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Development of "Game of Contract" for Interactive Edutainment

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ABSTRACT

Parties in the construction industry legal relationship are officiated through construction contracts comprising principles and elements of contracting parties' obligations and management process. The contract is rather legal-oriented, which is sometimes tricky to understand. Most of the students are struggling with the Professional Practice subject. Based on the preliminary survey, students encountered issues in understanding the conditions of the contract, and its standard clauses (81 clauses) are getting more complex and challenging. It leads to the dry subject syndrome. Games of Contract (GoC) is developed in gaining students' interest in understanding construction contracts in a leisure-learning environment through gamification. GoC is a board game that provides a platform to offer the students an overview of the construction contract. GoC provides the information on the process of post-contract stages, from the site possession until the preparation of the final certificate. The board game is administered by answering questions related to the clauses in the contract.

Additionally, the game is created to enhance the students' knowledge about the Post Contract Administration, which they can apply for their future endeavours in the construction industry. The novelty of the board game is significantly focusing on improving teaching and learning service to provide an atmosphere for students who are fun, motivated, and have high learning performance. Moreover, the continuous engagement with the game-based learning system beyond the novelty effect relies on creating the engagement meaningful and beneficial for the students.

Keywords: *Edutainment gaming; Interactive learning process; Construction industry; Construction contract*

INTRODUCTION

The application of game components and game design approaches in the educational context is called educational gamification. Gamification is a strategy in education that promotes game design dynamics in the academic environment to excite and connect directly with students, letting them substantially enhance their curricular, cognitive, and social competencies (Manzano-León et al., 2021). Moreover, Sustainable Development Goals (SDG) emphasized that by 2030, learners' knowledge and skills are required to promote sustainable development. It can be done through education for sustainable development and sustainable lifestyle, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship and appreciation of cultural diversity and culture's contribution to the development (Department of Statistic Malaysia, 2018).

According to Reyes et al. (2021), several new efforts were implemented to encourage students to take a more active role in their learning process while also boosting the possibilities of enhancing their motivation via the use of more current and exciting approaches. Because of their positive results, cooperative learning activities and group projects are prominent among them. Hence, this paper aims to introduce the development of a game board that can assist the Quantity Surveying students, especially in Professional Practice.

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Professional Practice consists of the syllabus relating to the professional practice of quantity surveyors starting from the inception stage to post-contract that involved various parties. The legal relationship among parties in the construction industry is officiated through construction contracts which comprise principles and elements of contracting parties' obligations and management process (Davies, 2020). The contract is rather legal oriented, which is sometimes difficult to understand by a layman. In the context of built environment program students that are typically visual-oriented (Meadati et al., 2012), it is observed that the students are less captivated in the topic of construction engineering and management. Students need to visualize the construction project through drawings and traditional learning used in their education and interpret the knowledge for their understanding; this has become difficult for the students with little or no practical experience. Moreover, the struggles are added by the Construction Law and Contracts involved in the whole construction project management. Therefore, the traditional learning and theoretical part need to be supplemented with the construction site visits to create a visual learning environment.

The construction contracts require a deeper understanding of the procedures and processes of managing projects from the inception stage to handing over involving various parties, including clients, consultants and contractors (Adeyeye, 2008). Recent feedback and assessment data revealed that students usually found these topics in construction contracts challenging. Hence, Game of Contract is developed to provide an alternative solution. Games of Contract (GoC) is designed to engage students' interest to understand construction contracts in a leisure-learning environment through game-based learning. GoC is a board game that provides a platform to offer the students an overview of the construction contract in a visual learning environment. GoC delivers the information on the process of post-contract stages, from the site possession until the preparation of the final certificate.

OVERVIEW OF GAME-BASED LEARNING AS AN EDUTAINMENT

Educational games are employed in various situations, including schools, families, and educational institutions. The principal aim of using games in

education is to improve critical thinking abilities while teaching a particular subject by allowing pupils to think creatively while adhering to rules (Kowsari & Garousi, 2018). Various games have been developed to aid the educational process to enhance the understanding and motivate the student during the teaching and learning, such as instructional games. (Boughzala, 2014) stated that instructional games include curricular information or other educational materials. The teacher needs to incorporate an interesting and engage the students in the teaching and learning process. Moreover, Guillén-Nieto and Aleson-Carbonell (2012) addressed how the value of games in education is unquestionable, and the potential advantages of using instructional games to enhance traditional classroom education are undeniable.

Identifying and categorizing games that may be utilized for educational purposes is problematic. Different individuals have different perspectives that define the fun in education. As there are many classifications of educational games such as video games, card games and board games, it is still involving excitement, passionate participation, structure, motivation, ego fulfilment, adrenaline, creativity, social contact, and emotion while learning (Plass et al., 2015). Boyle (2011) emphasized that games are tremendously helpful as instructional tools as they may charge instructive points and are especially effective for strengthening learners' essential intellectual capacities. The unique role of games can boost the students' self-esteem and help bridge the gap between slower and faster learners.

Characteristics of Game-based Learning in Education

Games may help to brighten educational topics and are particularly beneficial when dealing with problem solving and essential concepts. Royle (2006) believed that the games in education could engage the students in three different aspects and elements, which are:

a) The game's structure gives motivation and the desire to solve issues only to solve them.
b) The syllabus or storyline determines the engagement's plausibility or authenticity.
c) Characterization makes the player's involvement in the narrative dependable, allowing them to immerse themselves in the game completely.

These aspects will be used in a learning game that is both a game and an educational tool to stimulate engagement and support pedagogical goals. There are several reasons in favour of using games as learning tools. Game-based learning research shows a direct link between playing games and learning (Torrente et al., 2011). Because of their engaging character, it is more frequently stated that they can increase students' motivation to study.

Types of Games for Education

Educators and educational institutions are increasingly debating the use of existing and upcoming instruments in education. Education games may be perceived as a distraction from studying. However, their purpose is to raise students' motivation and engagement, improve their visual skills, improve their interaction and cooperation abilities with their peers, and apply gaming ideals in a real-world setting (Zirawaga et al., 2017). There are numerous online, offline, and physical material games for education. The educators need to carefully choose the most suitable and fulfil the educations' requirements. There are several types of game-based learning available with different purposes and objectives. Tobar-Muñoz et al. (2017) emphasized numerous educational technology researchers and developers aim to develop innovative techniques to make learning more dynamic and exciting to students. Table 1 describes several types of game-based learning available for education (Dimitra et al., 2020).

Table 1
Types of Game-Based Learning Approaches in Education

Types of game-based learning	Characteristics	Examples
Flashcard type games-Memory games (the University of Southern Maine, n.d.)	A flashcard is a two-sided card with information on both sides meant to be used as a memory aid. Flashcards are frequently utilized to memorize vocabulary, historical dates, formulae, and any other subject that may be learnt through a question-and-answer format	● Duel ● Jump and Say ● Roll the Dice
Simulation game (Torrente et al., 2011)	It refers to a broad range of video games that are meant to resemble real-world activities closely. Simulation games can provide players with a better understanding of how people perceive the world, such as moral and	● Plantsville ● Flight simulators ● Racing video games

	intellectual quirks. They can also assist in creating empathy for others and knowledge of personal and interpersonal values by allowing players to perceive the moral and ethical consequences of their decisions.	
Interactives (Guillén-Nieto & Aleson-Carbonell, 2012)	Players can search for material based on grade level or kind. It provides interactive activities that help students improve their arithmetic, reading, and literacy abilities.	Fun brain
Quiz games (Plass et al., 2015)	A quiz-style game platform in which participants attempt to answer questions regarding a specific subject.	Kahoot
Puzzles (Zirawaga et al., 2017)	A puzzle game generally puts the player's knowledge or creativity to the test. The player must arrange some pieces in a logical order.	● Crossword Word search
Strategy games (Torrente et al., 2011)	A game that promotes problem-solving skills for strategic thinking, focus, and prediction.	● Europa Universalls Warcraft
Reality testing games (Tobar-Muñoz et al., 2017)	A game in which players may view and communicate with a virtual world, either imagined or actual.	Chemistry VR
Board games (Rajkovic et al., 2019)	Players must engage with one another to acquire speaking and interpersonal skills, critical and strategic thinking, and the capacity to negotiate in board games.	● Monopoly ● Race games Snakes and ladder games

Transforming the Professional Practice into Game-based Learning for Education

Educational services are part of service management in an educational institution and a set of specialized activities that are carried out with the help of methods and techniques developed and deployed in public institutions or organizations within a community. It seeks to solve various issues concerning the education and training of different types of beneficiaries within the community (VÎJÎITU, 2017). The development of GoC is intended to cater to the needs of Quantity Surveying's students to induce the knowledge and skill required for a quantity surveyor. Applying knowledge management in education improved the quality and understanding of quantity surveyors.

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Quantity surveyors, also known as construction economists, are responsible for comprehensive obligations and wide-ranging tasks to support cost-effective construction and property development projects. The principal capabilities of quantity surveyors include measuring project quantities, determining project budgets, preparing contract documentation (such as Bills of Quantities and Cost Control Documents), administering contracts, and preparing final accounts (Shafiei & Said, 2013). Royal Institutions of Chartered Surveyors (RICS) has outlined the competencies of Quantity Surveyors, which involved starting from the inception stage to final accounts (RICS (Royal Institution of Chartered Surveyors), 2018). All the Quantity Surveyor's competencies and job specifications are specified in the subject of Professional Practice (PP) for undergraduate students. Each semester starting from Semester 4 to Semester 6, students will be learning the topics related to the project development life cycle.

The nature of Professional Practice (PP) as a subject for Quantity Surveying' students makes it necessary to have an emerging tool to support the immediate delivery of instruction. PP is a subject that deals with the facts and contractual processes which need to be understood and memorized. The course is designed to provide students with knowledge on the roles and obligations of quantity surveyors and other building professionals, procurement and contractual arrangements, and evaluation of tenders. The way PP is viewed as a subject of the importance of construction contract management in the construction industry will affect how students view the course to grasp terms, concepts and core competencies. Oladotun and Edosa (2017) stated that the core competencies are exclusively vital to the profession of quantity surveying. It entails construction contract practice, construction technology and environmental services, the economics of construction and procurement and financial management. Some course learning outcomes that have been set for PP are as follows:

a) To assess the contractual obligations of parties involved in procurement and tendering methods in Malaysia.
b) To demonstrate the roles and responsibilities of quantity surveyor in construction contract; and
c) To identify suitable procurement method and tendering system for construction project

The topics indicated in the syllabus are across-the-board and comprehensive, which need to be covered within the whole semester. The

lecturer's intention to assist in understanding and to memorize the application of contractual management can be transformed into fun gamification. Applying the gaming theories in PP will enable the students to see the course differently. The necessity to keep students engaged in such a course is becoming increasingly evident for them to retain what they learn even for future endeavours. The underlying philosophy behind the development of GoC is to provide an interactive method not only for the students but also for the construction industry players to help them comprehend the complicated clauses most creatively.

Board Game: A Suitable Design for Game of Contract

While discussing board games from teaching and learning, it is possible to say that it is more than just a strategic game played by moving pieces on the board. Botturi and Loh (2008) denotes the board game as actions (specific activities) and embraces the "experience of plays". Moreover, Hunsucker (2016) added that board games create a gameplay experience through their carefully designed system and identify particular problems, create the experience and make things more straightforward. The inspiration and concepts for the proposed board game are based on the classic Monopoly board game. Some modifications were made to suit the aim of the teaching and learning of Professional Practice. Referring to the same development of board games through the aspiration of Monopoly, Bryant et al. (2014) found that it provides satisfaction, engagement and memorization of the learning information throughout the overall course. In addition, the board game has all the necessary elements such as a story, characters, points, competition, and many other aspects.

The concept of Monopoly was selected for use in the Professional Practice subject due to several reasons. The decision making required in the Professional Practice version has a more significant association to the responsibilities of the Quantity Surveyors profession, especially in the contractual obligations. Also, it incorporates new features to stimulate students' curiosity and engagement in dealing with contract management for the construction industry. It was also considered using an actual board game rather than any online choices. While it may appear "traditional" compared to its online equivalents, it brought students together in a face-to-face collaborative learning environment deemed to benefit from various viewpoints.

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Several characteristics have been adopted in the development of board games to represent the purpose of game-based learning that may assist the understanding and learning process of the students that were adopted by (Torrente et al., 2011):

a) Goals and rules – players need to accomplish the instructions to complete the game based on the roles and obligations of the stakeholders in construction contracts.
b) Short feedback cycles – players will recognize the impact and penalties of their actions.
c) Immersion and engagement – applying different techniques such as using chance cards and questions cards to increase engagement and challenges.
d) Challenge – appropriate questions about the subjects to be solved before moving forward.
e) Adaptability – improve knowledge and skills either in the classroom or online games
f) Replayability – can be played more than once.

Another characteristic that can be adopted is a reward system where players will be rewarded with advantages in their movement. The game also allows the competitiveness among the players to complete the game. In some cases, the games are meant to be collaborative, and others allow players to choose whether to collaborate.

METHODS

There were two stages of methodology in this study to complete the development of the GoC. The first stage was the literature review on game-based learning to develop the board game. The second stage was the quantitative method utilizing the questionnaire survey to gain the students' perception of the developed GoC.

The fundamental concern that leading towards the development of the Game of Contract is:

"How can the students understand and apply the concepts of construction contracts in the construction industry?"

Consequently, in response to the concern, Game of Contract (GoC) is developed and designed based on several objectives, which are:

a) To enhance the knowledge of the students on Post Contract Administration.
b) To ensure the students can apply the knowledge for their future endeavours in the construction industry.
c) To provide an interactive method for the students and the construction industry players to help them comprehend the complex clauses creatively.

In addition, these respective learning outcomes had become the main goal in the development of GoC, which are:

a) To allow the students to understand the role and responsibility of Contractor and Consultant Quantity Surveyors in the construction industry,
b) To ensure the students understand the scope of work and competencies of a quantity surveyor,
c) To let the students to understand and develop an awareness of the provision of the Standard Contract form related to the construction period, and
d) The students understand the tender and procurement methods in the construction industry.

Components of Game of Contract

There are some components needed for the Game of Contract, which consists of:

a) a game board,
b) a numbered die represents steps to be taken,
c) coloured dice, which include red and green colours to represent the route of the game
d) two sets of cards:
    i) question cards
    ii) chance cards
e) game pieces (according to the number of players).

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The following rules and instructions demonstrate the steps to play the Game of Contract:

a) The game required at least three players, one of them being the Superintending Officer (S.O) or the judge of the game, and the rest of the players were the contractors. The S.O. will not play the game as he will be the game's referee.
b) Every player rolls the die to see who goes first. The person who moves the largest number goes first. Every player puts their game piece on the space that says, "Site Possession". The game will begin here.
c) The first player will roll the die and move their game piece forward.
d) When it reaches the colour intersection, the player must pick a random colour to decide their following path.
e) If their game piece lands on the question card, they must answer questions stated in the question card, and the S.O. will judge the answer.
f) If the player answers correctly, they will continue the game. If the player could not answer or the answer given does not satisfy the S.O., the player will lose a turn.
g) If the player's game piece lands on the chance card space, they must pick the chance card and do as instructed on the card. For example, if the card shows "Move three steps forward", the player needs to move their game piece three steps forward.
h) The winner will be the first player to get to the space called "CPC, which is Certificate of Practical Completion".
i) The other players will continue playing until the next player reaches CPC or the last person standing.
j) Meanwhile, if the player reaches the "Termination" space, they lose the game.

Preliminary Testing and Feedbacks of Game of Contract

The preliminary testing was conducted on the Quantity Surveying students across three Universiti Teknologi MARA campuses: Shah Alam, Seri Iskandar, and Kota Samarahan. A set of questionnaires was distributed to 54 selected degree students from three campuses that offer Bachelor of Quantity Surveying. Students from each campus were selected randomly during classes for the preliminary testing. The initial testing aims to provide

feedback from the student regarding the game's outcomes. There were several questions been inquired to the students consisting of three parts:

Section A: Demographics of the respondents
Section B: Feedbacks o Game of Contract
Section C: Comments and suggestions for improvements (not compulsory)

In Section A, the students were required to answer their campus and the current semester they were enrolling. In Section B, a 5-point Likert scale was used to gather the consensus of the respondents in giving perspectives towards the experience in playing GOC. The 5-point of agreements were used to measure the students' agreements on some statements and their feedback after playing the board game of GoC. The 5-points were indicated as 1-Strongly disagree; 2-Disagree; 3-Neutral; 4-Agree and; 5-Strongly Agree. These data were analyzed using the Average Index (A.I.) to indicate the overall perspective of the respondents. The A.I. was interpreted by referring to Sandirasegaran and Manap (2016) that indicated A. I to be 'Strongly disagree' (0.00 to 1.50), 'Disagree' (1.50 to 2.50), 'Neutral' (2.50 to 3.50), 'Agree' (3.50 to 4.50) or 'Strongly agree' (4.50 to 5.00). While in Section C, the students were requested to give their comments and suggestions for further improvements to assist in their understanding and studies of Professional Practice.

RESULTS AND DISCUSSION

The results and discussion of the Game of Contract were divided into two parts: Development of Game of Contract and Preliminary Testing and Feedbacks.

Development of Game of Contract

Based on the methods mentioned in the earlier part of Methods, the developed game board of Game of Contract is demonstrated in Figure 1.

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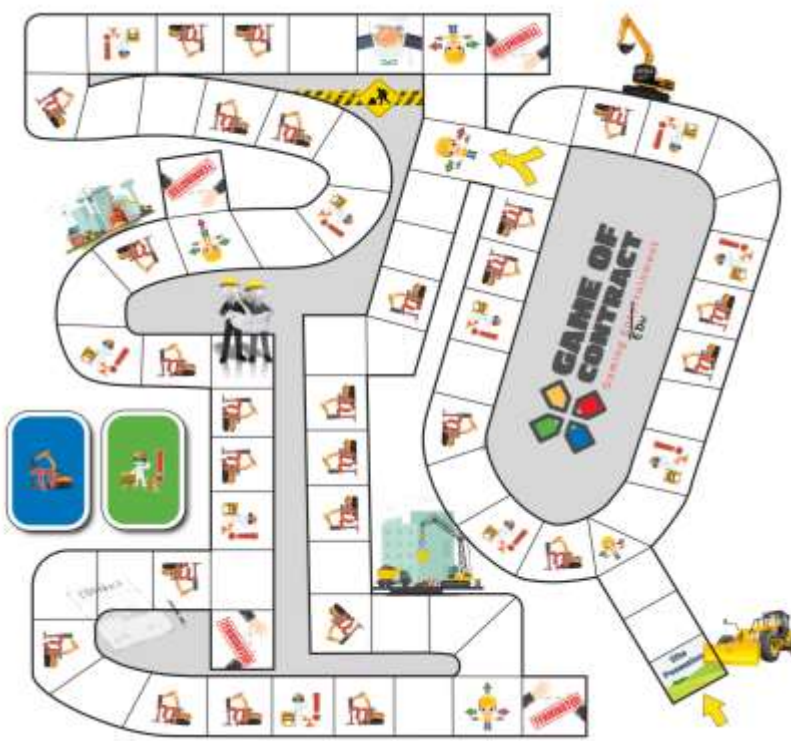
Figure 1
Board Game "Game of Contract"



The GoC edutainment has a set of defined rules indicated by the construction contract process. Each step and instructions allow the student to reflect on the appropriate approach, adaptation, problem-solving, communication and critical thinking entertainingly. Questions created from this game revealed that students are encouraged to have critical thinking and problem-solving skills. For example, the question "What will happen when the contractor does not give his written reply in 14 days for delays exceeding 90 days for the whole site?". The question required students to critically analyze the option available for the contractor when the contractor failed to respond within the time frame given.

Moreover, during the gameplay, each "chip" represents a group of students, which enables them to discuss and communicate with each other

before giving their final answer and improve their communication skills. Through this game, the game provides supplementary assistance for the students to create innovative thinking, motivate and engage the students. Teachers can use this game to enhance their understanding and think outside the box.

The learning outcomes that support the advantages of having game-based learning in the GoC can be expected from these characteristics:

a) Goals and rules
   The rules have been set to guide the players in completing the games, starting from the site possession to the completion of the construction projects. Each step in the game allows the students to have critical thinking to solve the questions on contracts, select the routes and communicate with the Superintending Officer (S.O).
b) Short feedback cycles
   Players will face penalties such as losing their turns if they cannot answer the questions given by the S.O. This mechanism informs the players how well he is performing in the game.
c) Immersion and engagement
   As this GoC is a board game, it provides entertainment to the players as they need to accomplish the game's goal, that is, the completion of the project. The engagement from the players can be seen from the participation and their commitment to finish what they have started from the site possession.
d) Challenge
   One of the reasons games are so engaging is that they provide an adequate and balanced amount of challenge. The challenges provided in the GoC are the questions card that needs to be answered by the players before they can move forward, selecting the route for completing the project and tossing the die to get the appropriate number to avoid penalties.
e) Adaptability
   GoC can be played online during classes, especially during online and distance learning, where the students can do some discussions among their group members to finish the game. However, it can be more fun and entertaining if the game is conducted physically in the classroom.

f) Replayability
To improve the understanding and knowledge of construction contracts, the students can keep playing until they reach better experience and good visualization of construction contract procedures and processes.

Preliminary Testing and Feedbacks

Preliminary testing was conducted in gaining the user's feedback on the development of GOC. The questionnaire was divided into three sections: Section A (Respondent's Demographic), Section B (Respondent's Feedback on GOC) and Section C (Comments and suggestions for Improvement).

Figure 2 shows the frequency of students from three campuses participating in the preliminary testing. The highest participation was from the Kota Samarahan campus, which contributed to 45%, and the lowest was from Seri Iskandar with 22%.

Figure 2
Frequency of Students From Three Campuses Who Participated in The Preliminary Testing

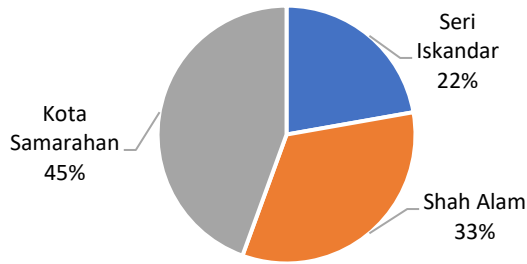


Figure 3 shows the students from different semesters that participated in the preliminary testing. The subject of Professional Practices was offered to three semesters where each semester was taught with a continuous syllabus and topics related to the Contract and Procurement.

Figure 3
Division of Semester for The Participated Students of Quantity Surveying Across Three Campuses

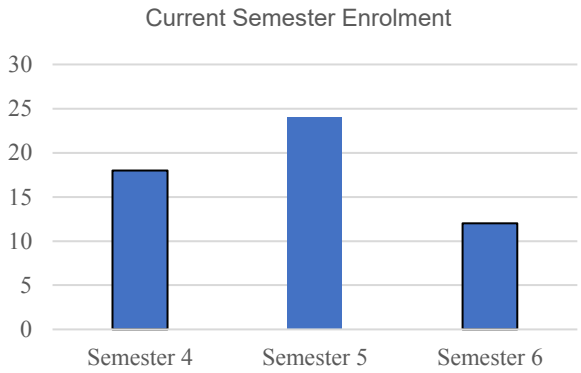


Table 2 demonstrated the feedback of the Game of Contract after playing the game board. Many of the students are in Semester 5. The Average Index (A.I.) signifies that the students' perspectives towards the Game of Contract were at the 'High' level, where the questions are rated between 3.89 to 4.26. The results provide positive feedback by the students on the game's development to be associated with the Professional Practice course.

Table 2
Students' Feedbacks on Game of Contract

Item	User's Feedback on GOC	Average index (A.I.)
1	The game is easy to play	4.19
2	The game provides a leisure way in learning	4.26
3	The game encourages students to exchange knowledge on the subject matter	4.17
4	The game is attractive and increases understanding compared to only reading notes/books	4.19
5	The game contains relevant information and ideas on course/subjects	3.89
6	The game enhances student's communication skills	3.89
7	The game has good potential to be applied in every course/subject	3.94

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As for Section C, the students gave several comments and suggestions, as indicated in Table 3. From this Section C, the improvements on the GoC will be made following the comments and suggestions. Most of the students felt delighted with the creativity of the development of GoC. Based on the preliminary test (questionnaire), the stipulated learning outcomes that have become the fundamental purpose of the development of GoC are almost being fulfilled and justified as follows:

a) The students understand the role and responsibility of Contractor and Consultant Quantity Surveyor in the construction industry,
b) The students understand the scope of work and competencies of a quantity surveyor,
c) The students understand and develop an awareness of the provision of the Standard Contract form related to the construction period, and
d) The students understand the tender and procurement methods in the construction industry.

Table 3
Comments and Suggestions Provided by The Students

Student	Comments and suggestions for improvements
A	I have a better understanding of the role and duties of a Quantity Surveyor as it provides a comprehensive overview of the professional and contractual responsibilities of a consultant and contractor quantity surveyor from the design stage till the final account stage.
B	I can also identify various parties involved in the construction industry and their construction contracts and contractual obligations.
C	The questions were mind-blowing for slow learners like me, but I understood after the game ended.
D	I have a better understanding of the preparation of the variation order, claim for extension of time and others.
E	It also requires us to use ICT and related technologies effectively. We had to use books and the internet to search and find relevant materials based on each of our questions based on our turns.
F	This game has also helped me to improve my thinking and problem-solving skills.
G	We were required to think creatively and critically to understand the types of tendering and procurement methods that are commonly used in the industry and apply them in the game
H	Maybe the game needs to be more challenging and cover all aspects of contractual obligations
I	The games should have penalties and rewards to encourage competitiveness and an exciting flow.

According to Smiderle et al. (2020), using a game-based learning technique in the classroom has helped students' better grasp the subject. The novelty of the board game is significantly focusing on improving teaching and learning in terms of providing an atmosphere for students in which are fun, motivating, and offer high learning performance.

The continuous engagement with the gamified learning system beyond the novelty effect relies on creating meaningful and beneficial engagement for the students. Students can keep playing and practising the GoC with their classmates and their lecturer during class to improve their understanding and knowledge. The responsibilities of the lecturer can be seen while serving and sharing knowledge with their students. Mizikachi (2006) stated that service management provided by the lecturer is related to the principles and concept of quality education. It includes service that meets the students' needs and expectations, problem-solving processes based on facts, feedback systems and statistical methods and improvement of processes and procedures collaboration and involvement. The development of GoC is guided by the principles and concepts suggested by Mizikaci (2006).

The step by step and flow of the game allows the students to comprehend the contractual management in the construction industry. Students can also learn to work as part of a team and take responsibility for their learning through games by going through the whole process of tendering, contracting and procurement.

CONCLUSION

Numerous opportunities exist to implement the gaming concept in education for a better learning process. Hence, this game is aimed to sharpen the students' knowledge in Post Contract Administration in the most fun and stress-free way possible. Additionally, the game is designed for students undertaking courses related to Professional Practice to facilitate them to understand better. Be that as it may, Game of Contract aspires to become beneficial for students to learn Professional Practice to prepare them for the industry, and finally, have fun, be smart and play creatively. The Game of Contract has a solid potential to be widely used by the lecturer as an indicator to verify the students' level of understanding of the post-contract

knowledge. Further study will be conducted to assess the efficiency and efficacy of this learning and teaching project by tracking student learning, involvement, and engagement, with any necessary improvements adopted in future years.

CONTRIBUTIONS OF AUTHORS

All authors were confirmed to contribute equally to every part of the paper. Also, the authors had assessed and agreed to the final version of the work.

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CONFLICT OF INTERESTS

All authors declare that they have no conflicts of interest.

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