education world. A cynic would say that technology has done nothing to the education world. Students still need to go to school, the teacher still needs to provide lecture, and you still see the same behaviour in class – students chatting with friends, sleeping or just pure daydreaming. Though the basis of classic ones experiences in the classroom is still the same, technology has great support and changed how teaching and learning are done inside or outside the classroom – digital learning tools, extended class, recording lectures and a whole lot of other learning tools that is 24 hours a day and seven days a week. With the way the future of education is heading, we are no longer dependent on a single platform of learning. Classroom, web, computer application, and mobile application have become an integral part of learning. It allows individualized learning where student can learn at their own pace or self-guided learning. The use of computers and other educational tools can facilitate learning as well as social interaction. Other than e-learning, technology has now enabled mobile learning and gained instant popularity (Sharrab et al., 2013). Having said this, motivation will greatly impact the quality of learning and learners engagement with the education platform. Olson (1997), the “location, location, location” is likely to become “motivation, motivation, motivation”, for it has become an important factor that educators can target in order to improve learning.

Statistica has issued a recent report on time spent by children in the United Kingdom according to their age and media. Children age 3 to 4 spent a fairly large amount of time, about 5.9 hours per week playing game. And, of course, a higher amount of time spent among older children with kids age 12-15 spent about 12.2 hours per week playing video games. Little children are very creative, and they loved to explore, experimenting and fantasizing. All this can be offered by playing video games. Because of the popularity that games has among children, educators have been introducing gaming elements to a non-gaming environment in the field of education; this is known as gamification. The definition of gamification is “the use of game design elements in a none game contexts’ thus, therefore, differentiate gamification from a serious game (full-fledged game). This paper present the designing instrument for gamified community-based learning mobile application with children 5 and 6 years old in preschool.

2. RELATED WORKS

In a report in New York Times, Richtel (2010) said that one of the main reasons for drop-out in education is due to boredom or lack of engagement. This often escalated to the absenteeism pattern where each absence makes the student unlikely to return to school. Escalating the problem, children nowadays are being distracted by technology such as the Internet as well as smartphones. However, it is not all negative about technology; in fact, the technology used correctly has made wonders in many fields, including in education. Tablets and smartphones have become important support tools for children’s learning and physical senses (Naciahappan, 2018). For example, a device may be used to assist children’s visual and psychomotor skills (Li et al., 2006). Other than that, the internet has allowed education from anywhere; physical presence is no longer an issue. E-learning is no longer a trend, but a must adoption by any education means institution.

In education, there are two very important elements ‘environment’ and ‘motivation’ (Vero & Puka, 2017). According to William (2011), children need to be exposed to various amounts of motivating experiences and variables regularly to ensure motivation is optimized. There is, however, a limitation of e-learning. E-learning from a pedagogical point of view that it is not able to transmit emotion, motivate or engage the student as a teacher could. For this fact, then, e-learning must therefore be able to compensate for the lack of feeling, stimulus or emotional interaction that it comes with (Nilsson, 2020).

According to Gok et al. (2016), gamification is a powerful tool that allows engagements with peers, keeps people's attention, and assists activities in reaching their desired outcome. As explained in chapter one, Gamification refers to the use of the game element in a non-game context by increasing the engagement between human and computer (Khaleel, 2016). Mundane activities that run over a long period of time are not appealing, especially in children’s learning, but combining game elements to the small divided task can create a more efficient way to motivate people. Such gamification has found ways in education and a topic of ongoing research. The right gamification elements can engage students, as children like a challenge and allow parents or students to monitor their progress (Alsawaier, 2017).

2.1 Designing A Gamified System For E-Learning

Dominguez et al. (2012), in creating a gamification system that can increase student motivation, the gamification education developer needs to focus on the fundamental elements of why video game is appealing to it. Games are motivating because of their impact on the players’ cognitive, emotional and

social interaction (Lee & Hammer, 2011). Yee (2007), in their book, has identified four reasons why people actually play games: to master, to distress, to have fun and also to socialize. Fun is then can be categorized into four kinds of fun: Hard fun is when a player is competitive and trying to beat the competition; Easy fun when players focus on exploring; An altered state fun changes the way the player feels, and Social fun engages the player with other players. Whereas Bunchball (2010) said that the most well-known game mechanics elements are points, badges, achievements, virtual goods, leaderboard and virtual gifts, whereas a game dynamics elements example are a reward, status, competition, and self-expression.

One of the gamification frameworks that receive a lot of attention is the MDA framework, which is defined by Hunicke et al. (2004). This framework divides the use of game into three component: Rules - System - Fun. This constitutes to it design counterparts which are the Mechanics - Dynamics - Asthetics. These are the components that create a gamified experience (Hunicke et al., 2004). Mechanics refers to a set of rules that can dictate the outcome of interactions within the system. Points, badges, leaderboards, quest, countdown, and other particular rewards are under the game mechanics category (Kim, 2015). Mechanics set the structure for the whole gamification experience in the application. The mechanics of a game remain constant throughout the experience and do not change from one player to another. According to Elverdam and Aarseth (2007), there are three types of game mechanics; set-up (the mechanics that set the environment, the object and object distributions among players), rules (constitutes the goal and concept of the gamified initiatives, acceptable actions and time limits) and progress mechanics (instruments that the designer used on the experience while it happens). Progress mechanics example is victory points, progress bars, levels or rank (Robson et al. 2015). Dynamics is the intermediary between mechanics and aesthetics, and it is a set of principle that supports the aesthetic experience. According to Kim (2015), game dynamics include behavioural momentum, feedback, progress, time pressure, and certain abilities to develop game avatars.

Robson et al. (2015) have modified the MDA framework by creating a framework known as the MDE framework. MDE framework changed the last components o in game design. This is because emotions better resemble a gamified setting with emotional or engagement outcome from the individual. Emotions are taken as the end product of the mechanics and dynamics of a gamified experience. Sweetser and Wyeth (2005) said that the essential emotion triggered by the game designer is “fun”. Fun can take various forms such as surprise, wonder, amazed and excitement. Important to note that the MDE Framework presents three interdependent principles. Changes in one principle will affect the other two and can alter and create a whole new experience. According to Robson et al. (2015), a game designer must always start from the players’ perspective and not the other way around.

Huang and Dilip (2013), in their report Practitioner’s Guide to Gamification of Education, had introduced a five-step process to effectively gamified process: Step 1: Understanding the Target Audience and the Context, Step 2: Defining Learning Objectives, Step 3: Structuring the Experience, Step 4: Identifying Resources, and Step 5: Applying Gamification Elements. Mahfuzah et al. (2017) has summarized that there are six most popular gamification that has been used in earlier studies: 1. Leaderboard, 2. Badge, 3. Points, 4. Level, 5. Avatar and 6. Award/Trading and Gifting.

3. METHODOLOGY

This study aims to design an instrument for gamified community-based application using critical analysis of previous literature. There are identified two elements (mechanics and dynamics) and additional two elements (emotions and aesthetic). So, four elements used as the variables in this study were identified using four steps: i. Reviewing current framework using literature review; ii. Sorting and categorizing instruments according to case study and domain content; iii. An expert review was therefore done to validate the instruments; and iv. Finally, the instrument was developed for the pilot study.

4. RESULT & DISCUSSION

Step 1. Reviewing current framework using literature review

From the MDA framework, three elements identified; mechanics, dynamics and aesthetics. And from the MDE framework, three elements identified; mechanics, dynamics and emotion. Thus this study proposed four elements combined from MDA and MDE. This elements then consists of 337 items.

Step 2. Sorting and categorizing instruments according to case study and domain content

From this phase, 60 items have been categorized and sorted. This categorizing and sorting based on a case study of community context of language, which is Kadazandusun language and for a specific focus group of children 5 to 6 years old. Children love games because it's FUN. Thus, familiarizing with the game is fast and easy as well as motivating (note: higher motivation = higher engagement). Birth to 5 years old:

Rapid development but gradually over time, children developed thinking, behaviour and well-being as well as developing stage of linguistic, emotional, social, cognitive and regulatory. Brain coordination such as visual, tactile and auditory happens early years in children. This sensitivity in stimuli may produce sensory skills.

Table 1. Content Validation Result

No.	Items	% Yes	% No
GENERAL QUESTIONS ON GAMIFICATION			
1	Do you know about gamification technique?	73.9 (17)	26.1 (6)
2	Based on your experiences, what is a game element?	82.6 (19)	17.4 (4)
3	Do you think game elements can support the learning?	87 (20)	13 (3)
4	I summarized a group of game elements based on previous work; can you select the most suitable category of gamification elements used for learning. 1.Achievements 2.Virtual gifts 3.Reward schedule 4.Status 5.Real time 6.Profile	82.6 (19)	17.4 (4)
5	In your opinion, what is the impact of these game elements on learning?	87 (20)	13 (3)
6	Based on your experiences, how these elements increase the effectiveness, interest, and motivation for students in learning	82.6 (19)	17.4 (4)
7	CATEGORIZING ELEMENTS: Points, Scoring system and Stars	78.3 (18)	
8	Virtual Gifts	100 (23)	0
9	Reward Schedules: Leaderboards	78.3 (18)	
10	Status: Progress bar Dashboard Result Percentage of competency Report	 87 (20) 82.6 (19) 78.3 (18) 73.9 (17) 69.6 (116)	
11	Real time: Stage & Level Countdown	 87 (20) 60.9 (14)	
12	Profile: Avatar Pictures Information	87 (20) 17 (73.9) 15 (65.2)	
INSTRUMENT VALIDATION STUDY			
1	Format suitable instrument for data collection	91.3 (21)	8.7 (2)
2	The meaning of each item is clearly	69.6 (16)	30.4 (7)
3	The language used is easy to understand	78.3 (18)	21.7 (5)
4	Size and legible writing appropriate	87 (20)	13 (3)
5	The instructions given are clear	82.6 (19)	17.4 (4)
6	Distance writing is appropriate	87 (20)	13 (3)
7	Option meets answer questions	78.3 (18)	21.7 (5)
8	There is no spelling mistakes	82.6 (19)	17.4 (4)
9	Number of items used is appropriate	69.6 (16)	30.4 (7)
10	Questions to achieve the objectives of the overall study	91.3 (21)	8.7 (2)

Step 3. Expert content validation
Content validation is done with 23 experts from the Information Technology education and industry field with more than ten years of experiences, with the majority (91.3%) of them PhD holders at the higher education level. Table 1 shows the result from content validation by experts. Part 2 is to validate the question for post experience of Mechanics (33 items), Emotions (43 items), Dynamics (8 items) and Social (15 items). All items majority said 'Yes'.

Step 4. Instrument Pilot Study
Finally, the last step, after content validation from experts, a pilot study was conducted with 10 participants, and 35 items were then finalized before real data collection conducted.

5. CONCLUSION

In conclusion, this research will focus on the framework of gamification, which includes the element, guideline, and method to be applied on the mobile learning application for community learning centre which covers the language module for children. From MDA and MDE framework, the instrument was designed with four elements identified as the variable with 35 items. Future works will use the instrument for real data collection among children 5 to 6 years in preschool. Thus, the development of mobile application hopefully will help to engage the children with their learning module. Therefore, a new mobile application will be developed based on children's preference with gamification technique.

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