Bulletin of Electrical Engineering and Informatics
Vol. 9, No. 2, April 2020, pp. 722~728
ISSN: 2302-9285, DOI: 10.11591/eei.v9i2.2083

The need of gamified assessment for engaging learning experience

Norhusyairi Hawari[1], Nurul Hidayah Mat Zain[2], Aslina Baharum[3]
[1,2] Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Cawangan Melaka, Kampus Jasin, Malaysia
[3] Faculty of Computing and Informatics, Universiti Malaysia Sabah, Malaysia

Article Info

Article history:

Received Oct 1, 2019
Revised Nov 30, 2019
Accepted Dec 28, 2019

Keywords:

Assessment
Engaging
Gamification
Gamified assessment
Learning experience

ABSTRACT

Gamification described as the use of game elements for purposes beyond games. As an extension of that, gamified assessment is defined as the use of gamification for assessment purposes. However, the traditional method of assessment remains the standard for student performance assessment, and this raises two assumptions. First, the current gamification implementation is still in its infancy. Thus, it is still unappealing enough for practical use. Second, there is a lack of study that brings forward the desire to have gamification implemented in the assessment. Hence, this study intends to explore the student's perception of gamified assessment followed by their verdict, acquire the strength and weakness points of the existing implementation. In total, 86 students across several universities in Malaysia involved in this study. The present study implemented standard descriptive statistical methods for analyzing the data. The findings showed that there are needs for gamified assessment for an engaging learning experience. Besides, the results showed one of the earlier presumptions, which is the lack of study that points toward the student's desire to have a gamified assessment. Keenly, the results of the study will emphasize the need for developing a rigorous gamified assessment model as a guideline to develop an application that engaging learning experience.

Corresponding Author:

Nurul Hidayah Mat Zain,
Faculty of Computer and Mathematical Sciences,
Universiti Teknologi MARA (UiTM) Cawangan Melaka, Kampus Jasin,
77300 Merlimau, Melaka, Malaysia.
Email: nurulmz@fskm.uitm.edu.my

1. INTRODUCTION

Games are fun. This characteristic is one of an element that makes a game voluntarily approachable and can be implemented in various ways, such as in the learning aspect. Typically, gamification is the use of game elements beyond the gaming context [1]. The implementation element of a game in education can result in an exciting learning experience where participation is autonomous. Previous study [2], stated that 97% out of 149 students find their course content to be more interesting through gamified simulation. Besides, the study [3] presented several game design elements for education, including points, level/stages, badges, leader boards, prizes and rewards, progress bar, storyline, and feedback. The implementation of this element into daily tasks can turn it into an enjoyable activity [1]. Another implementation of gamification is in assessments. There are several benefits gamified assessment including the increment of engagement level, heightening motivation, offering a sense of flow through the content, creating a fun

learning atmosphere, increasing accomplishments, and ensure involvement in activities [4]. However, a recent study showed there is a complex and challenging mission in distinguishing individual game elements to adapt in a different field [5] and to simplify the gamified task that aims to improve motivation [6]. Thus, gamified assessment can be viewed as a fun education experience by enhancing the motivation of the user to participate in an assessment process.

In the early years, gamification known as productivity games, surveillance entertainment, fun ware, playful design, behavioral games, game layer, or applied gaming [7]. Gamification is a popular support medium related to user engagement and positive assistive behaviors such as to encourage user's involvement and peer networking as a result of motivating the user internally [8]. Besides, an engaged student shows a stable academic activity through difficulties, the dedication of work, and motivated to execute their task as reported by a case study [9]. Motivation determines class participation since, unlike in school, attendance is voluntary instead of compulsory. Students may skip classes and miss out on the learning progress as motivation decreases [10]. In this case, motivation is a vital factor, and often the result of the lack of engagement. With that, engagement experience can be concluded as the determining factor for attitude and motivation, which will improve participation in an assessment.

A previous study [11] stated that higher academic performance driven by the thought and action of a motivated student. P. A. Howard-Jones and T. Jay [12] reported that long-term memory resulting in higher academic performance could be significantly enhanced through reward value goes up. This finding demonstrates an equivalent exchange of an effort toward a task or assessment with a reward element. The same practice applies in games where the players are rewarded with a valuable digital item within the game for achieving certain ranks. Thus, by exploiting this reward system, students will be motivated to put on extra effort while having fun.

At the post-graduation level, the implementation of technology in education is gradually rising [13]. One of the commonly used technology in education is online classes which is believed by 77% of academic officers to be similar or better than classroom learning in a study by M. D. Dixson [14]. This scenario enables gamified assessment to be implemented in higher level education by adopting several simultaneous gaming elements such as reward systems, including unlocking badges, achievement, and storytelling to maintain engagement throughout the lesson. These elements makes a game fun, engaging and drives motivation [15]. It is also a viable tool to maintain motivation in education.

Gamification is still discrete despite the growing study in the area and the various benefit of it. The media publications are still focusing on the negative part of video games such as violent. The previous study [16] reported that aggressive games as "casually increasing aggression," "predicts aggression," and "showing clear aggression in real life." Besides, S. Sengün, J. Salminen, P. Mawhorter, S. Jung, and B. Jansen [17] in their study presented the same result related to verbal aggression identity that can be anonymous online. However, this is limited to violent video games, according to the study. There is a conflicting study that proves otherwise, as stated in the same paper by T. Greitemeyer [16]. A study by S. Kühn, D. Kugler, K. Schmalen, M. Weichenberger, C. Witt, and J. Gallinat [18] also concluded that evidence is absent as there is no connection observed between violent video game and sensitivity to pain and empathy. The findings show that violence resulted from video games requires more study. P. M. Markey, C. N. Markey, and J. E. French [19] stated that research shows that the aggressive behavior resulted from video games is small, and most subjected to a biased portrayal of violence by the media publication. Gamification triggers curiosity, enjoyment, interest, prolongs attention span for hours a day, and encourage repeated reengagement with content [20-24].

Among the significant factors that make gamification unattractive is because the educational game is not entirely fun. They packed educational materials with limited gamification elements. This scenario makes participation being out of necessity instead of self-initiated [25]. Moreover, PowerPoint slides are overused and often overloaded with information making it repulsive [26]. Students end up ignoring or writing notes. In addition, reading from PowerPoint slides is ineffective one-way communication. A productive environment for higher education levels includes "interaction and the sense of engagement" [27]. This environment provides a space for discussion, debating the idea, negotiation, and reaching an agreement. Hence, interaction is a factor that can not be omitted. Therefore, the primary purpose of this study is to find out the interest in the implementation of gamified assessment in higher-level education.

This study aims to gauge university student's interest in gamification of assessment. The result of this study can be used to enhance the traditional assessment to involve students through the assessment process and improve motivation as well as to invoke voluntary participation. Moreover, the result of this study can be used to reduce the class dropout rate. The sample is collected from university students from various universities in Malaysia, and the results are then analyzed to gauge the interest level.

2. METHODOLOGI

2.1. The participants and procedure

A survey was conducted to investigate the need for gamification as an educational encouragement among university students. The target respondent of the study is limited to university students and managed to gather 86 participants. The survey was made and distributed online; thus, participation is voluntary, and no physical meeting is needed. The data analyzed after three days distributed among university students. The survey gathered demography data such as age, education level, and exposure to gamified assessment.

The survey procedure starts with gathering data through Google Forms. The survey is distributed through a designated social media group consisting of students of various disciplines and universities. The survey is then left to capture voluntary responses. Next, the data is analyzed to remove invalid responses (e.g., age=99 years old) to produce a valid result. The data then analyzed through the SPSS software to summarize it into frequency percentages. Finally, we run Cronbach's Alpha to measure of internal consistency and measure of scale reliability. The final result is a sorted data which can be used to produce meaningful and decipherable information.

2.2. The Instrument

The participants are given an instrument as adapted from a study by E. N. Wiebe, A. Lamb, M. Hardy, and D. Sharek [28]. The purpose of the instrument to measure the user's engagement level in video-games. The questionnaire consists of eight items for demographic investigation and 17 items related to interest in gamification. The items are Cronbach's Alpha tested in the SPSS software for internal consistency and questionnaire's reliability. The acceptable value for Cronbach's Alpha is between 0.7 and above, while the overall value for this survey item is 0.932 for 17 items. Each item is given a scale of agreeability according to the Likert scale ranging from 1= strongly disagree, 2=disagree, 3=neutral, 4=agree, and 5=strongly agree. The estimated time of completion for a single survey form is seven minutes. Table 1 shows the list of items distributed to the participants. Each item is given a scale of agreeability according to the Likert scale ranging from 1= strongly disagree, 2=disagree, 3=neutral, 4=agree, and 5=strongly agree. The estimated time of completion for a single survey form is 7 minutes. Table 1 shows the list of items distributed to the participants.

Table 1. List of the item

No	Items
AF1	I can do assessment better through gamified assessment
AF2	I can do assessment according to my own pace
AF3	I can do assessment anytime
AF4	I can do assessment anywhere
UF1	Assessing through gamified assessment is an encouraging activity
UF2	Gamified assessment challenges my understanding of the course content
UF3	I think gamified assessment is highly beneficial to me
UF4	I prefer gamified assessment over traditional assessment
UF5	I am highly interested in using gamified assessment in the future
UIF1	I wish there's more opportunity to use gamified assessment
UIF2	I wish to assess course content through gamified assessment
UIF3	I would like to integrate course content with gamified assessment
UIF4	I wish course content will be available as a gamified assessment
EF1	Gamified assessment involves me in the assessment process
EF2	I can pay more attention to the assessment content through gamified assessment
EF3	I can concentrate better through gamified assessment
EF4	I feel immersed when using gamified assessment

3. RESULTS AND DISCUSSION

The data gathered the number of participants taking part, the frequency of each answer, and the percentage relative to the rate as derived from the respondent's traffic for three days. Table 2 shows the collection of demography data. The result shows that the majority of the participants are females (n=49, 57%). Most are 22 years old (n=31, 36.1), and 78 out of 86 participants are pursuing bachelor's degrees (n=78, 90.7%). This finding proves that 22 is the most common age of bachelor's degree students. Moreover, 81.4% of the participants appear to be from University Technology MARA (UiTM) (n=70, 81.4%). Most participants agreed that playing games are a fun activity (n=82, 95.3%). Finally, as gamification is a new concept, the majority are uncertain of their exposure in gamified assessment where the highest frequency answered Maybe (n=42, 48.8%) followed by No (n=31, 36%). Only 15.1% are firmly sure of their experience in gamified assessment. The results are grouped into agreeability, disagreeability, and neutral part. According to the Likert scale, the strongly disagree and disagree scale are grouped into disagreeability parts. Meanwhile, for the scale of agree and strongly agree grouped into agreeability part. The middle point will be considered neutral.

Table 2. List of demographic items

Questions	Range	Frequency	Percentage (%)
Gender	Male	37	43
	Female	49	57
Age	21	10	11.6
	22	31	36.1
	23	19	22.1
	24	13	15.1
	25	7	8.1
	26	5	5.8
	27	1	1.2
Level of Education	Diploma	4	4.7
	Bachelor's Degree	78	90.7
	Master's Degree	3	3.5
	Doctor of Philosophy	1	1.2
Which IPTA/IPTS are you from?	UTM	2	2.3
	UMP	1	1.2
	UMS	1	1.2
	UiTM	70	81.4
	UMT	1	1.2
	UTeM	9	10.5
	UniMAP	1	1.2
	MSU	1	1.2
Do you like to play games?	Yes	82	95.3
	No	4	4.7
Have you been exposed to gamified assessment?	Yes	13	15.1
	No	31	36
	Maybe	42	48.8

Table 3 shown the findings of the accessibility element, with 69.7% of the respondent agree that gamification is a better way to do the assessment (AC1). Next, 30.2% of the respondents were neutral for this statement, and there is no disagreement. The respondents were asked whether the assessment should proceed according to the individual's pace (AC2), the data recorded 1.2% disagreement, while the majority is positive by according to 72.1% of the respondents.

Table 3. Mean score frequency (%) of responses on accessibility element (AC)

Element	Code	Strongly Disagree	Disagree	Neither Agree Nor Disagree	Agree	Strongly Agree	Mean	Std. Deviation
Accessibility	AC1	0	0	30.2	45.3	24.4	3.94	0.74
	AC2	0	1.2	26.7	53.5	18.6	3.90	0.70
	AC3	0	3.5	40.7	38.4	17.4	3.70	0.80
	AC4	2.3	9.3	25.6	37.2	25.6	3.74	1.02
Total mean							3.82	

Moreover, the respondents required to respond to the statement regarding their assessment process, which could implement at any given time (AC3). The result showed that 55.8% agreed that gamified assessment timing is flexible. Surprisingly, the neutral value is significant, which is 40.7% of the sample respondent. This finding may be subjected to the availability of internet access and limited place to settle during a lengthy assessment process. Typically, online assessments require a stable network connection. By tackling this issue, the agreeability part may increase. Finally, 11.6% disagree that gamified assessment could be done at any place (AC4). This result relates to the facility issues explained in the previous item. Nevertheless, 62.8% agree that they can do an assessment anywhere. The Cronbach's Alpha value for this element is 0.721 and falls within the highly related threshold.

Table 4 showed the result of the usefulness element. The first statement presented 88.4% agreed that gamified assessment encourages active participation (US1). This finding is an indicator that gamified assessment attracts students to participate in the process. The next statement challenges the respondents with their perceived understanding of the course content (US2). The result has shown 79% agreeability from respondents with a 1.2% minority for disagreement. There were 86% of respondents agree that gamified assessment gives self-beneficial value (US3) without any disagreement.

Moreover, 86.1% agreed that they prefer gamified assessment over the traditional assessment (US4), and 1.2% of the respondent believes that the conventional assessment is still the preferred choice. Finally, the statement regarding whether the respondents felt interested in using gamified assessment in the future (US5), there was 87.2% agreement with a 1.2% disagreement. This finding is surprising as there is a response that is uninterested with a modernized assessment. The Cronbach's Alpha value for this element is 0.861 and falls within the highly related threshold.

Table 5 showed the result that is related to the user interest element. In this section, the first statement refers to the opportunity to use a gamified assessment (UI1). There were 91.9% agreed with this

statement, which is a good sign that the gamified assessment is gaining attraction. Meanwhile, surprisingly, there was no disagreement with this statement. The findings do not align with the previous result, where there is a minority of respondents uninterested in the gamified assessment.

Table 4. Mean score frequency (%) of responses on usefulness element (US)

Element	Code	Strongly Disagree	Disagree	Neither Agree Nor Disagree	Agree	Strongly Agree	Mean	Std. Deviation
Usefulness	US1	0	0	11.6	46.5	41.9	4.30	0.67
	US2	0	1.2	19.8	48.8	30.2	4.08	0.74
	US3	0	0	14.0	45.3	40.7	4.27	0.69
	US4	0	1.2	12.8	44.2	41.9	4.27	0.73
	US5	0	1.2	11.6	43.0	44.2	4.30	0.72
Total mean							4.24	

Table 5. Mean score frequency (%) of responses on user interest element (UI)

Element	Code	Strongly Disagree	Disagree	Neither Agree Nor Disagree	Agree	Strongly Agree	Mean	Std. Deviation
User Interest	UI1	0	0	8.1	44.2	47.7	4.40	0.64
	UI2	0	1.2	8.1	45.3	45.3	4.35	0.68
	UI3	0	0	10.5	44.2	45.3	4.35	0.66
	UI4	0	1.2	14.0	46.5	38.4	4.22	0.73
Total mean							4.33	

In addition, 90.6% of respondents wished to assess their course content through gamified assessment (UI2), and again, 1.2% prefers the traditional method instead. There were 89.5% of respondents had shown their interest regarding the integration of their course content with gamified assessment (UI3). Lastly, the statement about whether the respondents wish to have their course content to be available as a gamified assessment (UI4), the result showed 84.9% agreed, while 1.2% are comfortable with the current assessment methodology. This finding indicates that a certain percentage of the respondents still find traditional assessment appealing. The Cronbach's Alpha value for this element is 0.890 and falls within the highly related threshold.

As shown in Table 6, 77.9% of respondents agreed with the statement that the user should involve in the gamified assessment process (EN1). There were 77.9% agreed that they could pay more attention to the assessment content through gamified assessment (EN2). However, 1.2% doesn't feel a positive difference.

Table 6. Mean score frequency (%) of responses on Engagement Element (EN)

Element	Code	Strongly Disagree	Disagree	Neither Agree Nor Disagree	Agree	Strongly Agree	Mean	Std. Deviation
Engagement	EN1	0	1.2	20.9	43.0	34.9	4.12	0.77
	EN2	0	1.2	20.9	46.5	31.4	4.08	0.75
	EN3	0	1.2	23.3	43.0	32.6	4.07	0.78
	EN4	0	0	20.9	45.3	33.7	4.13	0.73
Total mean							3.82	

Moreover, 75.6% agreed that they could pay more attention to the assessment content through gamified assessment (EN3). This result indicated that gamified assessment possesses better attraction even there is a 1.2% disagreement with this statement. It may be because the minority of respondents found that gamified assessment does not grab their attention or a distraction to an assessment. Lastly, there were 79% of respondents agree they feel immersed when using gamified assessment (EN4). The Cronbach's Alpha value for this element is 0.910 and falls within the highly related threshold.

4. CONCLUSION

This paper aims at finding the need of gamified assessment for engaging learning experience among students at a higher-level education in Malaysia. Gamified assessment is currently not widely used in education at this level. However, this study found through a survey that there is an interest shown for gamified assessment among university students. The survey collects quantitative data to be statistically analyzed using the SPSS software, and the result suggests that gamified assessment is the future of education, while the literature review points that it is an effective method to improve engagement and encourage active participation.

According to the overall finding, the gamified assessment is not the solution for a minority of the respondents. As engagement is perceived differently according to the user's interest and goal, some

of them are comfortable with the current method of assessment. However, the majority of the respondents agreed that gamified assessment is engaging. Most of the respondents agree that gamified assessment allows active participation and improve motivation.

Moreover, the results of the present study showed that most of the respondents agree on the need for gamified assessment. However, the conflicts were predictable, especially since gamified assessment is still not widely adopted in Malaysia. Besides, the result showed, many respondents still have not been exposed to gamified assessment.

ACKNOWLEDGEMENTS

We would like to express our sincere thanks towards UiTM and Ministry of Higher Education, Malaysia for sponsoring this research by using the funding of the Fundamental Research Grant Scheme (FRGS) numbered 600-IRMI/FRGS 5/3 (210/2019). Their support is greatly appreciated. We also would like to express our gratitude to all experts or respondents who were directly or indirectly involved in this study.

REFERENCES

[1] S. Deterding, M. Sicart, L. Nacke, K. O'Hara, and D. Dixon, "Gamification. using game-design elements in non-gaming contexts," *Proc. 2011 Annu. Conf. Ext. Abstr. Hum. factors Comput. Syst. - CHI EA '11*, p. 2425, January 2011.

[2] M. T. Bonde, G. Makransky, J. Wandall, M. V Larsen, M. Morsing, and H. Jarmer, "Careers and recruitment Improving biotech education through gamified laboratory simulations," *Nature Biotechnology. Publ. Gr.*, vol. 32, no. 7, pp. 694-697, 2014.

[3] F. F.-H. Nah, Q. Zeng, V. R. Telaprolu, A. P. Ayyappa, and B. Eschenbrenner, "Gamification of education: a review of literature," in *International Conference on HCI in Business*, vol. 8527 pp. 401-409, 2014.

[4] S. A. Kocadere and Ş. Çağlar, "The design and implementation of a gamified assessment," *Journal of E-Learning and Knowledge Society*, vol. 11, no. 3, pp. 85-99, September 2015.

[5] B. Morschheuser, L. Hassan, K. Werder, and J. Hamari, "How to design gamification? A method for engineering gamified software," *Information and Software Technology*, vol. 95, pp. 219-237, March 2018.

[6] J. Lumsden, E. A. Edwards, N. S. Lawrence, D. Coyle, and M. R. Munafò, "Gamification of cognitive assessment and cognitive training: a systematic review of applications and efficacy," *JMIR Serious Games*, vol. 4, no. 2, July 2016.

[7] S. Deterding, D. Dixon, R. Khaled, and L. Nacke, "From game design elements to gamefulness: defining 'gamification," in *Proceedings of the 15th International Academic MindTrek Conference: Envisioning Future Media Environments*, pp. 9-15, 2011.

[8] J. Hamari, J. Koivisto, and H. Sarsa, "Does Gamification Work? -- A Literature Review of Empirical Studies on Gamification," *2014 47th Hawaii International Conference on System Sciences*, Waikoloa, HI, pp. 3025-3034, 2014.

[9] M.-B. Ibanez, A. Di-Serio, and C. Delgado-Kloos, "Gamification for engaging computer science students in learning activities: a case study," in *IEEE Transactions on Learning Technologies*, vol. 7, no. 3, pp. 291-301, 1 July-Sept. 2014.

[10] A. Kucharcikova, M. Miciak, E. Malichova, M. Durisova, and E. Tokarcikova, "The motivation of students at universities as a prerequisite of the education's sustainability within the business value generation context," *Sustainability*, vol. 11, no. 20, p. 5577, October 2019.

[11] W. Fan and C. A. Wolters, "School motivation and high school dropout: The mediating role of educational expectation," *Br. J. Educ. Psychol.*, vol. 84, no. 1, pp. 22-39, 2014

[12] P. A. Howard-Jones and T. Jay, "Reward, learning and games," *Current Opinion in Behavioral Sciences.*, vol. 10, pp. 65-72, August 2016.

[13] S. Ismail, A. Almekhlafi, and M. Al-Mekhlafy, "Teachers' perceptions of the use of technology in teaching languages in United Arab Emirates' schools," *Int. J. Res. Educ.*, vol. 27, no. 1, pp. 37-56, 2010.

[14] M. D. Dixson, "Measuring student engagement in the online course: The Online Student Engagement scale (OSE).," *Online Learn.*, vol. 19, no. 4, 2015.

[15] D. Dicheva, C. Dichev, G. Agre, and G. Angelova, "Gamification in education: A systematic mapping study," *Educ. Technol. Soc.*, vol. 18, no. 3, pp. 75-88, 2015.

[16] T. Greitemeyer, "Playing violent video games increases intergroup bias," *Personality and Social Psychology Bulletin*, vol. 40, no. 1, pp. 70-78, 2014.

[17] S. Sengün, J. Salminen, P. Mawhorter, S. Jung, and B. Jansen, "exploring the relationship between game content and culture-based toxicity," *HT'19: Proceeding of the 30th ACM Conference on Hypertext and Social Media*", pp. 87-95, 2019.

[18] S. Kühn, D. Kugler, K. Schmalen, M. Weichenberger, C. Witt, and J. Gallinat, "The myth of blunted gamers: no evidence for desensitization in empathy for pain after a violent video game intervention in a longitudinal fmri study on non-gamers," *NeuroSignals*, vol. 26, no. 1, pp. 22-30, 2019.

[19] P. M. Markey, C. N. Markey, and J. E. French, "Violent video games and real-world violence: Rhetoric versus data.," *Psychol. Pop. Media Cult.*, vol. 4, no. 4, pp. 277, 2015.

[20] L.-M. Putz and H. Treiblmaier, "Gamified workshops as drivers for attitudinal and behavioral shifts toward sustainable business practices: the role of enjoyment, curiosity and external regulation," in *Proceedings of the 51st Hawaii International Conference on System Sciences*, pp. 1197, January 2018.
[21] C. Dichev, D. Dicheva, G. Angelova, and G. Agre, "From gamification to gameful design and gameful experience in learning," *Cybern. Inf. Technol.*, vol. 14, no. 4, pp. 80-100, 2014.
[22] J. Novak, M. Melenhorst, I. Micheel, C. Pasini, P. Fraternali, and A. E. Rizzoli, "Integrating behavioural change and gamified incentive modelling for stimulating water saving," *Environmental Modelling & Software*, vol. 102, pp. 120-137, April 2018.
[23] N. H. M. Zain, R. H. Johar, A. A. Aziz, A. Baharum, A. Jaafar, and A. M. Yasin, "An evaluation of player enjoyment in game-based learning arithmetic drills via racing game," *International Visual Informatics Conference*, vol. 10645 LNCS, pp. 636-646, 2017.
[24] N. H. M. Zain, M. H. Hashim, A. Baharum, I. Ismail, R. A. Aziz, and A. M. Yasin, "Evaluating player enjoyment in mobile," Games *Journal of Comp utational and Theoretical Nanoscience (ICCST)*, pp. 1366-1369, February 2018.
[25] N. Padilla-Zea, F. L. Gutiérrez, J. R. López-Arcos, A. Abad-Arranz, and P. Paderewski, "Modeling storytelling to be used in educational video games," *Computers in Human Behavior*, vol. 31, pp. 461-474, February 2014.
[26] V. Kasinathan, A. Mustapha, R. Fauzi, and M. F. C. A. Rani, "Questionify: gamification in education," *Int. Jornal. Integr. Engineering.*, vol. 10, no. 6, 2018.
[27] S. Geng, K. M. Y. Law, and B. Niu, "Investigating self-directed learning and technology readiness in blending learning environment," *International Journal of Educational Technology in Higher Education*, vol. 16, no. 1, 2019.
[28] E. N. Wiebe, A. Lamb, M. Hardy, and D. Sharek, "Seasuring engagement in video game-based environments: investigation of the user engagement scale," *Computer in. Human Behavior.*, vol. 32, pp. 123-132, March 2014.

BIOGRAPHIES OF AUTHORS

Norhusyairi Hawari received his Computer Science Diploma in Multimedia Computing from Universiti Teknologi Malaysia (UTM), bachelor's degree of Computer Science in Multimedia Computing from Universiti Teknologi Mara (UiTM), Jasin campus, Malaysia and currently pursuing his M.Sc. Degree of Computer Science in Universiti Teknologi Mara (UiTM), Shah Alam campus, Malaysia, in 2012, 2016 and 2019, respectively. His research interests include human-computer interaction, user interface and experience, multimedia, and education.

Nurul Hidayah Mat Zain received the Doctor of Philosophy (Visual Informatics) from Universiti Kebangsaan Malaysia (UKM) in 2016. She completed the Bachelor of Computer Science (Software Engineering) and MSc Computer Science (Multimedia System) both from Universiti Putra Malaysia (UPM), Serdang, Malaysia, in 2002 and 2003, respectively. She is currently Senior Lecturer with the Department of Computer Science (Multimedia Computing), UiTM Cawangan Melaka, Campus Jasin. She produced many publications in Scopus and ISI Thomson indexing publication including books, journal, proceeding, chapter in books and articles. She also won several gold medals, diamond award and platinum award in research and innovation exhibition. In addition, she is a reviewer paper for national and international journal including Q1 journal and actively involved several grants as project leader and co-researcher. Her research interest are Computer Games, Gamification, User Experience (UX), Eye-Tracking and Human Computer Interaction. She can be contacted at nurulmz@fskm.uitm.edu.my.

Ts. Dr. Aslina Baharum is a senior lecturer at the Faculty of Computing and Informatics, Universiti Malaysia Sabah (UMS). Hold and has actively involved several grants as project leader and co-researcher. Active in community services and won several medals (>30) award in research and innovation, awarded several publications, teaching, Excellence Service, and UMS Researchers awards. Has co-authored and published several books, book of chapters, technical papers and indexed journals (>40) papers. Served as editor for several journals, and scholarly contributed as committee and chairs session for conferences, editorial team and manuscript reviewers. Her research interests are in Human-Computer Interaction (HCI), Visual Informatics, Multimedia, User Experience (UX), Mental Model, Software Engineering, ICT, E-Commerce, and Entrepreneurship. She is currently an active member of ACM, IEEE, IACSIT, ICSES, Royal Institute of Information Technology (Fellow), UACEE, the IRED, and the SAI. Certified Professional Entrepreneurial Educator and Executive Entrepreneurial Leaders. Appointed as Deputy Director of Entrepreneurship Research and Development Centre (2016-2017), Ambassador of Magic, Leader of Technopreneur Cluster, DMH@UMS and Coordinator of Entrepreneurship. She currently holds position of Deputy Director at UMS Centre of External Education.