JomGames: Creating a Motivating Learning Environment

W. L. WilliamCheng[1], P. S. JosephNg[1(✉)], H. C. Eaw[2], and K. Y. Phan[3]

[1] Institution of Computer Science and Digital Innovation, UCSI University, UCSI Heights, 56000 Cheras, Kuala Lumpur, Malaysia
1001850428@student.ucsiuniversity.edu.my,
josephng@ucsiuniversity.edu.my
[2] Faculty of Business and Management, UCSI University, UCSI Heights, 56000 Cheras, Kuala Lumpur, Malaysia
eawhc@ucsiuniversity.edu.my
[3] Faculty of Information and Communication Technology, Universiti Tunku Abdul Rahman, Kampar, Perak, Malaysia
kyphan@utar.edu.my

Abstract. Games have played an impactful life in our current generation brimming with technological advancement. Not only has it become the main source of entertainment for people to enjoy, but it has also transitioned to becoming a learning experience for others. With our current repetitive standards and methods of teaching and learning in schools, the mind of many students has dulled their creativities as well as developing the extrinsic motivation to study at all. However, the implementation of game learning can be developed into modern-day teaching and be used as a tool for students to grasp their potentials and be motivated to learn level more using games. From the mix mode research conducted, many tertiary students would rather replace their conventional studying methods with a game learning experience. The player will be able to understand, develop listening skills and verbal communication skills towards other people to understand when it is necessary to be assertive in an environment. Moreover, this game will tackle the understanding of real-life decision-making skills that mimic real-life situations for players to adapt to. With that said, JomGear Grind Games aims to help students learn various skills such as creative thinking and interpersonal skills.

Keywords: Creative problem-solving · Gamification · Game learning · Videogames · Games · Strategic problem solving · Interpersonal skill

1 The Behavioural Effects of Games on Students

The technological world has advanced so far beyond what people have comprehended. This has created a surge of innovations within the minds of many in this technological time [1]. These advancements have improved social media platforms that allow for messaging services for worldwide use to get information from various places in the world. For example, Instagram or Twitter would be a famous social media platform [2].

Adolescents and children who are still in school use this as a place of talking to new people and sharing their stories and info online. However, they have to overuse these social media platforms and have created a concern towards the media and parents for this addiction. This has become a problem to the world as these people are usually using this as a type of procrastination over their duties when the duties have been given and the responsibilities are ignored [3].

Having a creative mind that can also think strategically within a university student mind nowadays is no easy feat [4]. Skills such as having a mind to think outside the box and also have a strategic mind are sought out in workplaces and has become well-needed skills to have [5]. Within refinement of the skills, research and development will be able to have a greater impact on society and bring forth new modes of innovations from many young minds [6]. Moreover, talking with others is an essential skill to have when working with a group or with other people, with interpersonal skills coming into the mind [7]. Working together with greater efficiency is the first step in the success of a project or goal as it creates a bond and trustful relationship amongst the team [8]. Many university students come off as shy and socially awkward which deters to social and communication skills. Traumatic events or lack of human interaction and love during their early life could be a major factor in this [9]. Almost all student levels from primary to tertiary education have played games and can be hooked into getting their sole attention in understanding the concept of sand outcomes of the games [10]. It is also a fact that not only boys play video games, but girls equally do it as well which shows that there is a gender variety of video game players [11].

Self-efficacy can also be better leant and developed from video games in our current modern era as well as researched from studies [12]. It is also said that video games how developed more violent tendencies from the player due to negative habits and outcomes found within the game that tampers with the real-life behaviours of the young people that have tread a problem in the society of gaming [13, 14]. Be that as it may, positivity can be given from video games as well that helps benefit and give motivations to the player in developing interests within the game's theme and world [15].

2 Legacy and Related Works of Game Learning and Gamification

There are elements within a game which can provide a sense of learning experience and enjoyment towards gamer and it is known as gamification [16]. Conventional studying methods towards students nowadays are not going to work as they do feel enjoyment in using a textbook method to learn the outcomes of a subject and their respective skills as it may feel boring especially when technology can play a big role [17]. Because of this, university students only learn and study for a test for the sake of getting over with it and progressing in their course, this is where gamification helps in providing an intrinsic motivation to study and learn a certain course [18]. This brings forth many avenues for video games to become a platform for learning where the elements of gamification play a vital role in greater developing the motivation for the university student to learn skills [19]. User engagement can also be obtained in the form of prizes and game achievements which boosts the players desired outcome towards the goal [20]. From a study, heuristics design within the game's levels has brought forward greater refine towards the algorithm of gamification to this day [21] as shown in Table 1.

Table 1. Similar gaming application comparisons table

Gaming characteristics and features	Gear grind games	Logic master	Logical test	Skills
Creativity	/	/	/	–
Design	/	/	/	/
Strategic skill	/	/	/	/
Interactive quests	/	–	–	–
Achievements	/	–	–	–
Games	/	–	/	/
scoreboards	/	–	/	–
Level Building	/	/	/	/
tasks system	/	–	–	–
Communication and dialogue	/	–	–	–

Problem Statement, Question and Objective

The certain characteristics and features of the game will emphasize the development of interpersonal, creative and strategic problem-solving skills in a game learning setting and using gamification elements to enhance the experience to the students. From the study, heuristics design within the game's levels has brought forward greater refine towards the algorithm of gamification to this day [21–24] as shown in Table 1.

Table 2. Research questions

RQ1: Can university students grasp the understanding of creative and strategic problem solving from video games?

RQ2: Can interpersonal skills be greatly developed with the help of game learning and gamification?

RQ3: Can game learning and gamification replace the traditional studying methods in universities and provide students with intrinsic motivation to learn from games?

The questions from Table 2 will be defined and determined from the scope of the research. The Scope of the project will mainly be university students of any field related using interpersonal, creative, and strategic problem-solving skills. The age range should be around 17–24 for typical university student ages and will take place in selected universities like Monash University, Sunway University, UCSI University, University Malaya, Asia pacific University and Tunku Abdul Rahman University College. The research questions will be answered by the research objectives below in Table 3.

Figure 1 shows the highlighted key points of the research which are displayed within the research model to further explain the game design aspect of the game, the software required for the game will be done by the Godot Game Engine with the usage of the Microsoft visual studio for the C# language incorporation and coding design. The main game art will be mainly done with the inspiration of pixel art games such as Games like

Table 3. Research objectives

RO1: To create a video game that emphasized the values of creative and strategic problem-solving skills.

RO2: To help university students to develop better interpersonal skills to make friends and increase teamwork via gamification.

RO3: Using game learning and gamification to intrinsically make students motivated to study traditional studying methods
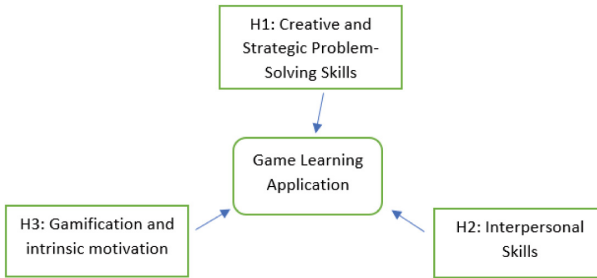

Fig. 1. Hypothesis research model

Fire Emblem and Undertale for the retro feel of the game overall. Figma will be greatly used to test the prototyping for the game where the outline will be copied and enhance when the game undergoes user interface and world design. The game will allow the development of key skills within the research which are interpersonal skills, creative and strategic problem-solving skills within the game application to further enhance students ability to communicate and to adapt to new situations creatively while also providing an intrinsic motivation for them to learn said skills.

3   Methodology

This research will be applying the usage of mixed-mode research of surveys and interviews to gain both qualitative and quantitative data. From Fig. 2 below, a mixed-mode method of surveys and interviews will be handed off to university students that like games and are interest in gamification to obtain both qualitative and quantitative data collections. A trial will be done with 5 survey respondents and 3 interview respondents. This is to check the efficiency of questions and check for amendments if questions are not understandable or appropriate. Random students will be selected for the research to ensure the data is not faked and the data set is qualitative.

4   Results and Findings

From the results that have been recorded from the research, the improvement of games on the creative and strategic problem solving of university students has been widely agreed on in both the preliminary and technical data collection.
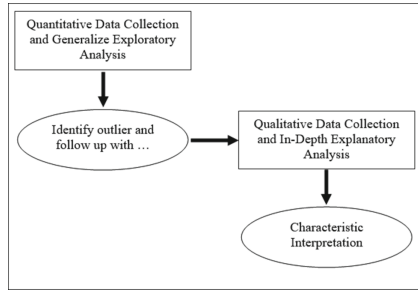
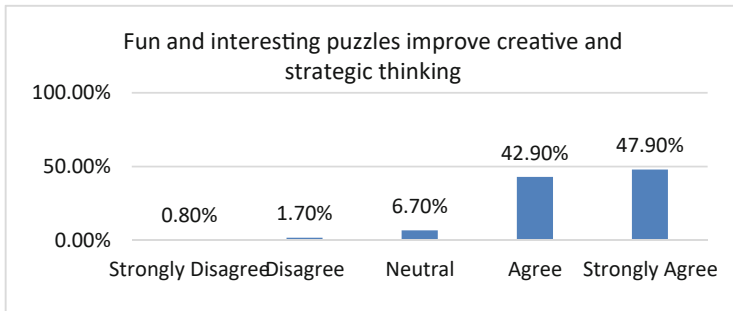**Fig. 2.** Sequential design [25–37]

Fig. 3. Post-test results of fun puzzles improve creative & strategic thinking.

From Fig. 3, a lot of the responses showed an agreement that games can help university students improve upon their creative and strategic problem-solving skills and more than 90% of the respondents widely accept that puzzles can help in the improvement of creative and strategic thinking. This suggests that the game application should include more interesting puzzles that can help stimulate the thinking process of university students. Meanwhile, Fig. 4 summarized the effect of game interaction dialogue on university students.
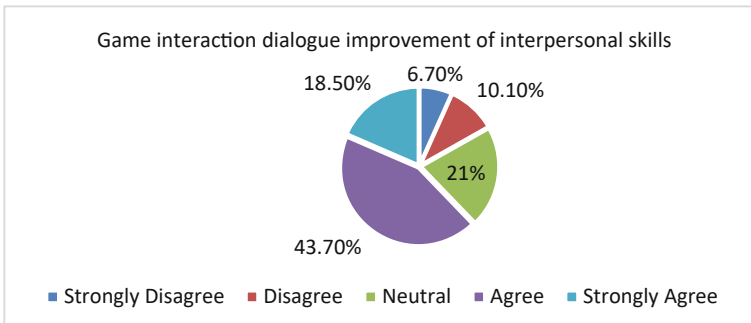

Fig. 4. Post-test results of game interaction dialogue improvement of interpersonal skills

From the data given in the figure, 43.7% of respondents agreed that the dialogue shown within games and the character interaction have helped in increasing the interpersonal skills of university students due to the realism and relatability of the conversation in games. This means that the application should include non-player characters (NPC) to include interactional dialogue to the player as a sense of communication. From the interview respondents, it has shown that most respondents agree that it is known as a source of indirect communication.
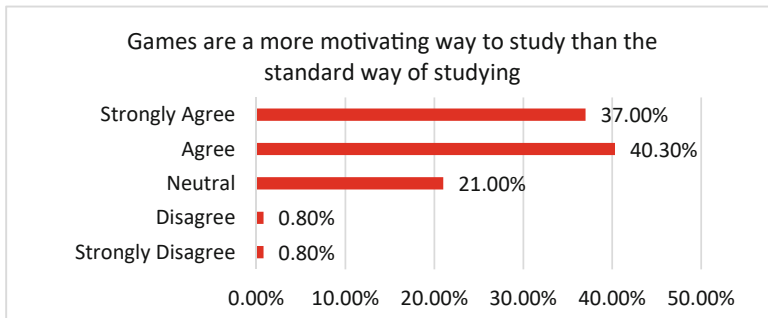

Fig. 5. Games post-test result a more motivating of studying than the standard way

Figure 5 can summarize that using games to study which leans towards game learning is better for university students as it creates more motivation for them to study compared to the usual textbook and lecture slide method. This could also motivate the lecturers at the university to use a hand on game learning method to teach students in a class so they can grasp the feel of games as an instrument of learning and also help them get more motivated to teach students as well. According to the interview results, most respondents responded with it being more fun and engaging way for students to learn while others state that games are new and not expected to the community of university students which suggests that people want more new inventive ways of studying instead of repetition.

Based on the interview and survey results of the research, most respondents agree upon the fact that most university students show a lack of creativity in out-of-the-box thinking. A total of 66% of respondents show that more people tend to follow a traditional way of studying which includes the textbook method instead of thinking of their solutions to things. This shows that the conventional way of thinking has blocked the creativity of students who only follow instructional procedures to most questions and problems. Moreover, the interview respondents showed more positive feedback towards the cost-effectiveness of game learning in universities. About 46% of respondents have agreed that having games will cut down the paper costs of printing papers in schools and promote online learning because it can save travelling as well. This would help the implementation of game learning technology in the university classroom and online platforms like Kahoot. The game app could be sold in large for universities for a low price in high quantities. The interviewers also left positive responses and feedback for remembering things that happen in games than study notes which could show that the interactivity and enjoyment of a game. Moreover, 63% of respondents agree that it helps

due to the interesting features and plots of the game and it helps the brain function more due to less stress. The rest of the responses indicate that it is more visually aesthetic while books are more static in terms of memorability. This could suggest that the game application to include more interesting plot points where the learning applications are the key factors of the game at that point. Based on the responses and feedback from the data collection, the game's main menu features of the game application on a mobile and desktop mode. It includes a play option, settings option, quit option, and achievement option. Figure 6 below further illustrates the game application's main menu screen.

Fig. 6. Achievement screen of the game application

The achievement screen shows the allocated information of the student playing the game such as their full name, student ID, and their current lecturer in charge of the class. These points will be allocated from communication points that relate to the interpersonal skills gained in the game, creativity points that relate to the out-of-the-box thinking done in-game, and lastly the strategy points which show the tactful methods used in the game. Furthermore, the bottom part of the screen includes reward tiers that can be obtained soon which will increase the motivation factor of the students to accumulate more points to reach the hidden threshold to obtain the rewards which is a gamification factor of the game learning process.
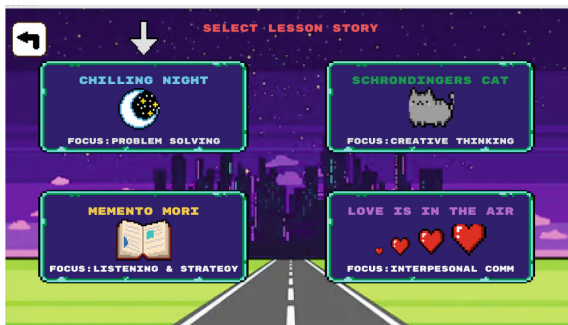

Fig. 7. Story selection of the game application

As shown above, Fig. 7 displays the game story selection which features multiple game story modes that can be chosen by the student to play based on the focus that they want to learn. The main focuses are shown at the bottom of each story selection so that the student will be shown a rounded-up emphasis on what they are going to get into once they select game mode. Each game mode can be played without order to give the freedom of choice to the player and the game modes can be revisited to relearn left out items and points of the story. Each story also contains its unique dialogue and to-do lists for the student to be involved in and complete. The guided storyline aims to provide a motivating environment to entice learning [38].

5   Conclusion, Limitation, and Future Work

In conclusion, JomGear Grind Games can help improve the learning habits and drive of University Students to further enhance their communication skills and out-of-the-box thinking using gamification elements that can be grasped from the game. Also, the scoreboard and rewards system help seek the encouragement of students and motivate them to try harder and more competitively as well as the storyline that lets them envelop into the game world. The limitations during the research that were found were the lack of time on how to research and the limited resources available for it. The game may be something to motivate the students to study but it is their capabilities and work that will benefit them. In the future, we seek to understand the extra benefits of the addition of AR and VR into the game for people to experience. This may benefit them even more as new technologies tend to sway the minds of people and their learning potential.

References

1. Griffy-Brown, C., Earp, B.D., Rosas, O.: Technology and the good society. Technol. Soc. **52**, 1–3 (2018)
2. Shu, M.T., Yaw, Y.W., Chih, M.W.: A study on digital games internet addiction, peer relationships, and learning attitude of senior grade of children in elementary school of Chiayi county. J. Educ. Learn. **9**(3), 2020 (2020)
3. Danah, H., et al.: Creativity and technology in education: an international perspective. Technol. Know. Learn. **23**, 409–42 (2018)
4. Leela, R.: Cooperative learning is a constructivist strategy in tertiary education. Int. J. Educ. Res. **6**(12) (2018)
5. Kang, C.M., et al.: A study on integrating penetration testing into the information security framework for Malaysian higher education institutions. In: International Symposium on Mathematical Science & Computing Research, Malaysia, pp. 156–161 (2015)
6. AdrianChin, Y.K., et al.: JomDataMining: learning behaviour affecting their academic performance, really? In: IEEE 6th International Conference on Engineering Technologies and Applied Science, Malaysia (2020)
7. AdrianChin, Y.K., et al.: JomDataMining: academic performance and learning behavior dubious relationship. Int. J. Bus. Inf. Syst. (Forthcoming 2020)
8. Lim, L.J., et al.: ScareDuino: smart farming with IoT. Int. J. Sci. Eng. Technol. **6**(6), 207–210 (2017)

9. Gerard, J.P., Cyndi, B., Selcuk, A., Jo, A.Y., Molly, H., John, F.C.: Creative problem-solving in small groups: the effects of creativity training on idea generation, solution creativity & leadership effectiveness. J. Creat. Behav. **52**(2), 25–36 (2018)

10. Matthew, B.: Student attitudes to games-based skills development: learning from video games in higher education. Comput. Hum. Behav. **80**, 283–294 (2018)

11. Frank, B., Janet, B., Michelle, Q., Peter, J.A., Shelley, B.B., Josh, S.: A clinical educator's experience using a virtual patient to teach communication and interpersonal skills. Australas. J. Educ. Technol. **34**(3) (2018)

12. Rowan, H.B.: Developing teamwork skills in undergraduate science students: the academic perspective and practice. In: Proceedings of the Australian Conference on Science and Mathematics Education, Monash University, 27–29 September 2017, pp. 137–148 (2019)

13. Daphne, B., Shawn, C.G.: Enhancing attentional control lessons from action video games. Neuron **104**, 147–163 (2019)

14. Fonseca, D., Villagrasa, S., Navarro, I., Sánchez, A.: Urban gamification in architecture education. Adv. Intell. Syst. Comput. **571**(1), 335–341 (2017)

15. Polo-Pena, A.I., Frias-Jamilena, D.M., Fernandez-Ruano, M.L.: Influence of gamification on perceived self-efficacy: gender and age moderator effect. Int. J. Sports Mark. Spons. (2020). ahead-of-print

16. Kühn, S., Kugler, D., Schmalen, K., et al.: Does playing violent video games cause aggression? A longitudinal intervention study. Mol. Psychiatry **24**, 1220–1234 (2019)

17. Lei, W., Kunter, G., Ramesh, S., Joseph, P.: Impact of gamification on perceptions of word-of-mouth consumers. Manag. Inf. Syst. **44**(4), 1–33 (2020)

18. Devin, J.M., Marina, M., Jessica, M., Nancy, L.H.: Exploring the pull and push underlying problem video game use: a self-determination theory approach. Personality Individ. Differ. **135**, 176–181 (2018)

19. Rapp, A., Hopfgartner, F., Hamari, J., et al.: Strengthening gamification studies: current trends and future opportunities of gamification research. Int. J. Hum. Comput. Stud. **126**, 1–6 (2018)

20. Lin, C.-J., Hwang, G.-J., Fu, Q.-K., Chen, J.-F.: A flipped contextual game-based learning approach to enhancing EFL students' English business writing performance & reflective behaviors. Educ. Technol. Soc. **21**(3), 117–131 (2018)

21. Waweru, B.W., et al.: Gamesy: how videogames serve as a better replacement for school? In: IEEE Student Conference on Research and Development, pp. 10–15 (2020)

22. Toda, A.M., Klock, A.C.T., Oliveira, W., et al.: Analysing gamification elements in educational environments using an existing gamification taxonomy. Smart Learn. Environ **6**(16), 18–32 (2019)

23. Mohd Hishamuddin, A.R., Ismail, Y.P., Noor Anida, Z.M.N., Nor Syazwani, M.S.: Gamification elements and their impacts on teaching and learning-a review. Int. J. Multimed. Appl. (IJMA) **10**(6), 37–46 (2018)

24. Knutas, A., van Roy, R., Hynninen, T., et al.: A process for designing algorithm-based personalized gamification. Multimed. Tools Appl. **78**, 13593–13612 (2019)

25. JosephNg, P.S., Loh, Y.F., Eaw, H.C.: Grid Computing for MSE during Volatile Economy. In: International Conference on Control, Automation and Systems, IEEE Explore, Busan, Korea, pp. 709–714 (2020)

26. JosephNg, P.S., et al.: EaaS: available yet hidden infrastructure inside MSE. In: 5th International Conference on Network, Communication, and Computing, ACM International Conference Proceeding Series, Kyoto, Japan, pp. 17–20 (2016)

27. JosephNg, P.S., Kang, C.M., Choo, P.Y., Wong, S.W., Phan, K.Y., Lim, E.H.: Beyond cloud infrastructure services in medium-size manufacturing. In: International Symposium on Mathematical Sciences & Computing Research, IEEE Explore. Ipoh, Malaysia, pp. 150–155 (2015)

28. JosephNg, P.S., Choo, P.Y., Wong, S.W., Phan, K.Y., Lim, E.H.: Malaysia SME ICT during economic turbulence. In: International Conference on Information & Computer Network, Singapore, pp. 67–71 (2012)
29. JosephNg, P.S., Yin, C.P., Wan, W.S., Nazmudeen, M.S.H.: Energizing ICT infrastructure for Malaysia SME during economic turbulence. In: Student Conference on Research and Development, IEEE Explore, Cyberjaya, Malaysia, pp. 328–322 (2011)
30. JosephNg, P.S., Eaw, H.C.: Making financial sense from EaaS for MSE during economic uncertainty. Adv. Intell. Syst. Comput. (Forthcoming 2021)
31. JosephNg, P.S., Eaw, H.C.: Still technology acceptance model? Reborn: exostructure as a service model. Int. J. Bus. Inf. Syst. (Forthcoming 2021)
32. JosephNg, P.S.: EaaS infrastructure disruptor for MSE. Int. J. Bus. Inf. Syst. **30**(3), 373–385 (2019)
33. JosephNg, P.S.: EaaS optimization: available yet hidden information technology infrastructure inside medium-size enterprises. J. Technol. Forecast. Soc. Change **132**(July), 165–173 (2018)
34. JosephNg, P.S., et al.: Exostructure services for infrastructure resources optimization. J. Telecommun. Electron. Comput. Eng. **8**(4), 65–69 (2016)
35. JosephNg, P.S., Moy, K.C.: Beyond barebone cloud infrastructure services: stumbling competitiveness during economic turbulence. J. Sci. Technol. **24**(1), 101–121 (2016)
36. Joseph, N.P.S., Mahmood, A.K., Choo, P.Y., Wong, S.W., Phan, K.Y., Lim, E.H.: Barebone cloud IaaS: revitalization disruptive technology. Int. J. Bus. Inf. Syst. **18**(1), 107–126 (2015)
37. Joseph, N.P.S., Mahmood, A.K., Choo, P.Y., Wong, S.W., Phan, K.Y., Lim, E.H.: IaaS cloud optimization during economic turbulence for Malaysia small and medium enterprise. Int. J. Bus. Inf. Syst. **16**(2), 196–208 (2014)
38. Mitchell, R., Schuster, L., Jin, H.S.: Gamification and the impact of extrinsic motivation on needs satisfaction: defining gamification. J. Bus. Res. **3**(2), 323–330 (2018)