

Developing an Interactive Games of Information Management Education for Online Distance Learning

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ABSTRACT

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Gamification has progressively gained popularity in higher education as a valuable complement to the breadth of available learning tools for academicians and students. Plausibly, this is due to the nature of the digital native generation, who are more likely to be interested in educational technologies. The purpose of the study is to develop an Interactive Games of Information Management Education that fosters information literacy and cataloguing skills for information management students. It is a self-learning game for academicians and students that aims to improve educational quality in entertaining ways. This study used a few website applications to design the course content with game elements that innovate the teaching and learning method. An online survey was conducted to examine students' perception of online interactive game-based learning. A total of 46 students of a public higher learning institution participated in the survey. Based on the frequency analysis, it was found that students' self-efficacy in information literacy and cataloguing skills increased due to the game's gamified learning approach. In general, most of the students surveyed have a favourable opinion after experiencing the Interactive Games of Information Management Education for their learning activities. Among others, they agreed that the Interactive Games of Information Management Education provide an effective and enjoyable online learning environment. Additionally, students believed that gamification would benefit them in gaining a better knowledge of the course materials.

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1. INTRODUCTION

The COVID-19 epidemic has impacted every industry in the world, including the education sector. The pandemic has caused a significant shift in teaching and learning methods used to present syllabus contents. Before the pandemic, it was common to have face-to-face communication between educators and students, but this is no longer the case. The affected educators and learners are forced to embrace online techniques to continue learning activities. Zainuddin et al. (2021) mentioned that shifting traditional classroom education into an online educational environment with insufficient planning is challenging and ineffective. The advent of social media and online gaming and the ubiquitous usage of intelligent gadgets have made it even harder to keep students motivated to learn (Rabah, 2018). It is more difficult to stimulate students' motivation and interest to engage in online courses and urge them to learn outside the traditional classroom setting (Baber, 2020). Educators are concerned about how to sustain students' interest and involvement (Rahman et al., 2018). Thus, educators are constantly finding ways to develop and implement learning activities that are based on a participatory, pleasurable, and fun manner. The improvement of teaching delivery aims to assist students in remembering more facts by providing entertaining and engaging learning experiences.

Gamification is one of the strategies that can promote teaching and learning effectiveness in a digital environment. Loos and Crosby (2017) expressed that gamification approaches based on active learning offer a solution to the passive classroom and a motivator of student involvement. Active learning encourages student flexibility and participation in the learning experience, and students can get the information on their own through experiential engagement in the learning process (Murillo-Zamorano et al., 2021). Sobocinski (2017) asserted that people's behavior might be improved by increasing motivation and engagement through immersive experiences. Tisza (2021) stated that fun is a crucial learning component, particularly among gamification experts. They can make learning more exciting, fun, and ultimately more effective (Barber, 2018; Barber & Smutzer, 2017). According to Siemon and Eckardt (2017), models that incorporate game dynamics increase motivation and enjoyment but do not always increase learning efficiency. Meanwhile, Llorens-Largo et al. (2016) discovered that the most significant element of a gamified system is the element of enjoyment. Merriam Webster (2022) indicated that fun is what provides amusement or entertainment. It generates interest, a feeling that accompanies or causes special attention to something or someone and induces or persuades to participate or engage.

Based on the above discussion, this paper aims to develop an Interactive Games of Information Management Education (i-GIME) framework to enhance students' learning concentration, motivation, and interest. The main idea behind this framework is that educators should incorporate entertaining gamification technologies in delivering education to students. Gamification in learning improves engagement in educational environments by introducing game elements into the learning context (Dichev & Dicheva, 2017). Integrating education and entertainment is essential to foster a sense of enthusiasm and enjoyment about learning in students. It is believed that learning delivery assisted by gamification could boost students' confidence, motivation and engagement in the class. The development of the i-GIME framework is relevant as most countries are gradually moving from traditional learning methods to more interactive, engaging, and immersive learning approaches. This paper is divided into several sections.

2. LITERATURE REVIEW

2.1 Gamification and Education

Gamification as an educational and commercial strategy is rising in all fields (Deif, 2017). It has received much attention in educational settings (Koivisto & Hamari, 2017). According to Merriam-Webster (2021), gamification is defined as the “process of adding games or game-like elements to something (such as a task) to encourage participation.” gamification relies on people using the gamified system in learning to be shown as valuable and practical (Ofosu-Ampong, 2020). Gamification is a societal phenomenon that has emerged because of a generation of digitally savvy people (Alsawaier, 2018). It has emerged as one of the most significant technology advancements in the field of human interaction (Majuri et al., 2018). Ahmed and Sutton (2017) highlighted that gamification is the practice of incorporating game theory and design, game components, game aesthetics, and game mechanics into a learning experience. It involves game features not to transform learning into a computer game, but to enhance learning, engagement and encourage positive behaviour (Alsawaier, 2018).

In China, gamification has been widely carried out in primary and secondary schools and has also been practiced in universities, especially in computer teaching (Ying, 2021). Ofosu-Ampong (2020) indicated that the widespread embrace of gamification and game features in education has a wide range of implications on student outcomes and engagement. Many educators believe that gamification will enhance students' enthusiasm to study and make academics more effective and meaningful (Rabah, 2018). Pastushenko et al. (2018) demonstrate that gamification does assist in increasing students' motivation. The basic idea of gamification is to study, use and replicate the same motivation and flow of the users in other fields. Mirzoyeva and Kabdrgalinova (2021) stated that the power of gamification could increase student focus and perseverance in learning. By playing games and allowing failures, namely repeated failures, students can learn from them. At the same time, cognitive reward includes the development of problem-solving and critical thinking skills. Students must complete tasks successfully to win and pass to the next level. The rewards provided at the end of each game increase motivation.

Santana et al. (2016) mentioned that gamification makes use of the elements present in electronic games, such as rewards, feedback, rankings, and exchanges. Their application in education can motivate students to accomplish specific tasks or competitions to achieve objectives. Gamification has the likelihood of adjusting behaviors, developing commitment and generating learning. In a similar vein, Liu et al. (2017) stated that gamification uses game design aspects to improve educational results, make repetitive processes more entertaining, and make students' assignments and learning more enjoyable. Thus, gamification incorporates a fun component that facilitates changing students' attitudes toward learning (Alsawaier, 2018) and boosts students' personalities and productivity (Ofosu-Ampong, 2020). However, for gamification to be effective in education, a concerted effort from educators, administrators, and the information technology department of a higher learning institution is crucial in creating successful gamified courses (Sobocinski, 2017).

Many research highlights the benefits of using gamification in learning. Alabbasi, 2017 stated that students believe that incorporating game elements in education enables them to have a sense of belonging, enjoy, feel less lonely, increase connectivity, lessen boredom, reduce anxiety, reduce stress, and increase positivity in the learning process. Similarly, Plump (2017) asserted that game-based learning tools oriented on online learning amusement, concept support, and good energy could contribute to increasing motivation and meaningfulness. Such

devices can create an inviting atmosphere that encourages active involvement and promotes learning. In another study, Pacheco-Velazquez et al. (2021) showed that the implementation of gamification activities in a problem-based learning classroom can positively impact students' academic achievement and satisfaction, including learning skills.

2.2 Interactive Games of Information Management Education

This study introduces i-GIME to supplement traditional teaching methods in information management courses. It teaches compliance, adaptation, problem-solving, interaction, critical thinking, and creativity rules. Also, it is a productive instructional tool since it enlivens traditional teaching approaches that students find mundane. The i-GIME is built with Google Sites, Wordwall, Liveworksheet, and interactive websites. This application is simple to use and intuitive to navigate. The contents in i-GIME are aligned with a particular course's academic syllabus to achieve learning outcomes. They engage learners' emotions by utilizing a computer monitor filled with vibrant colors and animations to capture and maintain their attention. Students can use a smartphone, tablet, or laptop to play the games available in i-GIME. Apart from games, students can also get information related to library management and information management when accessing i-GIME. It can be used as an alternative and innovative teaching method through digital games and playing games as part of learning for students. As a result, educators' competencies in expanding academic aims to comprehend and support the entire student, not just their subject knowledge and skills but also their social, emotional, and behavioral skills, are being developed. This flexible learning method meets the needs of 21st-century learning, that is, learning without being bound by space and time.

2.3 Developing the Interactive Games of Information Management Education

This i-GIME innovation was designed using Google Sites and is entirely web-based. The interactive information management education games website interface is depicted in Figure 1. The website includes the home menu, courses, tutorials, and external links. Figure 2 illustrates the home menu, which leads to the introduction of i-GIME, a web-based edutainment that delivers comprehensive information. The welcoming information is embedded and related to the information management and syllabus.



Figure 1. Website Interface of i-GIME



Figure 2. Home Menu

As indicated in Figure 3, the courses menu describes the subjects Introduction to Information Skills (course code IMD111) and Introduction to Cataloging (course code IMD223). Introduction to Information Skills is a subject that requires critical thinking skills, such as literacy, citation, and reference skills. Simultaneously, IMD223 is a curriculum that describes library materials according to established criteria. Additionally, each course includes tutorials. Students can play a game to better understand the material in these tutorials, which are game-based. Figure 4 illustrates the multiple games available for IMD111, including Info Hunt, Reshelf It!, Cite it!, and Where is it? According to the subject discussed, these games creatively use the given platform to produce engaging games.



Figure 3. Courses Menu



Figure 4. Course Tutorials

Figure 5 illustrates the game of *Info Hunt*, whereby students can find words hidden in a letter grid as fast as they can by reading the clue given. *Reshelf it!* need the students to drag and drop words to rearrange each sentence into the correct call number order, as demonstrated in Figure 6.



Figure 5. Info Hunt

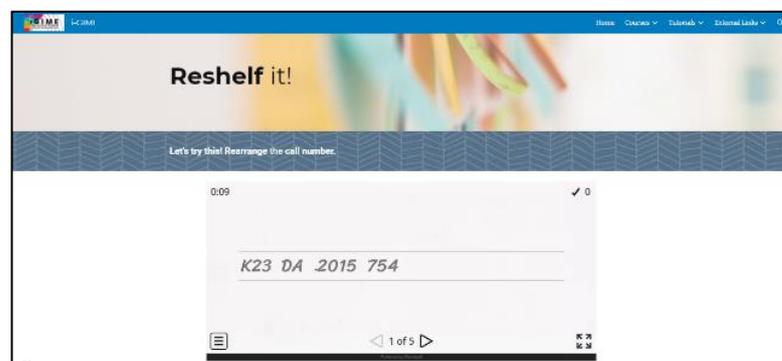


Figure 6. Reshelf It! Menu

In Figure 7, *Cite it!* is the game in which the students can tap the matching answer to eliminate it. Then, they need to repeat until the answers are gone. *Where is it!* Figure 8 is a maze chase, in which they need to find where to refer to, and they need to run to the correct answer zone while avoiding the enemies.



Figure 7. Cite it! Menu

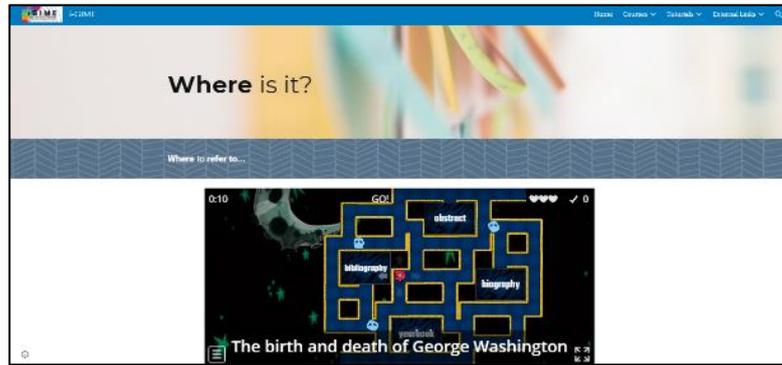


Figure 8. Where is it? Menu

On the other hand, in the IMD223 course, there are various games, such as *Info Hunt*, *Terms, Discover it!*, *Access Point*, and *Catalog it!* for the students to participate and learn in this course. Figure 9 shows the info hunt game, enabling them to play and enjoy a crossword puzzle about cataloging. They need to read the clues and type the answers into the crossword puzzle. Figure 10 illustrates the *Terms, Discover It!* game, where students can identify terms in bibliographic records with the drag and drop pin function to their correct place on the image.



Figure 9. Info Hunt for IMD223

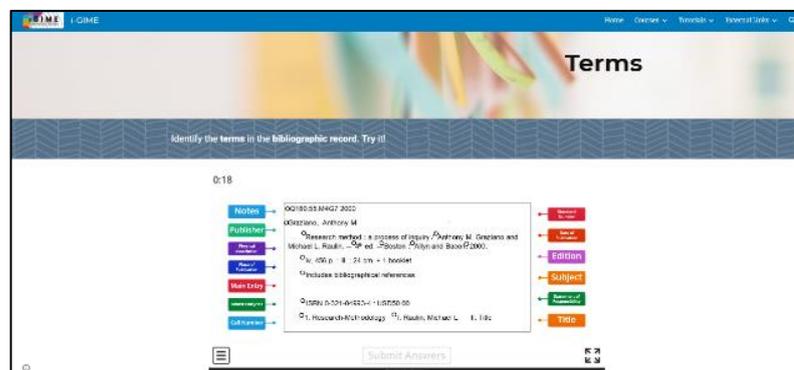


Figure 10. Terms, discover it! Menu

In the *Access Points* game, the students can correctly identify the main entry and added entry/ies. As displayed in Figures 11 and 12, describe the *Catalog it!* They can catalog books, sound recordings, and continuing resources from the game. Also, they can check their answers or email them to their educator.



Figure 11. Access Point Menu

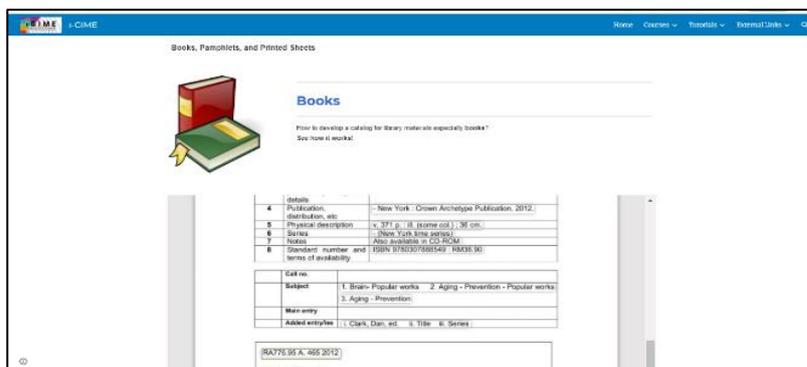


Figure 12. Catalog it! Book Menu

External link menu listed menus such as *Did You Know*, *Blogs*, *Directory*, and *References*. As illustrated in Figure 13, Did You Know is an exciting sharing about libraries in the menu. As shown in Figure 14, there are links to blogs related to library and information management.

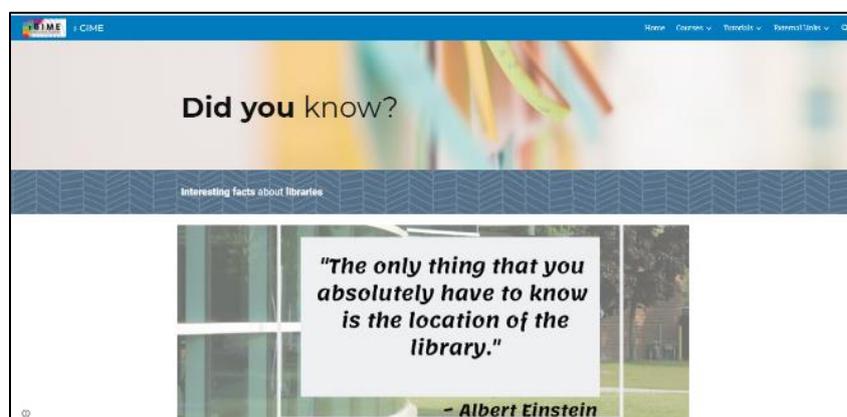


Figure 13. Did you know? Menu

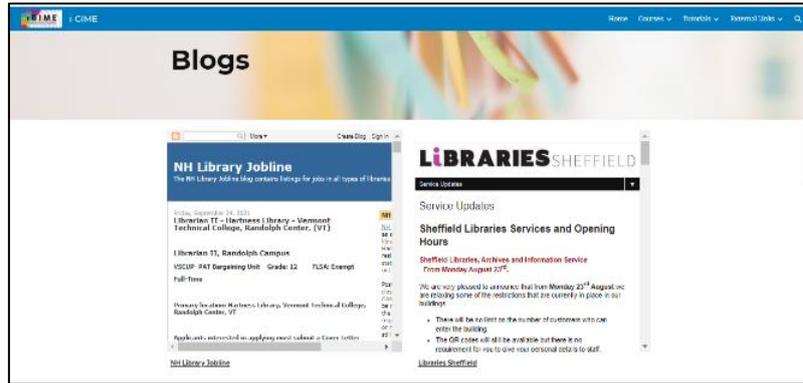


Figure 14. Blogs Menu

Figure 15 describes the directory. It includes the link to information agencies, such as libraries, archives, and museums. A list of references used in this innovation is made available in the *References* menu, as illustrated in Figure 16.



Figure 15. Directory Menu

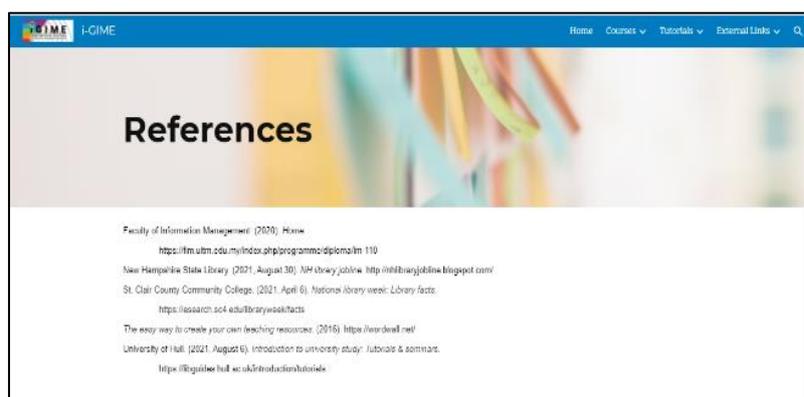


Figure 16. References Menu

I-GIME's implementation aims to make learning an exciting and pleasurable experience for students. Students can check the syllabus and courses menu that explains subjects in detail from the i-GIME web. Lecturers can proceed with online lectures and provide the students ample time

to explore the games, thus enhancing their understanding of the subject covered. There are game-based tutorials, which are *Info Hunt*, *Reshelf it! Cite it! Where is it? The term, discover it, Access Point Menu*, and *Catalog it*. The result of the assessments is automatically generated from the web which lecturers can document for monitoring purposes. By experiencing i-GIME, the students would better understand and comprehend the subject in an edutaining manner. The i-GIME comes with an external list that assists students with their queries, such as *Did you know page*, *Blogs*, *Directory*, and *References*. Such interactive edutainment games would benefit students and lecturers during the learning and teaching process. For example, they allow lecturers to continuously monitor and control their progress through feedback. More importantly, they could help develop students' cognitive, motor, and spatial skills, which are essential in the learning process.

4. METHOD

An i-GIME prototype was used to test the learning effects of gamification in education ideas. To refine the i-GIME prototype, we conducted a pilot study and used the results to fine-tune the game's mechanics. A total of 46 students were randomly selected from a list of Semester 1 and Semester 4 undergraduate students from a local university in Sarawak. Students were given the i-GIME website link to access and play the featured games. Each game takes roughly 5 to 10 minutes, and students were encouraged to find solutions to the problems given in each game. After experiencing the i-GIME, they were given an online survey that contained closed-ended Likert-scale questions related to their perceptions using i-GIME. The questions were written in statement sentences classified by perception domain for simple reading and interpretation. The response options were 'strongly agreed,' 'agreed,' 'neutral,' 'disagreed,' and 'strongly disagreed.'

5. DATA ANALYSIS AND RESULTS

A total of 46 respondents participated in the survey: 30 students were from Semester 1 (enrolled in course IMD111), and 16 students were from Semester 4 (enrolled in course IMD223).

Table 1. Students' Perception of the i-GIME

Response	Statements	Strongly Agreed		Agreed		Neutral	
		Sem 1	Sem 4	Sem 1	Sem 4	Sem 1	Sem 4
1.	The i-GIME instruction provided makes it easy to use the "game-based edutainment".	12 (40%)	6 (37.5%)	15 (50%)	8 (50%)	3 (10%)	2 (12.5%)
2.	i-GIME is enjoyable.	10 (33%)	5 (31.3%)	17 (57%)	10 (62.5%)	3 (10%)	1 (6.3%)
3.	i-GIME could help me learn the knowledge of information skills in information management.	15 (50%)	8 (50%)	10 (33%)	6 (37.5)	5 (17%)	2 (12.5%)
4.	i-GIME could help me learn the knowledge of cataloging skills in information management.	12 (40%)	8 (50%)	12 (40%)	6 (37.5%)	6 (20%)	2 (12.5%)
5.	I will be more motivated on learning with i-GIME.	11 (37%)	8 (50%)	16 (53%)	3 (18.8%)	3 (10%)	5 (31.3%)
6.	It will be more interesting if instructors apply i-GIME to their teaching.	15 (50%)	7 (43.8%)	12 (40%)	6 (37.5%)	3 (10%)	3 (18.8%)

Note: There was no response received for "disagreed" and "strongly disagreed", thus were omitted from the table (N = 46 respondents)

The result from Table 1 showed a total of 12 (40%) respondents from Semester 1 and a total of 6 (37.5%) respondents from Semester 4 rated strongly agreed with Statement 1 that the i-GIME instructions provided make it easy to use the "game-based edutainment". However, for the rating agreed was equal from Semester 1 (15) and Semester 4 (8). Both were 50%. Only 3 (10%) from Semester 1 and 2 and (12.5%) from Semester 4 took a neutral stand with Statement 1. The data collected from Statement 2 showed that 10 (33%) respondents from Semester 1 and 5 and 31% of respondents from Semester 4 strongly agreed that the i-GIME is (extremely enjoyable). Meanwhile, for Semester 1, 17 (57%) respondents and Semester 4, 10 (62%) respondents agreed that the games were very enjoyable, whereas 10% of Semester 1 and 3 respondents, and only 1 (6.3%) Semester 4 respondent had a neutral reaction and found the games to be somewhat enjoyable. No students disagreed or strongly disagreed. The data collected from Statement 3 found that the use of i-GIME enhanced students' knowledge of information skills. As shown in Table 1, 50% of the respondents rated strongly agreed, Semester 1 with 15 respondents, and Semester 4 with eight respondents. Out of the Semester 1 respondents, 12 (40%) and Semester 4, 6 (37.5%) respondents rated agreed and only 6 (20%) for Semester 1, and 2 (12.5%) for Semester 4 rated neutral.

As for Statement 4, 12 (40%) Semester 1 respondents and 8 (50%) Semester 4 respondents rated strongly agreed. 12 (40%) of Semester 1 and 6 (37.5%) of Semester 4 respondents agreed with the statement, whereas 6 (20%) of Semester 1 and 2 (12.5%) of Semester 4 respondents rated neutral. Statement 5 results show that 11 (37%) from Semester 1 and 8 (50%) from Semester 4 strongly agreed. This is followed by 16 (53%) Semester 1 and 3 (18.8%) Semester 4 respondents who agreed with the statement. A total of 3 (10%) students from Semester 1, and 5 (31.3%) from Semester 4, were neutral. The data from Statement 6 shows that 15 (50%) from Semester 1 and 7 (43.8%) from Semester 4 strongly agreed. Next, from Semester 1, 12 (40%) and Semester 4, 6 (37.5%) firmly agreed, whereas a neutral rating was chosen by 3 (10%) Semester 1 and 3 (18.8%) Semester 4 students.

6. DISCUSSION

Overall, the findings of the current study demonstrate that gamification can bring a positive impact on teaching and learning delivery. Based on the statistical analysis, the study found six significant students' perceptions of the i-GIME. First, the results show that students understood the instructions given in i-GIME and how they can be applied in their learning. Second, the students understood the material better and found the gamification method enjoyable using blended or online learning. This shows that they have a positive perception of gamification. Third, the students prefer gamification in online learning, improving their understanding of the information skills subject. Fourth, the students believed that gamification in i-GIME also improves their knowledge in cataloging skills subject that requires technical skills like information skills subject in Statement 3. Fifth, it indicated that students' perception of positive gamification motivates them to be interested in the topic taught through gamification. Researchers have found that gamification may be an effective method for motivating students to study, solve issues in various fields, and interact with diverse people (Deloitte, 2012). Finally, the results indicate that students think it would be more interesting if instructors applied i-GIME to their teaching. In addition, i-GIME may assist students in putting their knowledge into practice. Students can develop thinking and problem-solving abilities through i-GIME. They can also experience the joys of winning and losing in a competitive atmosphere with their peers.

All in all, the findings are consistent with the results of the previous studies who found that gamification has a positive impact on teaching and learning. Gamifying learning could increase students' interest in the course and pushes them to be more ambitious for success. Incorporating

gamification techniques improves student motivation to support other students in their learning. Through gamification, students can track their progress and improve in areas where they are inadequate. This makes the learning process more relaxed, stress-free, and fun. The implication of gamification, especially the type of interactive game, can attract interest and motivate students to learn and be more focused on the learning process. The student-centered learning to explore the realm of knowledge and information independently and train self-reliance among learners is appropriate and meets the concept of digital learning.

CONCLUSION

The study aims to develop an i-GIME framework to enhance students' learning concentration, motivation, and interest. The i-GIME is designed to improve educational quality in entertaining ways by developing a novel strategy of gamification to sustain and raise students' concentration, motivation, and interest in the learning process while attending an online class or course. The authors believe that active learning encourages student flexibility and involvement in the learning experience. The students also could obtain information on their own through experiential engagement in the learning process. Thus, it is important that educators should stimulate or create interactive learning experiences that are more participatory and entertaining in nature. Although the study provides valuable insights, several shortcomings should be addressed. The study focused on students in one state of Malaysia which limit the generalization of the findings to other countries. Moreover, the i-GIME prototype was only tested on Information Technology courses. Future studies should include other states, countries or courses to add support to the validity of the findings. This is important as it extends our current knowledge about the effectiveness of gamification in fostering students' interest and motivation in online learning. The success of i-GIME should inspire for more development of other similar gamification-based teaching and learning methods that match the need of the digital native generation.

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NK and MM carried out the introduction and literature review sections. SH collected and refined the data and performed the data analysis. SH and NK also wrote the data methodology section. SH wrote the findings and discussion sections. SH and NK conceived of the study and participated in its design and coordination and helped to draft the manuscript. All authors read and approved the final manuscript.

DECLARATION OF CONFLICTING INTERESTS

The authors declare that they have no conflict of interest.

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