Higher Education and Oriental Studies (HEOS) – Vol 2(1): 23 – 30
www.heos.asia/ojs
e-ISSN 2785-9118
http://doi.org/10.54435/heos. v2i1.43

Empirical Validation of Serious Game and Video Game Engagement among College Youth: Understanding its Impact on Learning

CHENG KIN MENG
UCSI University, Malaysia
chengkm@ucsiuniversity.edu.my

ABSTRACT

This study proposes and validates a conceptual model for predicting student engagement in playing serious and video games. The model comprises affective and behavioural engagement. The serious game involves gameful experience in formal matters like marketing, healthcare, business, or learning, except for pure entertainment. This study compares the perceptions of college students toward serious games and gameful learning to clarify the confusion between serious games and video games. Data are collected from young college students aged 18 and 25 who are also video game players to validate the conceptual model. This model is then used to find out the relationship between the serious game and video games through the engagement of these students, particularly in the area of affective and behavioral engagement. The research requires the students to experience an entertainment game (Krunker.io) and a serious game (Quizziz) in a classroom. Students spend one match of 20 minutes in a web-based browser multiplayer online game (Krunker.io) and spend one round of gamified quiz learning (Quizziz) in a class session. Afterwards, they answer the questionnaire based on affective and behavioural engagement aspects adapted from another research on gameful experience. This study provides new insights for validating models on students' affective and behavioural engagement that can be ultimately applied to the learning environment of youth for effective learning. This study identifies the limitations of using video games in helping the learning process apart from improving the learning ability with the power of mutual understanding of any subject matter that involves understanding the impact on learning.

Keywords: serious game; gamified learning; gameful experience; affective engagement; behavioural engagement

INTRODUCTION

Serious games are growing rapidly in the gaming industry and academic research fields. Digital serious games are often categorized as video games with objectives other than entertainment purposes (Stone, 2019; Conolly 2012). These objectives are commonly along the lines of enterprise training or education, aiming to provide more engagement to the users or the so-called "players" (Connolly, 2012). According to the United Nations, for statistical usage, youth are those who are aged between 15 and 24. The youth are exposed to the digital world most of their time. Of gamers, 70% are aged 18 or older; millennial gamers are aged between 18 and 34. The average age is 33 years old, which is relatively young (Yanev, 2020; E.S. Association, 2019). The terms "youth" and "gamers" have many definitions, but most gamers are young adults that are college-educated and college students. Besides, the increasing of sales from 25 billion USD in 2016 to 43.4 billion USD in 2019 marks a good amount of increment and the popularity of the gaming industry (E.S. Association, 2019). The engagement of fun within games has brought forward the serious game industry, which uses the key terms engagement, experience, immersion, flow, and absorption in video games to explore and gamify the education experience. In this study, an outline is given to a number of students in a class regarding experiencing video game and educational game. As they experience both, a preliminary understanding of their attitude toward both games can be concluded. Considering the digital learning opportunities, it can add the values of learning performance and motivation (Cho & Castañeda, 2019). Especially when the greatest impact is being felt in the education

sector, specifically on the rapid adoption of new technologies as a result of the closure of educational organisations and institutions.

LITERATURE REVIEW

A framework of engagement in gameplay is adapted. Engagement has three types. Affective engagement is driven by the need and relevant achievement. Cognitive engagement involves thinking. Content/behavioural engagement is relevant to play motives and preferences. This study focuses on affective and behavioural engagement. The former brings out fear, happiness, and empathy whereas the latter is more related to social connection (Abbasi, Ting, Hlavacs, Costa & Veloso, 2019; Ke, Xie, & Xie, 2016).

Playing video games is considered an integral part of all societies back in the days when such games were first introduced. A video game is often viewed as a form of entertainment and a casual activity to pass the time, with little disruption to gamers' emotional, social, or physical health and well-being (Ke, Xie, & Xie, 2016). With the advancement of video games, they evolve into a more social and interactive direction that results in the e-sports that people all know today. With the accessibility of internet, which is common to most households nowadays, e-sports has been gradually accepted and changed from a hobby to a large-scale competition.

As the academic world slowly accepts video games, they are known as the computer gaming competition, e-sports (Ke, Xie & Xie, 2016). Video games have digitally influenced the younger generation, with higher engagement demand in a gamified environment. This engagement attracts the younger generation, shifting from engagement to motivation. With the game-like digital technologies nowadays, affective engagement has made learning enjoyable (Cho & Castañeda, 2019). In traditional learning, teachers or trainers often use teaching and displaying teaching materials to make sure students are engaged and focused in the class. However, in the current digital era, students are exposed to a substantial amount of digital content, and they are more demanding than ever. Serious game is a tool to be used together with traditional teaching methods (Stockdale & Coyne, 2019) Furthermore, a serious game gains more retention from students than traditional method (Schwarz, 2013; Chittaro, 2015).

TABLE 1. Video game versus Serious game: Their differences

	Serious game vs. video game	
	Video game	**Serious game**
Basic definition		
Purpose	Any purpose	Change in behaviour, attitude, health, understanding, and knowledge
Application	Can be just play or for rewards	To understand the message of the game
Reason for playing	For fun	For engagement
Focus	Player experience	Content/Message
Fidelity	Self-consistent; otherwise, irrelevant	Faithfulness to message is essential

Source: Minkhollow.ca (2015)

The above table (Becker, 2015) indicates that video game is about engagement, whereas serious game is normally to reach a certain educational goal, such as a classroom midterm quiz or making learning effective. These two columns are the key parts of this research.

In this study, serious game and video game are differentiated according to the engagement of college students in Malaysia. Below is the conceptual framework of a serious game and video game.

FIGURE 1. Conceptual framework of serious game and video game

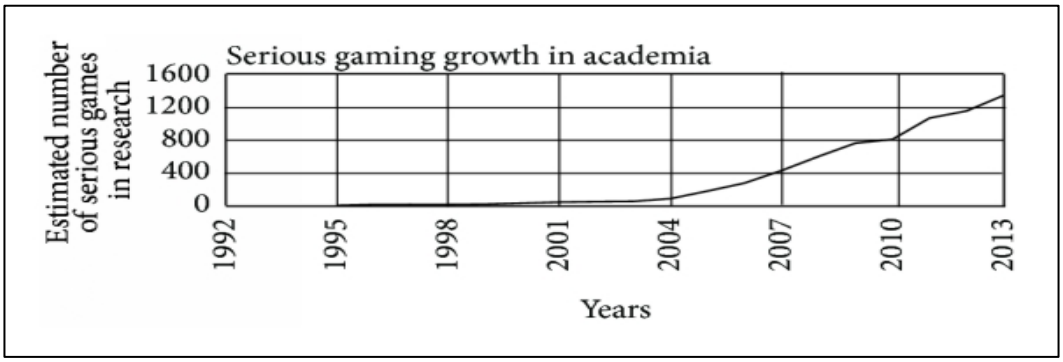
In Figure 1, serious game has all aspects of games, except for the pure entertainment within a game, and it is for practice or learning purposes. It has been applied to many industries, such as health, science, aircraft, and defence (Gamelearn, 2019). In this study, a particular learning game is investigated as a serious game. In the following section, participants follow the experiment to understand more about serious game and video game and not confuse pure entertainment video game with serious game. Toward the end, they will be able to identify serious game and video game.

GROWTH OF SERIOUS GAME

The field of serious games has grown rapidly for more than a decade. In the online archive covering 1995 to 2013, two major publishers, the Association for Computing Machinery (ACM) Digital Library and the Institute of Electrical and Electronics Engineers (IEEE) Xplore Digital Library have conducted a review of the published literature related to serious games (Laamarti, Eid, & El Saddik, 2014). The results are depicted in Figure 2. The graph shows the growth of serious game for the past 20 years. These publishers attempted to get rid of the double present invention; that is, listing the same publications in both libraries is considered a hit (Syufagi, Hariadi, & Purnomo, 2019; André, Pedro, João, Frutuoso, & André, 2014).

Figure 2 shows the exponential growth in various research, especially from the late 1990s to 2013, showing the importance of the research community in the growth of serious games.

FIGURE 2. Growth of serious game in the research field based on surveyed papers in ACM digital library and IEEE Xplore



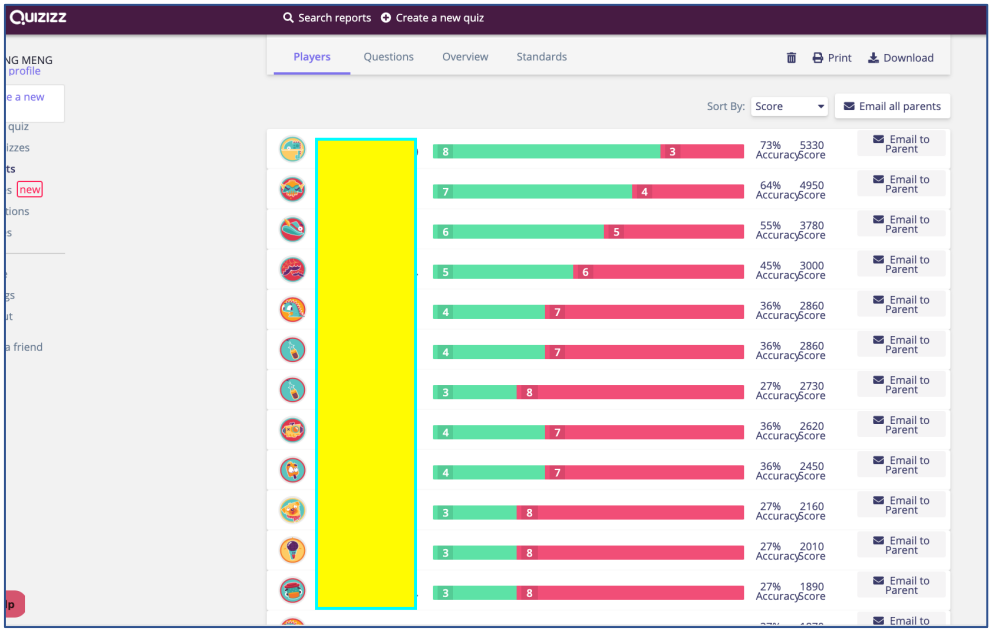
This section has recently developed serious game applications in different domains, including education, training, well-being, advertisement, cultural heritage, interpersonal communication, and health care. The description of games in this section also serves to give readers an idea of how new technology can be applied in different serious game areas to achieve their goals effectively (Syufagi, Hariadi, & Purnomo, 2013 ; Laamarti, Eid, M, & El Saddik, 2014).

EXPERIMENTAL DETAILS

In this study, two groups of students (n = 38) were asked to fill up a consent form for the research. Afterwards, they were requested to play an online multiplayer game (Krunker.io) and then experience Quizziz (an online gamification quiz platform) right after the online multiplayer game. Toward the end of the study, students answered a set of questionnaires on the serious game and video game-related to affective and behavioural engagement. The students were between 18 and 24 years old. They are considered as potential subjects for digital game-playing behaviour in this current digital era. In addition, teens and young adults are involved in substantial research on pathological gaming, which is overspending time in gaming that causes different social, physical, and well-being problems (Ke, Xie, & Xie, 2016; Stockdale, & Coyne, 2019).

Figure 3. Leaderboard of Krunker.io among the students as social interaction

FIGURE 4. Leaderboard of Quizziz among students



Students were engaged in the gamified environment. They played the pure entertainment game and followed by the learning game. They were asked to experience both games so they could compare the games effectively. Figure 3 is the leader board of students playing the pure entertainment game, and Figure 4 shows the leader board of students playing the serious game.

RESULTS AND DISCUSSION

Students answered the questionnaire after playing serious game and entertainment game. The questions are adapted from research about consumer video game engagement (Abbasi, Ting, Hlavacs, Costa, & Veloso, 2019).

The majority of the participants are 18–21 years old, with as little as 1%–2% difference from other ages. To gauge their preliminary understanding, students were asked what a video game and a serious game is. Out of 38 students, six think video game is about fun and relaxation. The rest of the results include having fun with other friends, a game that can be played together, and the main title of their favourite game. However, students are clearer with their opinion in learning when they answered the questionnaire. Students think that serious games can improve their solving problems, learning, and revision. Others' feedback are about relaxation and experience. Students spend most of their time gaming through personal computers and mobile phones. Only 7.9% of the students spend their gaming time on video game console and portable gaming devices. Regarding the hours spent for games per week, students often spend more than 10 hours per week in gaming, followed by 3–5 hours and 6–9 hours. This result shows that entertainment game highly grab the attention of the students.

The following question is about affective engagement in video game. Students think that the most suitable keyword is enthusiastic, followed by passionate and dedicated. Students answer based on their own opinion. After that, they answer with similar answers, such as being enthusiastic and in love with the game to keep engaging.

The second part of the question is about the affective engagement in serious game. Same as video game, students think enthusiasm is the most suitable keyword. They think that serious game is about learning new tactics, being passionate and enthusiastic, and relaxing. The answer is quite similar about the level of learning that affected their emotions.

For behavioural engagement in video gaming, students think that togetherness is the main factor that suits them best. They think video game is about friends, teammates, and togetherness. From a Likert scale of 1–5, only 13.1% choose 1 and 2. Among the students who think that their level of serious gaming affects their behaviour, 47.4% choose 3; 21.1%, 4; 18.4%, 5. A Likert scale of 1 to 5 is chosen because it is easy to complete, so naturally, less complaints are received (Kampen, 2019).

As for serious game, social connection is the main factor for students' behavioural engagement in learning. However, from most of their opinion, they think interaction, relaxation, and skill are the key terms to achieve behavioural engagement in serious game.

In the affective engagement in video game, feeling enthusiastic is important to keep the driving force within them and go forward to complete the quests. Regarding affective engagement in serious game, they have the same feeling as well, that is, to keep enthusiastic to complete tasks so that they can experience the interest, enjoyment, and approval from the game or result.

Behavioural engagement is different from affective engagement. Students think that togetherness is an important factor for video game, which means staying together brings up more engagement in a video game. However, social connection is more important for a serious game. Learning for them entails a close connection, which is in a class. Most of the time, they feel loved, cared for, or even valued by their peers, teacher, or coach in the classroom (Eisenberger, Naomi, Cole, Steve, 2012).

FINDING AND SUMMARY

Affective and behavioural engagement work hand in hand in a serious game as shown in the conceptual model under the serious game domain (see Figure 1). Students feel a strong connection with enthusiasm during the first part of the questionnaire for video game and serious game, which is about affective engagement. Enthusiasm is an affective characteristic. It involves motivation, experience, and the emotional aspects that drive students to work harder when learning. This emotion cannot be hidden and is expected to be expressed (Kunter, Tsai, Klusmann, Brunner, Krauss, & Baumert, 2008; Burić, 2019). In the second section, which is about behavioural engagement, students comment on social connection as the behavioural aspect closely related to enjoyment of experience. They believe they can release tension through social connection. Students feel greater relaxation and enjoyment during the social interaction and when seeing the points of their peers in the leader board (Burić, 2019).

CONCLUSION

In this study, the students are familiar with serious games, although they consider it relatively new and genuine entertainment. After the experiment, the students become more aware of their own needs while playing the game and gain a different perspective on the familiar serious and video games in which positive affective and behavioural engagement are visible. Affective and behavioural engagement are investigated to understand students' thinking. With regard to affective engagement, students focus more on expressing themselves with passion and excitement. Regarding behavioural engagement, they emphasize their emotions, especially through social interactions and connections wherein they feel connected with others in the classroom.

RECOMMENDATION

This study only focuses on the affective and behavioural engagement out of the three types of engagement. Cognitive engagement and other elements will be discussed in future experiment (Abbasi, Ting, Hlavacs, Costa & Veloso, 2019). In the next stage of this study, more insights into cognitive engagement with a gamified learning environment and the manner in which students engage in different areas will be investigated. This endeavour aims to understand how the motivation of the students can be assisted with video game elements that can emotionally and cognitively engage the youth nowadays.

REFERENCES

Abbasi, A. Z., Ting, D. H., Hlavacs, H., Costa, L. V., & Veloso, A. I. (2019). An empirical validation of consumer video game engagement: A playful-consumption experience approach. *Entertainment Computing, 29* (October 2018), 43–55. https://doi.org/10.1016/j.entcom.2018.12.002

Barbosa, A. F., Pereira, P. N., Dias, J. A., & Silva, F. G. (2014). A new methodology of design and development of serious games. *International Journal of Computer Games Technology,* 2014.

Becker, K. (2015). Games vs Game-based Learning vs Gamification – My Version. http://minkhollow.ca/beckerblog/2015/06/21/games-vs-game-based-learning-vs-gamification-my-version/

Bo, L. N. (2021). Web-Based Learning Environment and Effectiveness of Zoom Classes: The Moderating Role of Teacher Attitude in Online Setting. *Higher Education and Oriental Studies, 1*(1), 68–84.

Burić, I. (2019). The role of emotional labor in explaining teachers' enthusiasm and students' outcomes: A multilevel mediational analysis. *Learning and Individual Differences, 70*(5065), 12–20. https://doi.org/10.1016/j.lindif.2019.01.002

Chittaro, L., & Sioni, R. (2015). Serious games for emergency preparedness: Evaluation of an interactive vs. a non-interactive simulation of a terror attack. *Computers in Human Behavior, 50*, 508-519.

Cho, M. H., & Castañeda, D. A. (2019). Motivational and affective engagement in learning Spanish with a mobile application. System, 81, 90–99. https://doi.org/10.1016/j.system.2019.01.008

Connolly, T. M., Boyle, E. A., MacArthur, E., Hainey, T., & Boyle, J. M. (2012). A systematic literature review of empirical evidence on computer games and serious games. *Computer Education, 59*(2), 661-686. http://dx.doi.org/10.1016/j.compedu.2012.03.004

Eisenberger, N. I., & Cole, S. W. (2012). Social neuroscience and health: neurophysiological mechanisms linking social ties with physical health. *Nature neuroscience, 15*(5), 669-674.

E. S. Association. (2019). Essential Facts about the Computer and Video Game Industry, Entertainment Software Association.

Felicia, P. (2009). Digital games in schools: Handbook for teachers.

Gamelearn. (2019). *Eight examples that explain all you need to know about serious games and game-based learning.* https://www.game-learn.com/all-you-need-to-know-serious-games-game-based-learning-examples/

Janarthanan, V. (2012, April). Serious video games: Games for education and health. In 2012 Ninth International Conference on Information Technology-New Generations (pp. 875-878). IEEE.

Kampen, J. K. (2019). Reflections on and test of the metrological properties of summated rating, Likert, and other scales based on sums of ordinal variables. *Measurement: Journal of the*

International Measurement Confederation, 137, 428–434. https://doi.org/10.1016/j.measurement.2019.01.083

Ke, F., Xie, K., & Xie, Y. (2016). Game-based learning engagement: A theory- and data-driven exploration. British Journal of Educational Technology, 47(6), 1183–1201. https://doi.org/10.1111/bjet.12314

Kunter, M., Tsai, Y.-M., Klusmann, U., Brunner, M., Krauss, S., & Baumert, J. (2008). Students' and mathematics teachers' perceptions of teacher enthusiasm and instruction. *Learning and Instruction, 18*(5), 468–482. https://doi.org/10.1016/j.learninstruc.2008.06.008

Laamarti, F., Eid, M., & El Saddik, A. (2014). An overview of serious games. *International Journal of Computer Games Technology,* 2014. https://doi.org/10.1155/2014/358152

Proaps, A. B., & Bliss, J. P. (2014). The effects of text presentation format on reading comprehension and video game performance. *Computers in Human Behavior, 36,* 41-47.

Schwarz, D., Štourač, P., Komenda, M., Harazim, H., Kosinová, M., Gregor, J., ... & Dušek, L. (2013). Interactive algorithms for teaching and learning acute medicine in the network of medical faculties MEFANET. Journal of medical Internet research, 15(7), e2590.

Stockdale, L., & Coyne, S. M. (2019). Parenting paused: Pathological video game use and parenting outcomes. Addictive Behaviors Reports, (December 2018), 100244. https://doi.org/10.1016/j.abrep.2019.100244

Stone, R. J. (2008). Human factors guidelines for interactive 3D and games-based training systems design. *Human Factors Integration Defence Technology Centre Publication, 6*(1), 5-86.

Syufagi, M., Hariadi, M., & Purnomo, M. H. (2013). Petri net model for serious games based on motivation behavior classification. *International Journal of Computer Games Technology,* 2013.

Tan, P. L., Hay, D. B., & Whaites, E. (2009). Implementing e-learning in a radiological science course in dental education: a short-term longitudinal study. *Journal of dental education, 73*(10), 1202-1212.

Yanev, V. (2020). Video Game Demographics – Who Plays Games in 2020. https://techjury.net/stats-about/video-game-demographics/#gref.

Zumbach, J., Rammerstorfer, L., & Deibl, I. (2020). Cognitive and metacognitive support in learning with a serious game about demographic change. *Computers in Human Behavior, 103* (September 2019), 120–129. https://doi.org/10.1016/j.chb.2019.09.026

ABOUT THE AUTHOR

Kin Meng's research interests include gamified learning, human-computer interaction and environmental sustainability. For many years, he has been an active researcher in gamification study on learning. In addition, he was involved in several multimedia-related projects throughout his career.