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Gamification in Vocational Teaching and Learning: Perception and Readiness among Lecturers

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Abstract

Sustainable economic growth and socioeconomic stability can be achieved through technical and vocational education (TVET). Improving TVET education can help empower students to play a significant role in achieving sustainable growth in their country. Teaching and learning in TVET institutions need to be reformed to achieve the international standard and increase students' understanding and motivation. Recently, gamification appears to be an emerging trend in education due to its conviction that it can support learning and motivate students. Thus, this study aims to identify vocational lecturers' perceptions and readiness to implement gamification in their teaching and learning. The findings have shown a high mean score in lecturers' perception and a moderate mean score in their readiness to implement the gamification approach in their teaching and learning. The findings from this study show that vocational teachers need to be trained and ready to use this method in their teaching and learning as a way to deal with the post-pandemic era, where teaching and learning should be more interactive by using the right technology.

Keywords: gamification, vocational, lecturer, perception, readiness

1. Introduction

The global era is accelerating at the moment, given the widespread use of technology in different sectors around the country. On the other hand, the education sector is not lagging behind in terms of leveraging ICT as a teaching and learning platform. As a result, teachers began incorporating a variety of technology-based instructional strategies that were compatible with 21st-century learning. Recently, gamification approaches focused on problem-based learning have gained popularity among teachers and students due to their unique characteristics and educational benefits. Gamification is the application of game design elements to non-game contexts (Deterding, Sebastian, et al., 2011). Gamification is a concept used in education to describe a component of a game that can stimulate and motivate its users, allowing for the incorporation of teaching through games (Hussain, Tan & Idris, 2014; Mohamed Rosly & Khalid, 2017). Gamification of the teaching and learning process transforms the activity into a formal and serious game, adding an element of entertainment and interaction to the learning process (Cugelman, 2013). According to Sung and Hwang (2013), game-based learning is a type of learning environment that integrates games that promote student involvement (collaboration) and organises the knowledge acquired during the learning process.As stated in “How Gamification Reshapes Learning” (Raftopoulos, 2014), the most successful way to incorporate gamification into learning is to first establish a broad framework and narrative, and then to choose the most relevant game elements to create an immersive experience that takes the user on an adventure. When working with software providers, subject matter experts, instructional designers, and stakeholders, my advice to learning professionals is to assert control over the project. This approach necessitates a fundamental rethink and reform of the ways in which we engage and encourage learners. A good place to start is to conceive of teachers as game masters and our students as players. By doing so, we may begin to challenge conventional wisdom about learning and instruction in order to improve our students' experiences.

Students in the information age are more interested in learning via the lens of entertainment than in the more traditional approach of notes and textbooks. Gamification enables the establishment of a more dynamic and engaging teaching and learning environment that is also immersive enough for students to concentrate on and deliver immediate feedback when solving problems in the game. Additionally, game-based learning enables students to solve complex problems in a game-like atmosphere (Elshiekh & Butgerit, 2017). Additionally, gamification can be used to improve personal skills, creativity, persistence, and responsibility during teaching and learning (McGonigal, 2011).

Numerous scholars have examined the usefulness of gamification in vocational education in terms of students' attitudes, motivation, and engagement (Jayalath & Esichaikul, 2020; Han, Bolat, & Goksu, 2021). However, before gamification is implemented in an institution, it is critical to ascertain teachers' perceptions and readiness to embrace the gamification approach. In this study, lecturers at a vocational college should have a favourable attitude toward gamification and a high level of willingness to utilise it in their classroom to ensure the lesson's effectiveness. Thus, the purpose of this study is to ascertain lecturers' perceptions of gamification and their willingness to use it in vocational education institutions.

2. Gamification in Teaching and Learning

Learning must incorporate technology and multimedia to practise development process skills, stimulate creativity, and hone problem-solving abilities. Teachers must possess the required skills and abilities to create learning environments that encourage students to seek knowledge via practise (Kummanee, Nilsook & Wannapiroon, 2020). Gamification is one of the technology-enhanced learning methodologies that has recently gained traction among educators. Nick Pelling coined the term "gamification" in 2002 while serving on the Entertainment Industry Technical Committee. TED and gamification both utilise mechanical game components to facilitate practical solution techniques by attracting specific groups of individuals (Prambayun & Farozi, 2015). Gamification is a term in education that refers to the process of employing game mechanisms and game design approaches to increase motivation and maintain students' attention in class in order to achieve learning objectives and goals. Additionally, gamification may be defined as the practise of thinking in terms of games and the game elements that are used to engage people in problem-solving (Al-Azawi, Al-Faliti & Al-Blushi, 2016). According to Deterding et al. (2011), gamification is a strategy that is gaining traction as a new trend by integrating video game concepts and dynamics into non-game environments.

Gamification-based learning is adopted in the twenty-first-century learning process in the same way an innovation culture is implemented in the classroom, to make teaching and learning more interesting and to raise the quality of national education (Mohamed Rosly & Khalid, 2017). Student behaviour is typically inconsistent in education, making it challenging for teachers to encourage and engage students using conventional educational approaches. This is because traditional learning methods are repetitive, and due to memorising techniques, students' comprehension and retention of knowledge are low. Additionally, conventional learning places a high value on concept mastery above competency. Additionally, students are disengaged from teaching and learning sessions, resulting in less effective learning. Furthermore, teachers struggle to determine whether their students understand and are engaged in the material they are presenting. Printed notes, videos, and PowerPoint slide notes are all examples of teaching aids that are used in traditional learning techniques.

Thus, educational technologists must develop mechanisms such as gamification, which employs game mechanics and thinking in non-game environments, to innovate and motivate students to participate fully in the teaching and learning process (Alsawaier, 2018). Academics define gamification-based learning as a creative method and technological innovation in education that uses gaming strategies or gamification to give cognitive challenges and a positive influence on learners. Numerous game aspects can be included into teaching and learning to maximise the gamification approach's efficacy. Figure 1 illustrates the most frequently used game aspects in education and learning.

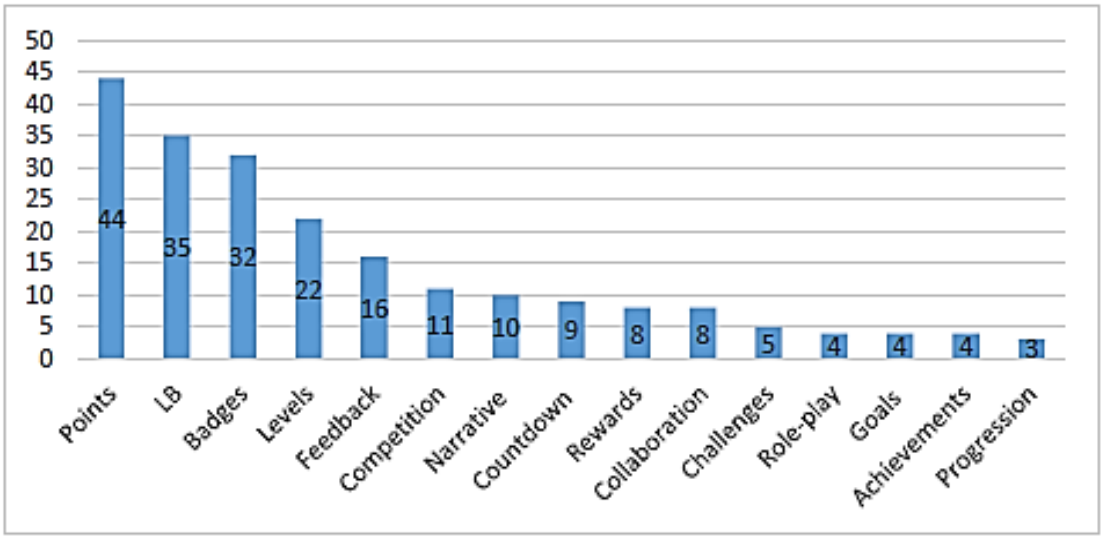

Figure 1. The Most Commonly Used Game Features in Teaching and Learning (Jaftha, Zahra-Micallef & Chircop, 2020)

As illustrated in Figure 1, the most frequently utilised game feature in teaching and learning is the point, followed by the LB and badges. Gamification is a successful delivery strategy, especially for vocational students, because it combines an effective engagement strategy with affective motivation and a competitive spirit among participants. According to Iruela et al. (2018), the majority of vocational students expressed a strong willingness to continue incorporating gamification into their classes. The researcher used web-based gamification technologies into the lesson, specifically Kahoot!, because because of its user-friendly interface and game creation features. Kahoot! is a simple programme that enables users to include gamification components into their classroom, such as score management, leaderboards, and real-time student feedback. Students find learning to be both enjoyable and motivating, with the majority of them eager to move on to the next subject throughout class.

Additionally, Jayalath and Esichaikul (2020) discovered that by including game aspects into the implementation stage of providing learning opportunities, we may stimulate and engage learners, resulting in the development of necessary competencies. Bateman and Nacke (2010) discovered that playing games benefits the brain by releasing chemicals such as dopamine (increases reward-seeking behaviour), epinephrine (increases stress and excitement), and norepinephrine (leads to excitement), all of which induce enjoyment and motivate players to remain engaged throughout the game. Even if a game is created to be won, being in the game and engaging in game thinking is more fun (Kapp 2012). The study developed a game for vocational students with the objective of enhancing their motivation and achievement. Further, the study revealed that gamification can help learners overcome motivational and engagement barriers, as well as avoid discontent and boredom.

3. Methodology

3.1 Research Design

This study adopted a survey-style design for its quantitative research. The purpose of this study was to ascertain the attitudes and readiness of vocational college lecturers toward the implementation of gamification in the teaching process. This research design was chosen due to the characteristics of survey research, which enable the description and exploration of human behaviour and preferences and are often employed in social and psychological research (Singleton & Straits, 2009).

3.2 Sampling

This survey involved lecturers from vocational colleges. Simple random sampling was used to choose the sample for this study, which was done on 12 vocational colleges in Johor. The study population included lecturers from vocational colleges located throughout Johor. However, the researchers chose 55 teachers from three vocational colleges in Pasir Gudang, Tun Hussein Onn, and Pagoh. As a result, according to Krejcie and Morgan's (1970) sample table, 48 respondents were required to represent the population in this study.

3.3 Instrument

This study employed a questionnaire as the instrument. The questionnaire is divided into two parts, with Part 1 comprising demographic information on the respondents and Part 2 comprising the items based on the constructs required to address the research objectives. The second part of the questionnaire is divided into two constructs: perception and readiness. The first construct, which represents the lecturer's perception of gamification, consists of fourteen components. The second construct, which indicates lecturers' readiness to incorporate gamification, contains 14 items.

3.4 Data Analysis

The questionnaire was distributed to vocational college lecturers in order to ascertain their perceptions of and readiness to use gamification in the teaching and learning process. The IBM Statistic Package for Social Science (IBM SPSS) version 25 was used to analyse the data collected throughout the research. Descriptive statistics were used to analyse the data collected. This data is expressed as a mean and a standard deviation. The mean value obtained through data analysis is then interpreted as a level based on the mean interpretation table.

3.5 Research Objectives

The objectives of this study were to:

1. Determine the lecturer’s perception of the implementation of gamification in a vocational college.

2. Evaluate the lecturer’s readiness to implement the gamification approach in the teaching and learning process.

3.6 Mean Interpretation

Based on the findings, the mean score interpretation table is used to identify the level of perception and readiness using the mean score obtained during data analysis. Table 1 shows the mean interpretation table used in this study.

Table 1. Mean Interpretation (Harrell, 2017)

Level	Mean Score
High	3.68 – 5.00
Moderate	2.34 – 3.67
Low	1.00 – 2.33

4. Findings and Discussions

4.1 Lecturers' Perception on the Implementation of Gamification in Vocational Teaching and Learning

Table 2 depicts the distribution of mean score, standard deviation, and mean score interpretation (level) of lecturers' perceptions of the gamification approach's implementation.

A descriptive analysis of lecturers' perceptions of the gamification approach's implementation reveals that item 6 has the highest mean value (M = 4.06, SD = 0.99), followed by item 7 (M = 4.00, SD = 0.96). Item 6 indicates that most lecturers find that their students are actively involved in the teaching and learning process when a gamification approach is used in the classroom. Furthermore, the lecturers also agree that gamification is suitable and effective to be used in the teaching and learning process, as indicated in item 7. Meanwhile, item 11 (M = 3.42, SD = 1.06) showed a moderate mean value, where the item states that the gamification approach is suitable to be implemented in a practical class. Based on the mean scores of all the items, the lecturers' perceptions of the gamification method are at an average of 3.42 to 4.06, indicating a high level of interpretation for all the items.

The results of the study found that the average mean for lecturers' perceptions of the implementation of the gamification approach in vocational colleges is at a high level and very satisfactory. The findings indicate a positive perception of gamification in teaching and learning. This is because the gamification approach is a method of teaching and learning with the concept of blended learning that is very effective for students in vocational colleges because the majority of students who enter vocational colleges are relatively weak in terms of academic achievement (Roksa, 2006). Therefore, this approach can help students master their learning and improve their understanding. In terms of the continuous assessment process that is carried out, vocational colleges still use the conventional method of assessment using written and practical test methods. This means that the gamification method for strengthening students can be used mostly for academic learning.

Table 2. Vocational Lecturers' Perception on the Implementation of Gamification

No.	Item	Mean	SD	Level
1.	The implementation of gamification in the classroom can improve my teaching competencies.	3.92	0.89	High
2.	The implementation of gamification in teaching and learning is effective for vocational students.	3.92	0.91	High
3.	Teaching using gamification is fun for students.	3.90	0.99	High
4.	Students' interest increases when gamification is used in the classroom.	3.94	1.04	High
5.	Gamification in teaching and learning help students to achieve high level of focus during learning process.	3.94	0.97	High
6.	I found my students to be actively involved in the classroom when using gamification.	4.06	0.99	High
7.	Gamification is suitable for teaching and learning tools because it is effective in the learning process.	4.00	0.96	High
8.	The implementation of gamification enhances students' motivation	3.90	0.99	High
9.	The gamification approach enhances students' knowledge	3.94	0.95	High
10.	The Gamification approach can help lecturers achieve the learning outcomes effectively.	3.83	0.95	High
11.	Gamification is suitable to be implemented in practical classes	3.42	1.06	Moderate
12.	Gamification can help students to compete with their peers in a healthy way.	3.85	1.01	High
13.	The implementation of gamification encourages students to interact with lecturers during teaching and learning.	3.88	1.00	High
14.	I support the implementation of gamification to be practiced among vocational lecturers during teaching and learning sessions.	3.90	1.01	High

Gamification has the potential to foster an active teaching and learning process based on constructivism theory, in which students can construct new concepts and knowledge through their own experiences (Kotini & Tzelepi, 2015). According to Bicen and Kocakoyun (2018), students become more active when a gamification approach is used instead of traditional approaches. Additionally, the researchers discovered that incorporating gamification into teaching and learning can boost students' interest and drive. This is also demonstrated in a study by Bai, Hew, and Huang (2020), which demonstrates how this method can result in an interesting user experience. Gamification can boost student motivation during the teaching and learning process in the classroom, and was one of the questionnaire items that received a

high mean score. The data demonstrate unequivocally that gamification strategies incorporating game aspects may shape and motivate users (Hussain, Tan & Idris, 2014; Bai, Hew & Huang, 2020).

Additionally, the study's findings indicate that the gamification technique can help boost students' overall knowledge in a topic course. This is because the gamification approach enables students to be given time and encouraged to seek out new knowledge that is related to previously acquired knowledge. Thus, students will evaluate their newly obtained knowledge in light of their current level of comprehension (Banfield & Wilkerson, 2014). In short, vocational college lecturers' perceptions of the gamification strategy are favourable. The majority of lecturers feel that in the future, this gamification technique should be incorporated in vocational institutions' teaching and learning processes. This is because 21st-century learning approaches based on information and communication technology (ICT) are strongly emphasised. Additionally, with the implementation of new standards in Malaysia as a result of the COVID-19 disease outbreak that affected the country's education system this year, drastic changes in teaching and learning sessions have occurred, with the latter becoming entirely reliant on online learning sessions. As a result, lecturers believed that gamification was one of the most successful strategies they could utilise throughout the teaching session.

4.2 Lecturers' Readiness to Implement Gamification Approach in Vocational Teaching and Learning

Table 3 shows distribution of frequency, percentage, mean score and standard deviation of lecturers' readiness to implement gamification in teaching and learning.

Based on table 3, the mean range of all the items is between 3.21 and 3.75. The majority of the mean scores are at a moderate level, with only 3 items showing a high level of readiness. The item with the highest mean score is item 6 (M = 3.77, SD = 0.83), followed by item 11 (M = 3.75, SD = 0.91) and item 5 (M = 3.73, SD = 0.73). Item 6 indicates that the lecturers agree that they can construct exercises to assess students online using a gamification approach. Other than that, most of the lecturers are ready to make a change in their teaching and learning approach by implementing gamification in their classroom as indicated in item 11. However, item 8 (M = 2.67, SD = 1.24) shows the lowest mean score, which indicates that some of the lecturers never attended courses on gamification in teaching and learning.

Based on the findings, the lecturers' readiness to implement a gamification approach in teaching and learning shows a moderate level of readiness. The findings indicate that most lecturers disagree with the statement regarding having skills in developing gamification-based applications. This is because developing the gamification tools demands some basic knowledge of gamification techniques. Lecturers should be given a training on how to create a gamification-based teaching and learning materials using the basic gamification implementation process as proposed by Huang and Soman (2013). In addition, before starting the development of gamification materials for teaching and learning, lecturers should identify the target users who will use the materials. However, lecturers have difficulties creating and using the gamification approach in the classroom due to a lack of basic skills in determining and developing these applications. According to Rosly and Khalid

(2017), the lack of specific aspects when designing the gamification materials might result in input limitations, making them ineffective in terms of content structure, format, and narrative.

Table 3. Vocational Lecturers' Readiness to Implement Gamification

No.	Item	Mean	SD	Level
1.	I am aware of the gamification approach in teaching and learning.	3.56	0.92	Moderate
2.	I have knowledge on how to implement gamification in teaching and learning.	3.31	0.82	Moderate
3.	I clearly understand the implementation process of gamification in teaching and learning.	3.42	0.84	Moderate
4.	1 have good skills on the use of Information Technology and Communication.	3.65	0.83	Moderate
5.	I prefer the use of gamification during teaching and learning because this approach is easier than traditional approach.	3.73	0.73	High
6.	I can construct the exercises to assess students online based on gamification during teaching and learning.	3.77	0.83	High
7.	I have the skills to develop gamification-based application for teaching and learning.	3.38	0.95	Moderate
8.	I have attended courses on gamification in teaching and learning.	2.67	1.24	Moderate
9.	I frequently use the gamification application in education. (Ex: Kahoot, Quizziz, VLE, etc)	3.54	1.05	Moderate
10.	I have enough time to prepare for lessons using gamification approach in my classroom	3.21	1.07	Moderate
11.	I am ready to make a change in my teaching and learning approach by implementing gamification in my classroom	3.75	0.91	High
12.	I can implement the concept of gamification based on the topic	3.52	0.92	Moderate
13.	I have the skills on steps to design the gamification clearly	3.46	0.92	Moderate
14.	I understand all models related to gamification design	3.50	0.94	Moderate

Other than that, the findings show that lecturers' readiness in terms of time to prepare the materials using a gamification approach is at a moderate level. This is because incorporating gamification into the classroom demands significant planning time and effort to create a material that is consistent with the lecturer's learning objectives. According to Sánchez-Mena and Martí-Parreño (2016), much more time is needed in the process of designing and planning the teaching activities. Resources seem to be a key barrier when using gamification

in teaching, and one of the resources is time to prepare the materials. Time is critical in the preparation of instructional materials since the effectiveness of gamification-based learning is dependent on the instructional materials (dos Reis Lvero et al., 2021). Thus, the materials should be appropriately prepared.

Furthermore, the results of the study found that the level of skills in the mastery of Information and Communication Technology (ICT) among the lecturers is still at a moderate level. This is because most of the lecturers in vocational colleges are veteran lecturers and lack skills in mastering information and communication technology (ICT), which causes the gamification approach to be less prevalent in vocational colleges than in regular schools. According to Yeap et al., (2021), some vocational lecturers prefer to use conventional methods over technology based teaching methods. This is due to the finding that most of the lecturers are lacking in ICT skills. There are also findings by Thangaiah et al. (2020) that most instructors refuse to integrate technology into their teaching and learning processes due to some factors such as insufficient infrastructure, less exposure to the technology, limited access to the internet, and the frequent changes in the curriculum itself. In summary, this study found that the level of readiness of lecturers in using the gamification approach in vocational colleges is at a moderate level in terms of skills in developing gamification-based applications, time to prepare teaching and learning materials using the gamification approach, and skills in information and communication technology (ICT) and low level in terms of determining each design step in the gamification process.

5. Conclusion

The gamification approach in this study mainly focused on vocational college lecturers proved that the lecturers' perception of this approach is positive. Gamification can be used as an effective teaching and learning method according to the needs of 21st-century learning. In addition, vocational college lecturers' perception of the concept of the gamification approach focuses on the play aspects and the potential benefits to their students during the teaching and learning process in the classroom. The implementation of concept -related gamification approach, especially among students, is highly encouraged as students are a generation more receptive to innovation-related changes. Educational technology has transformed passive teaching and learning methods to a more up-to-date method and can contribute significantly in terms of more dynamic student mind development. Suppose this gamification approach can be implemented carefully and clearly, it can be used as a strong strategy in improving the national education program so that learning objectives are achieved because it affects student behavior during the teaching and learning process in the classroom. This can give awareness to lecturers that gamification has elements of ideas and innovations that can elevate educational strategies in Malaysia.

References

Al-Azawi, R., Al-Faliti, F., & Al-Blushi, M. (2016). Educational gamification vs. game based learning: Comparative study. *International Journal of Innovation, Management and Technology, 7*(4), 132-136. https://doi.org/10.18178/ijimt.2016.7.4.659

Alsawaier, R. S. (2018). The effect of gamification on motivation and engagement. *The International Journal of Information and Learning Technology, 35*(1), 56-79. https://doi.org/10.1108/IJILT-02-2017-0009

Bai, S., Hew, K. F., & Huang, B. (2020). Does gamification improve student learning outcome? Evidence from a meta-analysis and synthesis of qualitative data in educational contexts. *Educational Research Review, 30*, 100322. https://doi.org/10.1016/j.edurev.2020.100322

Banfield, J., & Wilkerson, B. (2014). Increasing student intrinsic motivation and self-efficacy through gamification pedagogy. *Contemporary Issues in Education Research (CIER), 7*(4), 291-298. https://doi.org/10.19030/cier.v7i4.8843

Bateman, C., & Nacke, L. E. (2010). The neurobiology of play. In Proceedings of the international academic conference on the future of game design and technology (pp. 1-8). ACM. https://doi.org/10.1145/1920778.1920780

Bicen, H., & Kocakoyun, S. (2018). Perceptions of students for gamification approach: Kahoot as a case study. *International Journal of Emerging Technologies in Learning, 13*(2). https://doi.org/10.3991/ijet.v13i02.7467

Cugelman, B. (2013). Gamification: what it is and why it matters to digital health behavior change developers. *JMIR serious games, 1*(1), e3139. https://doi.org/10.2196/games.3139

Deterding, S., Dixon, D., Khaled, R., & Nacke, L. (2011, September). From game design elements to gamefulness: defining" gamification". In Proceedings of the 15th international academic MindTrek conference: Envisioning future media environments (pp. 9-15). https://doi.org/10.1145/2181037.2181040

Deterding, S., Sicart, M., Nacke, L., O'Hara, K., & Dixon, D. (2011). Gamification. using game-design elements in non-gaming contexts. In CHI'11 extended abstracts on human factors in computing systems (pp. 2425-2428). https://doi.org/10.1145/1979742.1979575

dos Reis Lívero, F. A., da Silva, G. R., Amaral, E. C., de Souza, A. N. V., Baretta, I. P., Diegues, M. E. M., ... & Lovato, E. C. W. (2021). Playfulness in the classroom: Gamification favor the learning of pharmacology. *Education and Information Technologies, 26*(2), 2125-2141. https://doi.org/10.1007/s10639-020-10350-w

Elshiekh, R., & Butgerit, L. (2017). Using gamification to teach students programming concepts. *Open Access Library Journal, 4*(8), 1-7. https://doi.org/10.4236/oalib.1103803

Huang, W. H. Y., & Soman, D. (2013). Gamification of education. *Report Series:*

Behavioural Economics in Action, 29, 11-12.

Hussain, S. Y. S., Tan, W. H., & Idris, M. Z. (2014). Digital game-based learning for remedial mathematics students: A new teaching and learning approach In Malaysia. *International Journal of Multimedia Ubiquitous Engineering, 9*(11), 325-338. https://doi.org/10.14257/ijmue.2014.9.11.32

Iruela, M. G., & Neira, R. H. (2018, June). How gamification impacts on vocational training students. In *International conference on artificial intelligence in education* (pp. 99-103). Springer, Cham. https://doi.org/10.1007/978-3-319-93846-2_19

Jaftha, N., Zahra-Micallef, M., & Chircop, T. (2020). The Impact of Gamified Instruction on Students' Learning Outcomes: Systematic Review of Experimental Studies. *International Journal of Education, 13*(4), 55-85. https://doi.org/10.5296/ije.v13i4.19193

Jayalath, J., & Esichaikul, V. (2020). Gamification to enhance motivation and engagement in blended eLearning for technical and vocational education and training. *Technology, Knowledge and Learning, 27*, 91-118. https://doi.org/10.1007/s10758-020-09466-2

Kapp, K. M. (2012). *The gamification of learning and instruction: Game-based methods and strategies for training and education*. Hoboken: Wiley. https://doi.org/10.1145/2207270.2211316

Kotini, I., & Tzelepi, S. (2015). *A gamification-based framework for developing learning activities of computational thinking. Gamification in education and business* (pp. 219-252). Springer, Cham. https://doi.org/10.1007/978-3-319-10208-5_12

Krejcie, R. V., & Morgan, D. W. (1970). Determining sample size for research activities. *Educational and psychological measurement, 30*(3), 607-610. https://doi.org/10.1177/001316447003000308

Kummanee, J., Nilsook, P., & Wannapiroon, P. (2020). Digital learning ecosystem involving STEAM gamification for a vocational innovator. *International Journal Information Educational Technology, 10*, 533-539. https://doi.org/10.18178/ijiet.2020.10.7.1420

McGonigal, J. (2011). *Reality is broken: Why games make us better and how they can change the world*. Penguin.

Mohamed Rosly, R., & Khalid, F. (2017). Gamifikasi : Konsep dan Implikasi dalam Pendidikan. *Gamifikasi : Konsep Dan Implikasi Dalam Pendidikan*, 144-154.

Öden, M. S., Bolat, Y. İ., & Goksu, İ. (2021). Kahoot! As a Gamification Tool in Vocational Education: More Positive Attitude, Motivation and Less Anxiety in EFL. *Journal of Computer and Education Research, 9*(18), 682-701.

Prambayun, A., & Farozi, M. (2015). Pola perancangan gamifikasi untuk membangun engagement siswa dalam belajar. *Semnasteknomedia Online, 3*(1), 5-7.

Raftopoulos, M. (2014). What are the most effective uses of gamification in learning. How

Gamification Reshapes Learning*, 13*.

Roksa, J. (2006). Does the vocational focus of community colleges hinder students' educational attainment? *The Review of Higher Education, 29*(4), 499-526. https://doi.org/10.1353/rhe.2006.0038

Rosly, R. M., & Khalid, F. (2017). Gamifikasi: Konsep dan implikasi dalam pendidikan. Pembelajaran Abad ke-21: *Trend Integrasi Teknologi*, 144-154.

Sánchez-Mena, A., & Martí-Parreño, J. (2016, June). *Gamification in higher education: teachers' drivers and barriers*. In Proceedings of the International Conference the Future of Education (pp. 180-184).

Singleton, R. A., & Straits, B. C. (2009). *Approaches to social research* (5th ed.). New York: Oxford University Press.

Sung, H. Y., & Hwang, G. J. (2013). A collaborative game-based learning approach to improving students' learning performance in science courses. *Computers & Education, 63*, 43-51. https://doi.org/10.1016/j.compedu.2012.11.019

Thangaiah, E. A., Jenal, R., & Yahaya, J. (2020). Penerokaan Penggunaan E-Pembelajaran dalam Kalangan Pelajar dan Pengajar TVET-Satu Kajian Awal. *Journal of Southeast Asia Social Science & Humanities (Akademika), 3*, 5-18.

Yeap, C. F., Suhaimi, N., & Nasir, M. K. M. (2021). Issues, challenges, and suggestions for empowering technical vocational education and training education during the COVID-19 Pandemic in Malaysia. *Creative Education, 12*(8), 1818-1839. https://doi.org/10.4236/ce.2021.128138

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